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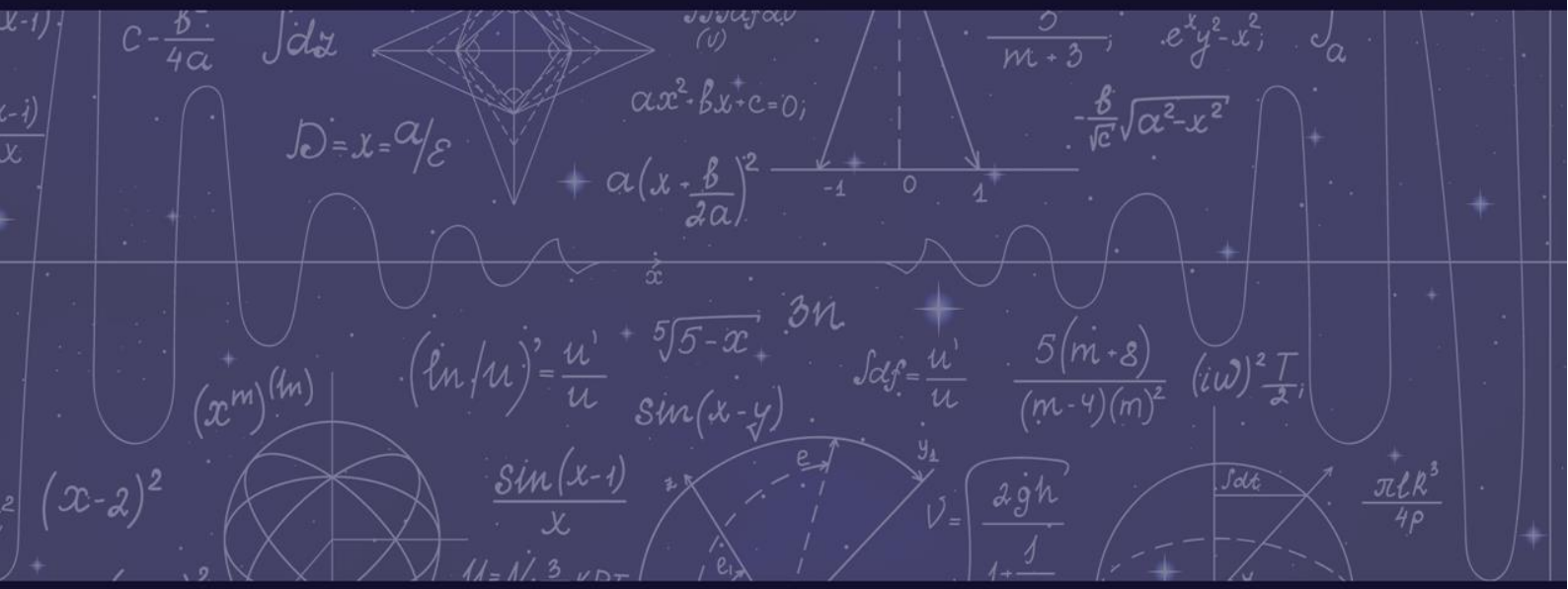

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The collection contains scientific articles accepted for issue 1 for 2023 of the international scientific journal "Science and Innovations".

In this scientific journal, in the form of scientific articles, the results of scientific research conducted by professors and teachers of the Republic of Uzbekistan and international higher educational institutions, independent researchers, doctoral students, undergraduates were published. In addition to higher educational institutions, the journal also includes scientific articles by employees working in other research institutes, production organizations and enterprises of our region and republic.

The materials of the journal can be used by professors, teachers, independent researchers, doctoral students, undergraduates, students, teachers of lyceums and schools, scientists and everyone who is interested in science.

This issue of the journal is indexed in the international scientific databases Index Copernicus, OpenAire, ZENODO, Cyberleninka and Google Scholar.

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ABDUKAYUMOV ABDURASHID
Doctor of technical sciences, professor

Abdukayumov Abdurashid was born on February 1, 1943 in Tashkent. In 1960, he entered the Faculty of Energy of the Central Asian Polytechnic Institute, and in 1966 he graduated from the Faculty of Engineering Physics, which was opened in the same institute in 1966. He is among members of scientific seminars and scientific councils awarding scientific degrees at TSTU, TSTPU and TITU. He started his career as an assistant at the Department of Industrial Electronics of Tashkent Polytechnic Institute. In 1967-1968, he advanced his qualifications at Moscow Institute of Energy.

In 1968, he entered the graduate school of Tashkent Polytechnic Institute and was mobilized for 3 years at the Physics and Mechanics Research Institute of the Academy of Sciences of the Republic of Ukraine in Lviv. In May 1972, he defended his candidate's dissertation on the topic "Creation and research of multi-stationary components of industrial automation" and continued to work as an assistant at Tashkent Polytechnic Institute. In 1973, he worked as a senior teacher, in 1975 as an associate professor, and from 1987, he worked as the head of the newly established department of "Radioelectronic Devices Design and Technology". In 1993, he defended his doctoral dissertation on the topic "Frequency-phase electromechanical multipoint components of control systems".

In 1996 he received the title of professor. Since 1997, he had been the head of the Department of "Aircraft and Airport Radio-Electronic Equipment" at Tashkent State Aviation Institute (TDAI). He was the head of the department until 2013, after TDAI had been dissolved in 2008 and joined the Aviation Faculty of Tashkent State Technical University. From 2013 to 2016 he worked as a professor of TSTU, 2016-2017 - professor of Tashkent Railway Engineering Institute, 2017-2020 - professor of TDTU, 2020-2022 - professor of the department of "Aeronautical Systems" of TSTPU, from 2022 to present - professor of the department "Radioelectronic devices and systems" of TSTPU.

During his work, he was awarded with a number of honors. For several years, he participated as a judge in the TV show "Oyla, izla, top" in the field of youth education. In this regard, he received honorary certificates of "Teleradiocompany" and the Ministry of Public Education. During his career, he trained 1 Doctor of Science, 2 Candidates of Science, 2 Philosophy Doctors (PhD). He has improve qualifications on information technology in Mara University of Malaysia.

He has developed all the normative documents of 4 bachelor's courses and 2 master's specialties. Specialist personnel are being trained based on the developed normative documents.

ADVANCED PRACTICES AND MODELS OF CORPORATE GOVERNANCE

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Abstract. *The article examines the role of corporate governance in the development of the national economy, foreign experience of corporate governance, the peculiarities and differences of different models, modern corporate governance, trends in corporate governance in the world and some recommendations.*

Keywords: *joint-stock company, corporate governance, corporation, modern corporate governance, shareholder, Anglo-American model, German model, Japanese model.*

Introduction

Today, the essence of modern corporate governance in joint-stock companies is very important, as the principles and models of corporate governance greatly contribute to the processes of efficiency and high profit in joint-stock companies. Therefore, our government is developing various decisions, projects and programs for the development of current sector. By the Decree of the President of the Republic of Uzbekistan "On the development strategy for the further development of the Republic of Uzbekistan" dated January 28, 2022 No. PF-60, aimed at further increasing the well-being of people, transforming economic sectors and rapidly developing entrepreneurship, unconditionally ensuring human rights and interests, and forming an active civil society in order to determine the priorities: "Development strategy on seven priority directions of development of New Uzbekistan in 2022-2026 was approved[1]. In this programmatic document, the main tasks to be implemented in the next few years in 7 areas were defined. Including increasing the competitiveness of the national economy for further development and it's liberalization, continuing institutional and structural reforms to reduce state participation in the economy, protecting the right to private property and further strengthening its priority position, encouraging the development of small business and private entrepreneurship, improving the investment environment it was noted that it is necessary to actively attract foreign investments to the sectors and regions of our country's economy, and a number of measures are being implemented in this direction.

The participation of joint-stock companies in the development of the national economy, increasing its competitiveness and activating international integration is increasing. Especially in the current period of improvement of market relations and rapid changes, effective financial and economic activity of joint-stock companies cannot be ensured without a carefully worked out financial policy and a mechanism for its implementation. This is one of the most important aspects of effective corporate governance in joint-stock companies.

Importance and necessity of improving corporate governance in order to fundamentally increase the efficiency of joint-stock companies, attract foreign direct investment to enterprises, ensure their openness and attractiveness for future investments, introduce modern corporate governance methods, and strengthen the role of shareholders in the strategic management of enterprises is increasing [2].

Literature review

Nowadays, there is no single definition of corporate governance in the world. Various scientific studies and researches have been conducted in corporate governance, as a result of which different definitions of corporate governance have been formed. These definitions mainly depend on the legal situation of the country or the views of the authors.

Sir Adrian Cadbury, one of the first foreign authors, who gave the following definition to corporate governance in the his report "Committee on Financial Aspects of Corporate Governance" in 1992: "Corporate governance (see Corporate Governance) is a system of managing companies and controlling their activities"[3].

American economists R. Monks and N. Minou, who are considered pioneers in the field of corporate governance, interpreted corporate governances "the relationship between various participants (chief executive officer, management, shareholders, employees) in the process of determining the direction of development and performance of the corporation" [3].

Economist of our country M.B.Khamidulin's definition explains, "Corporate governanceis the conscious, direct participation of the owners of the corporation in the formation of the capital of the corporation, its more effective use for the purpose of profit, and the determination, definition and adoption of strategic important decisions aimed at the fair distribution of the received income among all participants of corporate relations" [4].

D. Suyunov explained corporate governance such as "Corporate governance is a set of activities carried out to achieve the goal of the enterprise on the basis of certain principles of management based on the applicable legal norms, regardless of the form of ownership"[5].

According to A.A. Hashimov's definition, "The main content of corporate governance is the balancing of the interests of various persons involved in the activities of the joint-stock company"[6].

In our country, well-known economists B.Yu. Khodiev, S.S. Gulomov, K.Kh. Abdurakhmonov, B.B. Berkinov, N.Q. Yoldoshev, D.N. Rakhimova, M.L. Tursunkhodjaev, Sh.N. Zaynutdinov, J.A. Fattakhova, A.A. Khoshimov, R.I. Nurimbetov, M.B. Khamidulin,
D.Kh. Suyunov, Sh.G'. Yuldashev , D.B. Begmatova, M.M. Ziyaeva and others [7] studied in their work.

A corporation is a partnership-based organization established for the purpose of continuous operation through the voluntary pooling of capital by individuals and legal entities, management functions are assigned to hired professional managers, relations in the corporation are regulated by internal administrative rules and collective decisions, not contradicting the relevant legislation of the country, and the personnel of the corporation, in general , is an organization that serves to improve the standard of living of the society [8].

In our opinion, it is necessary to pay special research attention to the issues of formation of corporate motivation of personnel in order to correct this definitions and achieve corporate governance of more personnel and higher economic indicators.

The corporation as an economic institution has the following main features:

- It is an association of economically based producers, owners, and is a legal entity with the right to independently sell and buy, attract credit funds, and enter into contractual relations in the interests of the corporation;

- The property of the corporation is shown in the form of the sum of the shares and production capital invested in it;

- Shareholders have the right to control the activities of corporations that are considered owners;

- Directors and managers of the corporation have the right to make decisions on relevant issues;

- All investors of the corporation have financial responsibility in the amount of their investments[9].

In our opinion, the above features require clarification, that is, the corporation is an economic unit that produces material and immaterial goods to meet the needs of society, and its economic indicators directly affect the standard of living of the members of the corporation and the population in general. It is for this reason that the corporation and the corporate governance system serving its efficiency should be considered as an economic category[10].

Modern corporate governance is a specific system of relations between the organization's management, its shareholders and the board of directors. Its main purpose is to exercise control over corporate activity [3]. Modern corporate governance enables the implementation of the development strategy and goals of the joint-stock company based on international standards, ensures the financial strength of the joint-stock company and its long-term operation as a profitable company, and also helps to increase the competitiveness of the country.

Modern corporate governance covers the system functioning in foreign countries, the content and essence of foreign standards, state participation, development trend of the practices in the countries of the world and in digital economy.

Research methodology

The basis of the research methodology is the systematic analysis of the practices and models of corporate governance, the materials on the analysis of selected literature. Also, scientific research methods such as generalization, grouping, comparison, analysis and synthesis are widely used in the research process.

Analysis and results

Today the studies of mature and modern experience and formed skills in the practice of corporate governance is one of the urgent issues. There are various models of corporate governance in practice around the world. Each country forms a corporate governance model based on its own characteristics. All corporate governance models in the world are based on three basic different models.

Corporate governance is a concept that represents the system of interactions between managers, the board of directors, shareholders and individuals interested in the governance of the company. Such a system affects not only the income of the founders, but also the future investments of the company.

The above-mentioned ***Anglo-American or outsider model*** is a governance model of a joint-stock company based on the use of external market mechanisms of a high level of corporate control over a joint-stock company or control over the management of a joint-stock company. Such a governance model is typical for countries such as the United States, Great Britain, Canada, and New Zealand. In this case, the interests of the shareholders are manifested in a unique large number of investors who exist depending on the governance of the joint-stock company. The real governance of the joint-stock company is carried out by professional managers. The main problem

in the application of this model is the problem of mutual relations between the founders of the joint-stock company and the involved managers. In such circumstances, the role of the stock market, which plays an important role in the implementation of control over the management of the joint-stock company, will certainly increase. The main participants are managers, directors (board of directors) and investors. Also participating are consulting firms providing corporate governance and fiduciary voting advisory services to government entities, stock exchanges, self-regulatory bodies, corporations and investors.

Among the countries that implement the Anglo-American model of corporate governance, the United States has the strictest standard of information disclosure.

Other countries that use this model also have a high level of transparency, but in the United States, corporations must publish various information once a quarter. Also, the following information should be included in the annual report or the annual general meeting of shareholders:

The following are included in the main principles of the Anglo-American model of corporate governance:

- ✓ separation of property and liabilities;
- ✓ separation of property rights and control of the corporation;
- ✓ a sufficient condition for "promoting the welfare of a joint-stock company": wealth-maximizing behavior;
- ✓ maximizing the market price of shares is maximizing shareholder wealth;
- ✓ all shareholders have equal rights;

Outsider (foreign) model - the use of a joint-stock company in the foreign market at a high level or corporate control mechanisms is a control model.

The continental (German) or insider model is a governance model of joint-stock companies, with priority given to the use of internal methods of corporate control or self-control methods. "The German model of corporate governance is typical of Central and Western European countries (Germany, Holland, Switzerland, Austria, Norway, Scandinavian countries, Belgium and France). It is based on the principle of social interaction: all interested parties (shareholders, managers, employees, banks, public organizations) have the right to participate in the decision-making process of a joint-stock company. The German model is characterized by a weak focus on stock markets and shareholder value in management, as the company controls its own competitiveness and performance”[11].

"The formation of this model was influenced by a number of objective and subjective factors. Among them, first of all, it is necessary to single out the high level of concentration of share capital, which ensures the leading role of banks in making corporate decisions and is characterized by the placement of their shares in a relatively small part of private investors. For example, in large companies, more than 40% of shares belong to 5 large shareholders. Accordingly, the stock market in Germany is somewhat less liquid than in the United States and Great Britain. For this reason, the continental model is characterized by a somewhat higher level of ownership concentration and the presence of strategic investors with blocked share packages in which banks play the main role. In recent years, the influence of foreign investors on management based on the German model is increasing.

The Anglo-American and German models of corporate governance represent two mutually conflicting systems that reflect the national characteristics of a particular country and consist of many options based on the leading priorities of one or another system. The development of a

particular model of corporate governance within the national economy depends mainly on the following three factors:

- a mechanism for the protection of shareholders' rights;
- functions and duties of the board of directors;
- disclosure level.

The Japanese model of corporate governance was formed after the Second World War on the basis of financial-industrial groups (keiretsu), influenced by the country's political-economic conditions, culture and traditions, and is characterized by a completely closed system based on bank supervision, which allows to reduce the problems of managers' control.

The Japanese model of corporate governance is multilateral and is structured around a core (leading) bank and a financial-industry group (chain) or keiretsu. “The main bank and keiretsu are two different but complementary elements of the Japanese model. Virtually all Japanese corporations have close relationships with their parent banks. The bank provides loans to its corporate clients, issues bonds, shares, and provides services for maintaining account numbers and providing consulting services.

This model is characterized by the accumulation of a large part of the property in the hands of large and medium-sized shareholders who own shares in the companies included in the "keiretsu". That is, 70% of the shares of joint-stock companies belong to financial institutions, but the monitoring of the company's activity is carried out not only by their shareholders, but also by the main bank, which is considered a major creditor. Typically, a keiretsu is organized around a single large bank that can provide financing for all companies in a financial-industrial group. [12]

Boards of Japanese corporations are larger than those in the US, UK or Germany, with an average of 50 members. If the corporation's profits decrease over a period of time, the main bank and keiretsu members can fire the directors and appoint their own candidates. Another custom typical of the Japanese state is the inclusion of retired heads of various ministries and agencies on the board of directors of a corporation. For example, Japan's Ministry of Finance may appoint a retired executive to a bank's board of directors. In the Japanese model, the composition of the board of directors depends on the financial condition of the corporation.

As a result of changes in legislation in the country in recent years, the Japanese model of corporate governance began to have a negative impact on effective development. The reason is that, as a result of the increase of foreign institutional investors in the country, Japanese companies began to focus more on the market, shareholders, and, moreover, on the Anglo-American model.

The family based model of corporate governance is widely spread in all countries of the world (mainly in Asian and Latin American countries, Canada, Sweden, Italy and France). In this case, the governance of the corporation is carried out by members of the same family. Corporate capital is concentrated and distributed through family channels, and control over the movement of the corporation's business and financial resources rests entirely with the family (for example, the Wallenbergs in Sweden, the Agnellis in Italy, the Bronfmans in Canada, and the Li Kai Shi dynasty in Taiwan). In some cases, family businesses may involve investors, but they will not have much of a voice in corporate governance. Such shares may also be issued through a public offering. If all the shares of a joint-stock company are owned by one voter, then family-owned shares offer additional advantages (for example, exceptional rights in the election of board members). Such an instrument allows controlling the activities of a joint-stock company even without having a large shareholding. According to some researchers, family companies represent an outdated method of

capital accumulation and are not considered an effective form of business management. However, data shows that family companies account for 45% to 75% of GDP in industrialized countries . In addition, family companies tend to be in business for a longer period of time compared to companies with a large number of owners. [13]

In world practice, the experience of the existing four models of corporate governance in joint-stock companies differs from each other in terms of their specific features in their application and the mechanism of their implementation. Based on the conducted research, a comparative analysis of the advantages and disadvantages of the use of these models was carried out, and the result was expressed in the following table:

Corporate governance models advantages and disadvantages

Anglo-American model	**continental European model**	**Japanese model**
Advantages		
➢ A high level of personal savings is attracted through the stock market; ➢ Investors are directed to areas with high returns; ➢ The main purpose of the business is to increase the profitability of the company; ➢ Information transparency of companies will be high.	➢ Low cost of invested capital; ➢ Investors are focused on long-term goals; ➢ High level of stability of companies; ➢ Management and control functions are clearly separated.	➢ Raising capital is cheap; ➢ Capital is directed to long-term goals; ➢ Companies strive to be highly competitive; ➢ Companies stability is high.
Disadvantages		
➢ attraction done to capital high dividends to pay; ➢ stock market of assets real value broke to show; ➢ Management and control functions sure not separated.	➢ role of the stock market is external control tool as unimportant ; ➢ minority of shareholders rights less attention is given; ➢ information transparency low for investments done increase difficult;	➢ investments done increase complicated; ➢ investment of income lack of and of the bank absolute dominant; ➢ of companies information low transparency; ➢ minority of shareholders rights less attention is given.

Studies show that none of the above-mentioned models of corporate governance, unique to joint-stock companies, have priorities that stand out from others, and none of them can be said to be universal. On the contrary, the situation in the last decade shows that it is typical for all leading countries in the world to mix different systems of corporate governance.

At the same time, the effective organization of corporate governance in joint-stock companies not only contributes to the development of their activities, but also increases the volume

and movement of cash flows, provides additional value growth by reducing the cost of capital invested in investment projects, and increases the development, international integration and competitiveness of the national economy. also has its effect. [14]

This increases the need to apply advanced foreign practices of corporate governance in joint-stock companies. In this case, the accumulation of certain experiences in corporate governance in our country, the creation of necessary conditions for practice, indicate that there are necessary elements for the implementation of advanced foreign experiences in this regard.

Summary

In order to improve the practice of corporate governancein joint-stock companies, it is desirable to implement the following:

1. Attracting highly qualified and experienced experts from abroad in the corporate governance of joint-stock companies, using their suggestions and experiences in practice to improve the corporate governance system, improving the professional level of experts in the implementation of the corporate governance system in accordance with international standards in our country, corporate governance culture, ethics, psychology and skills should be formed.

2. In the corporate governance of joint-stock companies, it is necessary to ensure full and regular implementation of the concepts of capital value, capital composition, value of money per unit of time, and the interdependence of profitability and risk level in the careful development of financial policy and the provision of the financial basis for its implementation.

3. To achieve an increase in resistance to free competition in the international market on the basis of ensuring their access to the foreign capital market by ensuring the entry of joint-stock companies of our country to foreign prestigious stock exchanges (IPO), in which organizational-legal, technical-economic, informational and it is appropriate to develop the basis and mechanism for personnel supply.

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NETWORK ROUTING AND COMMUNICATION ALGORITHM

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https://doi.org/10.5281/zenodo.7517416

Abstract. *Analysis of network routing and communication algorithms. Analyze physical and logical topologies Analyze network speed and analysis of cost indicators.*
Key word: *topology, networks, applications, security, switch, routers, Cisco devices, system software, router rip, protocols.*

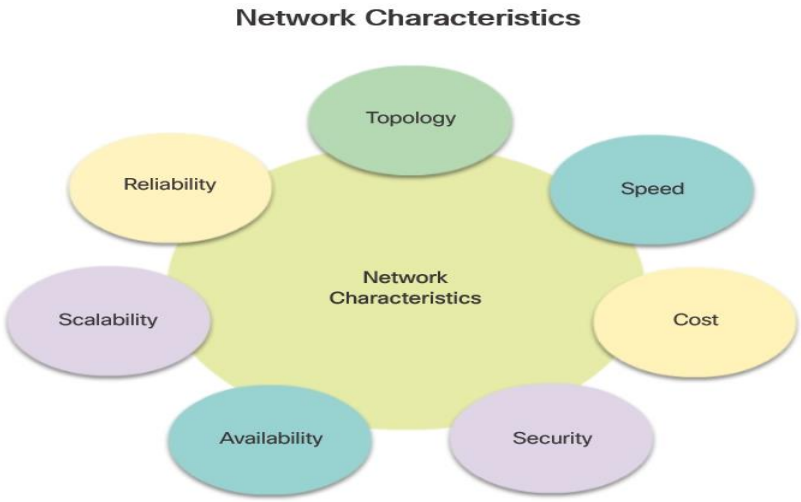
Characteristics of a Network

Networks have had a significant impact on our lives. They have changed the way we live, work, and play.

Networks allow us to communicate, collaborate, and interact in ways we never did before. We use the network in a variety of ways, including web applications, IP telephony, video conferencing, interactive gaming, electronic commerce, education, and more.

As shown in the figure, there are many key structures and performance-related characteristics referred to when discussing networks:

- **Topology** - There are physical and logical topologies. The physical topology is the arrangement of the cables, network devices, and end systems. It describes how the network devices are actually interconnected with wires and cables. The logical topology is the path over which the data is transferred in a network. It describes how the network devices appear connected to network users.
- **Speed** - Speed is a measure of the data rate in bits per second (b/s) of a given link in the network.
- **Cost** - Cost indicates the general expense for purchasing of network components, and installation and main-tenance of the network.
- **Security** - Security indicates how protected the network is, including the information that is transmitted over the network. The subject of security is important, and techniques and practices are constantly evolving. Consider security whenever actions are taken that affect the network.

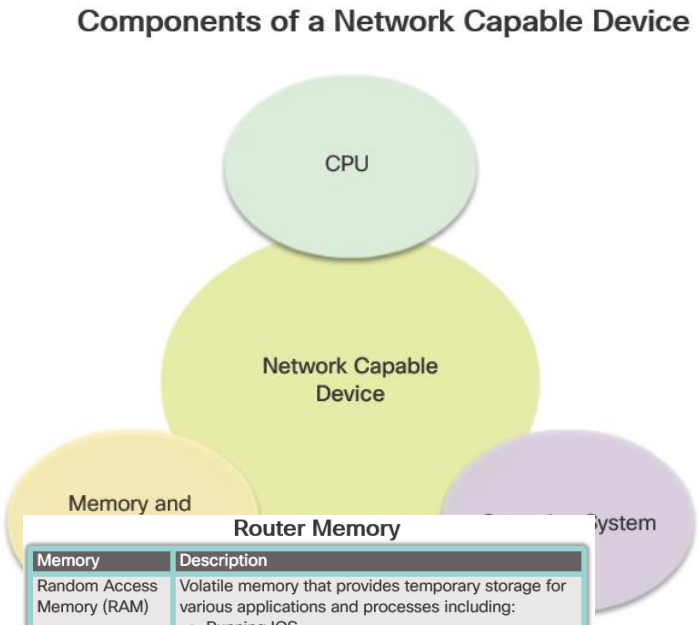


- **Availability** - Availability is the likelihood that the network is available for use when it is required.

- **Scalability** - Scalability indicates how easily the network can accommodate more users and data transmission requirements. If a network design is optimized to only meet current requirements, it can be very difficult and expensive to meet new needs when the network grows.
- **Reliability** - Reliability indicates the dependability of the components that make up the network, such as the routers, switches, PCs, and servers. Reliability is often measured as a probability of failure or as the mean time between failures (MTBF).

Routers Are Computers

Most network capable devices (e.g.., computers, tablets, and smartphones) require the following components to operate, as shown in Figure 1:



- Central processing unit (CPU)
- Operating system (OS)
- Memory and storage (RAM, ROM, NVRAM, Flash, hard drive)

A router is essentially a specialized computer. It requires a CPU and memory to temporarily and permanently store data to execute operating system instructions, such as system initialization, routing functions, and switching functions.

Note: Cisco devices use the Cisco Internetwork Operating System (IOS) as the system software.

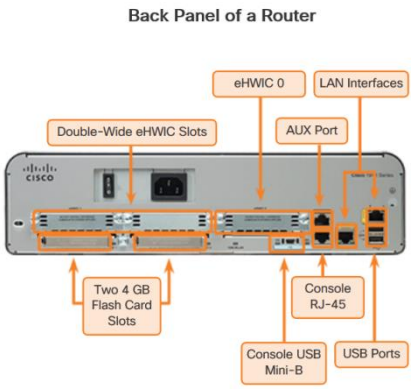
Router memory is classified as volatile or non-volatile. Volatile memory loses its content when the power is turned off, while non-volatile memory does not lose its content when the power is turned off.

The table in Figure 2 summarizes the types of router memory, the volatility, and examples of what is stored in each.

Router Memory

Memory	Description
Random Access Memory (RAM)	Volatile memory that provides temporary storage for various applications and processes including: • Running IOS • Running configuration file • IP routing and ARP tables • Packet buffer
Read-Only Memory (ROM)	Non-volatile memory that provides permanent storage for: • Bootup instructions • Basic diagnostic software • Limited IOS in case the router cannot load the full featured IOS
Non-Volatile Random Access Memory (NVRAM)	Non-volatile memory that provides permanent storage for the: • Startup configuration file
Flash	Non-volatile memory that provides permament storage for: • IOS • Other system-related files

Unlike a computer, a router does not have video adapters or sound card adapters. Instead, routers have specialized ports and network interface cards to interconnect devices to other networks. Figure 3 identifies some of these ports and interfaces.

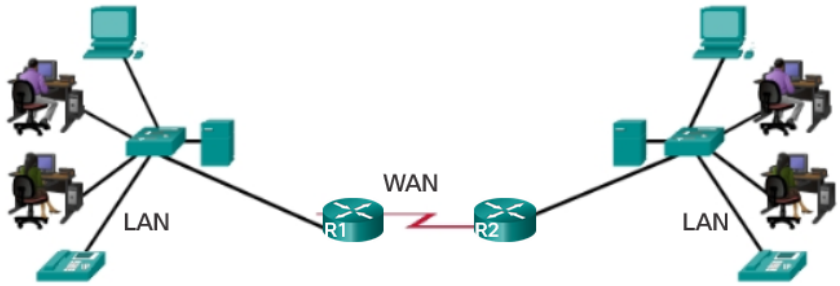


Routers Interconnect Networks

Most users are unaware of the presence of numerous routers on their own network or on the Internet. Users expect to be able to access web pages, send emails, and download music, regardless of whether the server accessed is on their own network or on another network. Networking professionals know that it is the router that is responsible for forwarding packets from network to network, from the original source to the final destination.

A router connects multiple networks, which means that it has multiple interfaces that each belong to a different IP network. When a router receives an IP packet on one interface, it determines which interface to use to forward the packet to the destination. The interface that the router uses to forward the packet may be the final destination, or it may be a network connected to another router that is used to reach the destination network.

R1 and R2 are responsible for receiving the packet on one network and forwarding the packet out another network toward the destination network.



Each network that a router connects to typically requires a separate interface. These interfaces are used to connect a combination of both local-area networks (LANs) and wide-area networks (WANs). LANs are commonly Ethernet networks that contain devices, such as PCs, printers, and servers. WANs are used to connect networks over a large geographical area. For example, a WAN connection is commonly used to connect a LAN to the Internet service provider (ISP) network.

Packet Forwarding Mechanisms

Routers support three packet-forwarding mechanisms:

- **Process switching** - An older packet forwarding mechanism still available for Cisco routers. When a packet arrives on an interface, it is forwarded to the control plane where the CPU matches the destination address with an entry in its routing table, and then determines the exit interface and forwards the packet. It is important to understand that the router does this for every packet, even if the destination is the same for a stream of packets. This process-switching mechanism is very slow and rarely implemented in modern networks.
- **Fast switching** - This is a common packet forwarding mechanism which uses a fast-switching cache to store next-hop information. When a packet arrives on an interface, it is forwarded to the control plane where the CPU searches for a match in the fast-switching cache. If it is not there, it is process-switched and forwarded to the exit interface. The flow information for the packet is also stored in the fast-switching cache. If another packet going to the same destination arrives on an interface, the next-hop information in the cache is re-used without CPU intervention.
- **Cisco Express Forwarding (CEF)** - CEF is the most recent and preferred Cisco IOS packet-forwarding mechanism. Like fast switching, CEF builds a Forwarding Information Base (FIB), and an adjacency table. However, the table entries are not packet-triggered like fast switching but change-triggered such as when something changes in the network topology. Therefore, when a network has converged, the FIB and adjacency tables contain all the information a router would have to consider when forwarding a packet. The FIB contains pre-computed reverse lookups, next hop information for routes including the interface and Layer 2 information. Cisco Express Forwarding is the fastest forwarding mechanism and the preferred choice on Cisco routers.

Figures 5 to 7 illustrate the differences between the three packet-forwarding mechanisms. Assume that a traffic flow consisting of five packets are all going to the same destination. As shown in Figure 1, with process switching, each packet must be processed by the CPU individually. Contrast this with fast switching, as shown in Figure 6. With fast switching, notice

how only the first packet of a flow is process-switched and added to the fast-switching cache. The next four packets are quickly processed based on the information in the fast-switching cache. Finally, in Figure 7, CEF builds the FIB and adjacency tables, after the network has converged. All five packets are quickly processed in the data plane.

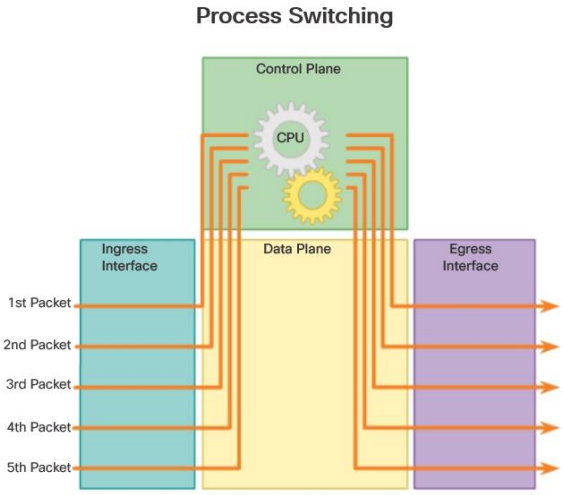


Figure 5

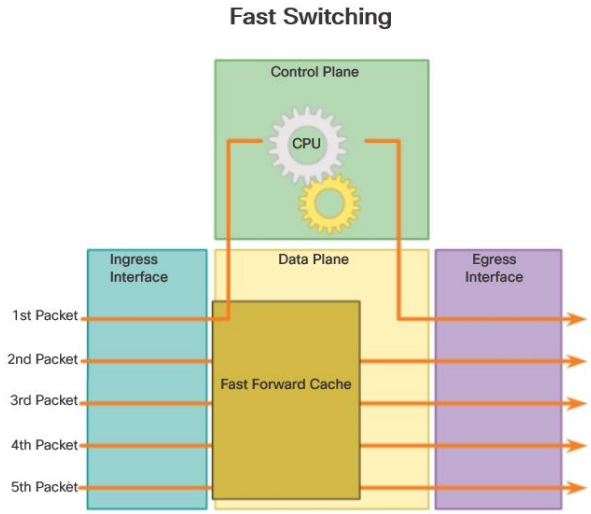


Figure 6

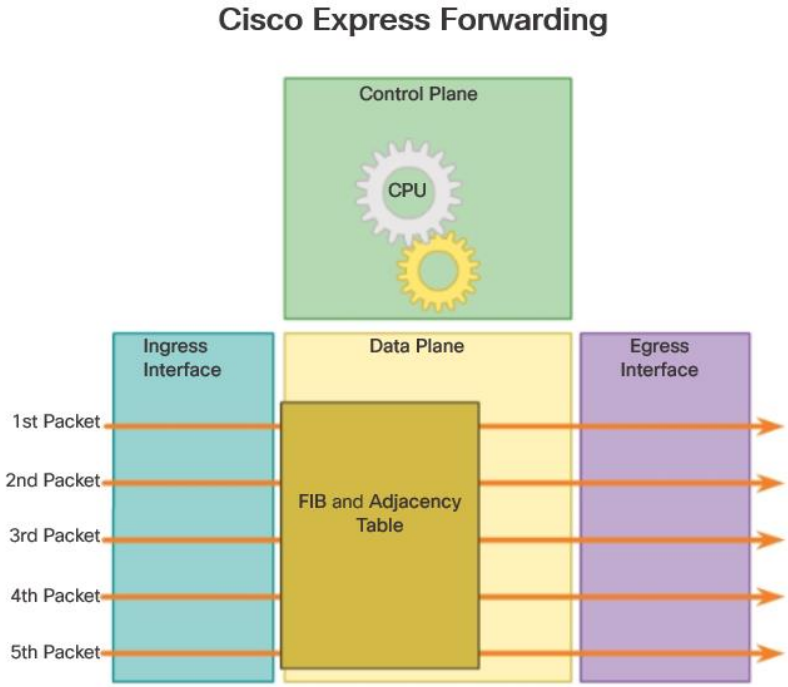


Figure 7

A common analogy used to describe the three packet-forwarding mechanisms is as follows:

- Process switching solves a problem by doing math long hand, even if it is the identical problem.
- Fast switching solves a problem by doing math long hand one time and remembering the answer for subsequent identical problems.
- CEF solves every possible problem ahead of time in a spreadsheet.

Connect to a Network

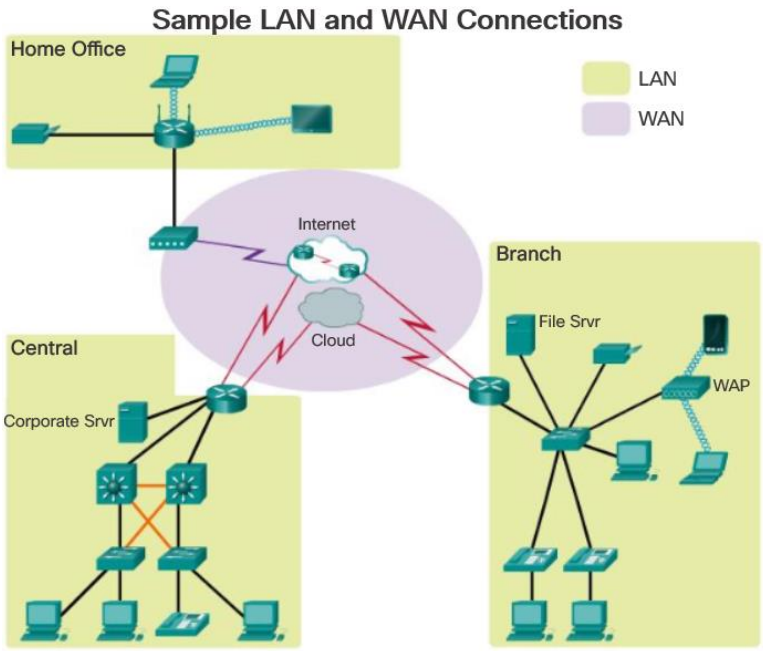
Network devices and end users typically connect to a network using a wired Ethernet or wireless connection. Refer to the figure as a sample reference topology. The LANs in the figure serve as an example of how users and network devices could connect to networks.

Home Office devices can connect as follows:

- Laptops and tablets connect wirelessly to a home router.
- A network printer connects using an Ethernet cable to the switch port on the home router.
- The home router connects to the service provider cable modem using an Ethernet cable.
- The cable modem connects to the Internet service provider (ISP) network.

The Branch site devices connect as follows:

- Corporate resources (i.e., file servers and printers) connect to Layer 2 switches using Ethernet cables.
- Desktop PCs and voice over IP (VoIP) phones connect to Layer 2 switches using Ethernet cables.
- Laptops and smartphones connect wirelessly to wireless access points (WAPs).
- The WAPs connect to switches using Ethernet cables.
- Layer 2 switches connect to an Ethernet interface on the edge router using Ethernet cables.



An edge router is a device that sits at the edge or boundary of a network and routes between that network and another, such as between a LAN and a WAN.

- The edge router connects to a WAN service provider (SP).
- The edge router also connects to an ISP for backup purposes.

The Central site devices connect as follows:

- Desktop PCs and VoIP phones connect to Layer 2 switches using Ethernet cables.
- Layer 2 switches connect redundantly to multilayer Layer 3 switches using Ethernet fiber-optic cables (orange connections).
- Layer 3 multilayer switches connect to an Ethernet interface on the edge router using Ethernet cables.
- The corporate website server is connected using an Ethernet cable to the edge router interface.
- The edge router connects to a WAN SP.
- The edge router also connects to an ISP for backup purposes.

In the Branch and Central LANs, hosts are connected either directly or indirectly (via WAPs) to the network infrastructure using a Layer 2 switch.

Default Gateways

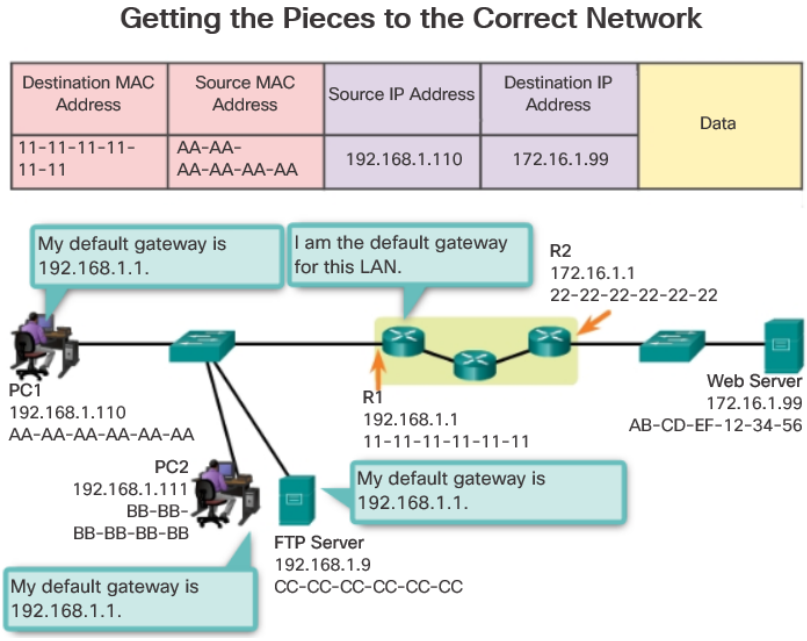
To enable network access, devices must be configured with IP address information to identify the appropriate:

- **IP address** - Identifies a unique host on a local network.

- **Subnet mask** - Identifies with which network subnet the host can communicate.
- **Default gateway** - Identifies the IP address of the router to send a packet to when the destination is not on the same local network subnet.

When a host sends a packet to a device that is on the same IP network, the packet is simply forwarded out of the host interface to the destination device.

When a host sends a packet to a device on a different IP network, then the packet is forwarded to the default gateway, because a host device cannot communicate directly with devices outside of the local network. The default gateway is the destination that routes traffic from the local network to devices on remote networks. It is often used to connect a local network to the Internet.



The default gateway is usually the address of the interface on the router connected to the local network. The router maintains routing table entries of all connected networks as well as entries of remote networks, and determines the best path to reach those destinations.

For example, if PC1 sends a packet to the Web Server located at 176.16.1.99, it would discover that the Web Server is not on the local network and it, therefore, must send the packet to the Media Access Control (MAC) address of its default gateway. The Packet protocol data unit (PDU) in the figure identifies the source and destination IP and MAC addresses.

Static Routing

ip route Command

Static routes are configured using the **ip route** global configuration command. The basic syntax for the command is shown in the figure.

The following parameters are required to configure static routing:

- *network-address* - Destination network address of the remote network to be added to the routing table, often this is referred to as the prefix.

- *subnet-mask* - Subnet mask, or just mask, of the remote network to be added to the routing table. The subnet mask can be modified to summarize a group of networks.

One or both of the following parameters must also be used:

- *ip-address* - The IP address of the connecting router to use to forward the packet to the remote destination network. Commonly referred to as the next hop.
- *exit-intf* - The outgoing interface to use to forward the packet to the next hop.

The *distance* parameter is used to create a floating static route by setting an administrative distance that is higher than a dynamically learned route.

ip route Command Syntax

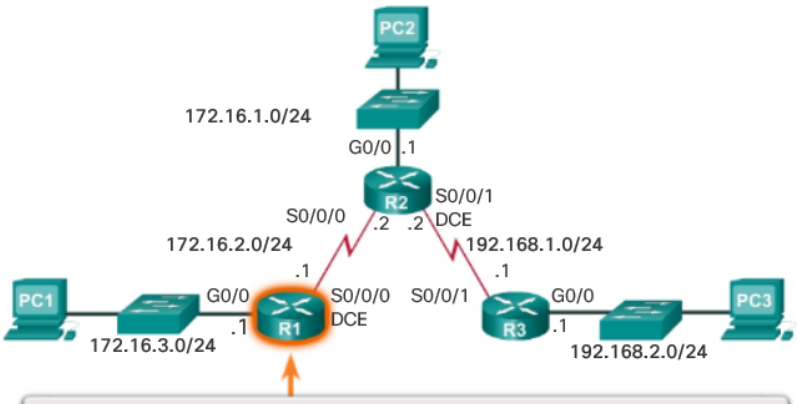
```
Router(config)# ip route network-address subnet-mask
{ip-address | exit-intf}
```

Parameter	Description
network-address	Destination network address of the remote network to be added to the routing table
subnet-mask	• Subnet mask of the remote network to be added to the routing table. • The subnet mask can be modified to summarize a group of networks.
ip-address	• Commonly referred to as the next-hop router's IP address. • Typically used when connecting to a broadcast media (i.e., Ethernet). • Commonly creates a recursive lookup

Verify a Default Static Route

In the figure, the **show ip route static** command output displays the contents of the static routes in the routing table. Note the asterisk (*)next to the route with code 'S'. As displayed in the Codes table in the figure, the asterisk indicates that this static route is a candidate default route, which is why it is selected as the Gateway of Last Resort.

Verifying the Routing Table of R1




```
R1# show ip route static
Codes: L - local, C - connected, S - static, R - RIP,
       M - mobile, B - BGP, D - EIGRP,
       EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1,
       N2 - OSPF NSSA external type 2,
       E1 - OSPF external type 1,
       E2 - OSPF external type 2, i - IS-IS,
       su - IS-IS summary, L1 - IS-IS level-1,
```

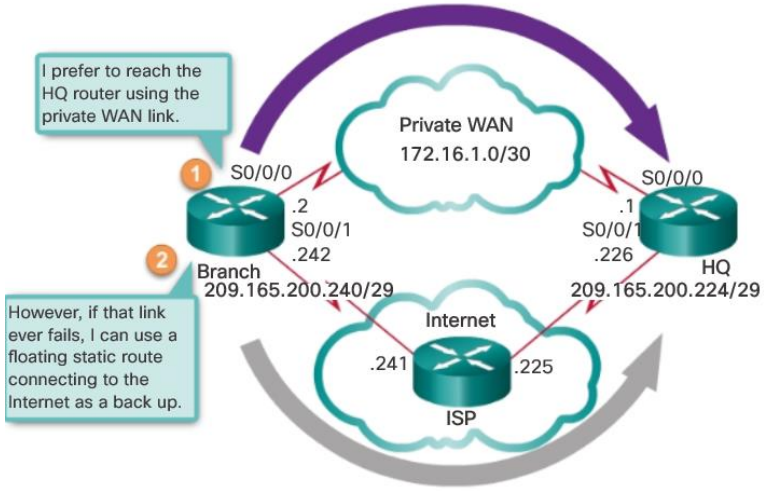
The key to this configuration is the /0 mask. The subnet mask in a routing table determines how many bits must match between the destination IP address of the packet and the route in the routing table. A binary 1 indicates that the bits must match. A binary 0 indicates that the bits do not have to match. A /0 mask in this route entry indicates that none of the bits are required to match. The default static route matches all packets for which a more specific match does not exist.

Floating Static Routes

Floating static routes are static routes that have an administrative distance greater than the administrative distance of another static route or dynamic routes. They are very useful when providing a backup to a primary link, as shown in the figure.

By default, static routes have an administrative distance of 1, making them preferable to routes learned from dynamic routing protocols. For example, the administrative distances of some common dynamic routing protocols are:

- EIGRP = 90
- IGRP = 100
- OSPF = 110
- IS-IS = 115
- RIP = 120



The administrative distance of a static route can be increased to make the route less desirable than that of another static route or a route learned through a dynamic routing protocol. In this way, the static route "floats" and is not used when the route with the better administrative distance is active. However, if the preferred route is lost, the floating static route can take over, and traffic can be sent through this alternate route.

Dynamic Routing

Router RIP Configuration Mode

Although RIP is rarely used in modern networks, it is useful as a foundation for understanding basic network routing. This section provides a brief overview of how to configure basic RIP settings and how to verify RIPv2.

Refer to the reference topology in Figure 8 and the addressing table in Figure 9. In this scenario, all routers have been configured with basic management features and all interfaces identified in the reference topology are configured and enabled. There are no static routes configured and no routing protocols enabled; therefore, remote network access is currently impossible. RIPv1 is used as the dynamic routing protocol. To enable RIP, use the **router rip** command, as shown in Figure 10. This command does not directly start the RIP process. Instead, it provides access to the router configuration mode where the RIP routing settings are configured. When enabling RIP, the default version is RIPv1.

To disable and eliminate RIP, use the **no router rip** global configuration command. This command stops the RIP process and erases all existing RIP configurations.

Figure 11 displays the various RIP commands that can be configured. The highlighted keywords are covered in this section.

Reference Topology

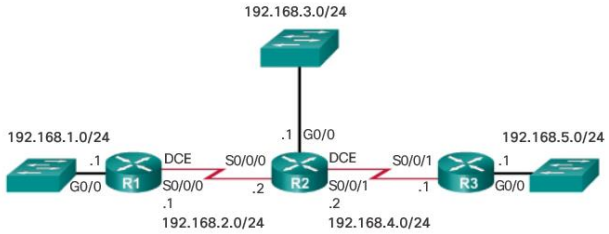


Figure 8

Addressing Table

Device	Interface	IP Address	Subnet Mask
R1	G0/0	192.168.1.1	255.255.255.0
	S0/0/0	192.168.2.1	255.255.255.0
R2	G0/0	192.168.3.1	255.255.255.0
	S0/0/0	192.168.2.2	255.255.255.0
	S0/0/1	192.168.4.2	255.255.255.0
R3	G0/0	192.168.5.1	255.255.255.0
	S0/0/1	192.168.4.1	255.255.255.0

Figure 9

Entering Routing Configuration Mode

```
R1# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)# router rip
R1(config-router)#
```

Figure 10

RIP Configuration Options

```
R1(config-router)# ?
Router configuration commands:
 address-family          Enter Address Family command mode
 auto-summary            Enable automatic network
                         number summarization
 default                 Set a command to its defaults
 default-information     Control distribution of
                         default information
 default-metric          Set metric of redistributed
                         routes
 distance                Define an administrative
                         distance
 distribute-list         Filter networks in routing
                         updates
 exit                    Exit from routing protocol
                         configuration mode
 flash-update-threshold  Specify flash update
                         threshold in second
 help                    Description of the
                         interactive help system
 input-queue             Specify input queue depth
 maximum-paths           Forward packets over multiple
                         paths
```

Figure 11

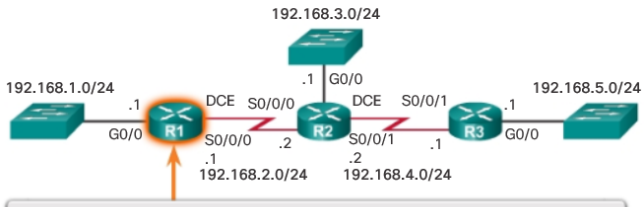
Advertise Networks

By entering the RIP router configuration mode, the router is instructed to run RIPv1. But the router still needs to know which local interfaces it should use for communication with other routers, as well as which locally connected networks it should advertise to those routers.

To enable RIP routing for a network, use the **network** *network-address* router configuration mode command. Enter the classful network address for each directly connected network. This command:

- Enables RIP on all interfaces that belong to a specific network. Associated interfaces now both send and receive RIP updates.
- Advertises the specified network in RIP routing updates sent to other routers every 30 seconds.

Advertising the R1 Networks




```
R1(config)# router rip
R1(config-router)# network 192.168.1.0
R1(config-router)# network 192.168.2.0
R1(config-router)#
```

Note: RIPv1 is a classful routing protocol for IPv4. Therefore, if a subnet address is entered, the IOS automatically converts it to the classful network address. For example, entering the **network 192.168.1.32** command would automatically be converted

to **network 192.168.1.0** in the running configuration file. The IOS does not give an error message, but instead corrects the input and enters the classful network address.

The **network** command is used to advertise the R1 directly connected networks.

Verify RIP Routing

The **show ip protocols** command displays the IPv4 routing protocol settings currently configured on the router. This output displayed in Figure 1 confirms most RIP parameters including:

Verifying RIP Settings on R1

```
R1# show ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is "rip"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Sending updates every 30 seconds, next due in 16 seconds
  Invalid after 180 seconds, hold down 180, flushed after 240
  Redistributing: rip

  Default version control: send version 1, receive any version
    Interface              Send  Recv  Triggered RIP  Key-chain
    GigabitEthernet0/0     1     1 2
    Serial0/0/0            1     1 2

  Automatic network summarization is in effect
  Maximum path: 4
  Routing for Networks:
    192.168.1.0
    192.168.2.0

  Routing Information Sources:
    Gateway         Distance      Last Update
    192.168.2.2          120      00:00:15
  Distance: (default is 120)

R1#
```

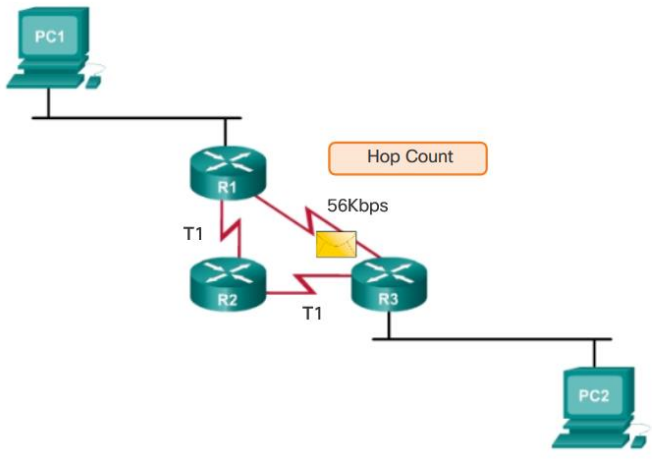
1. RIP routing is configured and running on router R1.
2. The values of various timers; for example, the next routing update, is sent by R1 in 16 seconds.
3. The version of RIP configured is currently RIPv1.
4. R1 is currently summarizing at the classful network boundary.
5. The classful networks are advertised by R1. These are the networks that R1 includes in its RIP updates.
6. The RIP neighbors are listed, including their next-hop IP address, the associated AD that R2 uses for updates sent by this neighbor, and when the last update was received from this neighbor.

Best Path

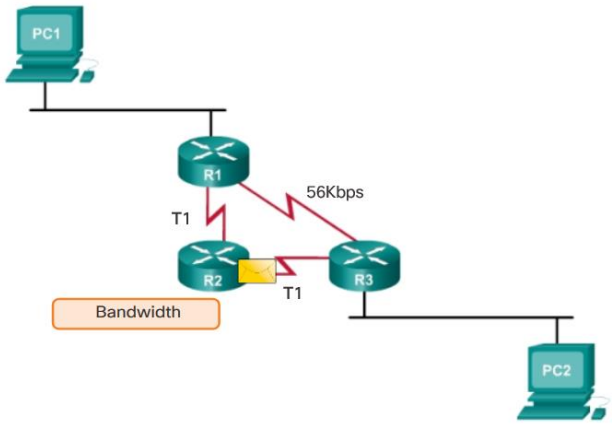
Determining the best path involves the evaluation of multiple paths to the same destination network and selecting the optimum or shortest path to reach that network. Whenever multiple paths to the same network exist, each path uses a different exit interface on the router to reach that network.

The best path is selected by a routing protocol based on the value or metric it uses to determine the distance to reach a network. A metric is the quantitative value used to measure the distance to a given network. The best path to a network is the path with the lowest metric.

Hop Count Versus Bandwidth as a Metric



Dynamic routing protocols typically use their own rules and metrics to build and update routing tables. The routing algorithm generates a value, or a metric, for each path through the network. Metrics can be based on either a single characteristic or several characteristics of a path. Some routing protocols can base route selection on multiple metrics, combining them into a single metric.



The following lists some dynamic protocols and the metrics they use:

- **Routing Information Protocol (RIP)** - Hop count
- **Open Shortest Path First (OSPF)** - Cisco's cost based on cumulative bandwidth from source to destination
- **Enhanced Interior Gateway Routing Protocol (EIGRP)** - Bandwidth, delay, load, reliability

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WAYS TO IMPROVE MARKETING ACTIVITIES AT "SHAKHRIYOR TOUR SERVIS" LLC

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Abstract. *In this article, the improvement of hospitality services in the field of marketing technologies , the development and prospects of the hospitality industry, development of the marketing complex, expansion of the range of hospitality services and development of additional tourist services.*

Keywords:*tourism, hospitality, marketing, service , assortment, technology,*

INTRODUCTION

Improvement of marketing activity in tourism and development of the service sector is one of the priorities in our country. In our republic, in 2021, the share of this sector in the country's gross domestic product is set to reach 64%.

Tourism and hotel business have a special place in the service sector. Therefore, as the President noted, "It is inevitable that the development of this sector will make a huge contribution to the economic and social development of our country by attracting a lot of foreign tourists to our country, and most importantly, by providing large foreign exchange earnings."

The existence of both the necessity and the opportunities for the tourism and hospitality business, the continuous increase of the requirements for it, imposes the requirements to strengthen the economy and increase the efficiency of the tourist complexes that carry out these types of activities, to organize the management tools that serve this, such as tourism marketing in accordance with today's requirements. This demand, in turn, necessitates deep research of the problems of economic development and efficiency improvement of tourist complexes, as well as theoretical, organizational and methodological issues of marketing in them.

Research methodology. Systematic approach, abstract-logical thinking, grouping, comparison, factor analysis, selective observation methods were used in the research process.

Analysis and results. The improvement of hospitality services in the field of marketing technologies is included.

To achieve this result, several tasks were set in the work:

- Development and prospects of the hospitality industry in Uzbekistan.
- Developing a marketing complex in the hospitality industry.
- Expanding the range of hospitality services anddevelopment of additional tourist services.
- Analyzing the main directions and results of marketing activities in "Shakhriyor tour servis" LLC;
- Show problems related to marketing activities in "Shakhriyor tour servis" LLC;
- Show ways to improve marketing activities in tourist enterprises.

The main goal of the society is to provide the population of the Republic of Uzbekistan with a job, satisfy their need for various products and services, as well as get income from entrepreneurship.

In order to achieve its main goal, the society carries out the following types of activities:

- organization of hotels and provision of services,

- travel operator, accepting and sending tourists, organization of travel services,
- buy foreign tourism and national tourism Development of domestic travel routes, organization of excursions, formation and reception of groups of tourists, provision of motor transport, provision of various services to guests,
-opening ticket offices, obtaining, pre-presenting and selling air tickets of the national airline "Uzbekistan Khavo Yullari" and other foreign airlines on the basis of an agency agreement.

It is known that there is a problem of creating all conditions for tourists for new companies to engage in tourist activities. The issue of lodging and feeding tourists will be especially relevant. Therefore, a lot of time and effort was spent on solving organizational problems in 2021. This can be seen from the information on the reception of tourists. (Table 1)

Table -1

Dynamics of reception of tourists by "Shakhriyor Tour Service" LLC during 2020-2021

T/R	Indicator name	Unit of measure	2020 year	2021 (1 sq.)	2021 (expected)	change	in % compared to 2020
1	Number of tourists arriving in Kabul	person	172	27	220	+48	127.9
	Including						
2	Foreign countries	person	134	16	160	+26	119.4
3	MDX countries	person	8	1	20	+12	250
4	Uzbekistan	person	30	10	40	+10	133.3

It can be seen that "Shakhriyor Tour Service" LLC focused on foreign tourists in its activities. 78% of the received tourists were tourists from foreign countries, 5% were guests from the CIS countries and 17% were citizens of Uzbekistan.

At the same time, in 2021, "Shakhriyor Tour Service" LLC is planning to further expand its activities and is thoroughly preparing for the season. According to the plan, it is planned to increase the number of tourists received in 2021 by almost 28%, including the number of foreign tourists by 20%, and the number of Uzbek tourists by 33%. Diagrams 1 and 2.

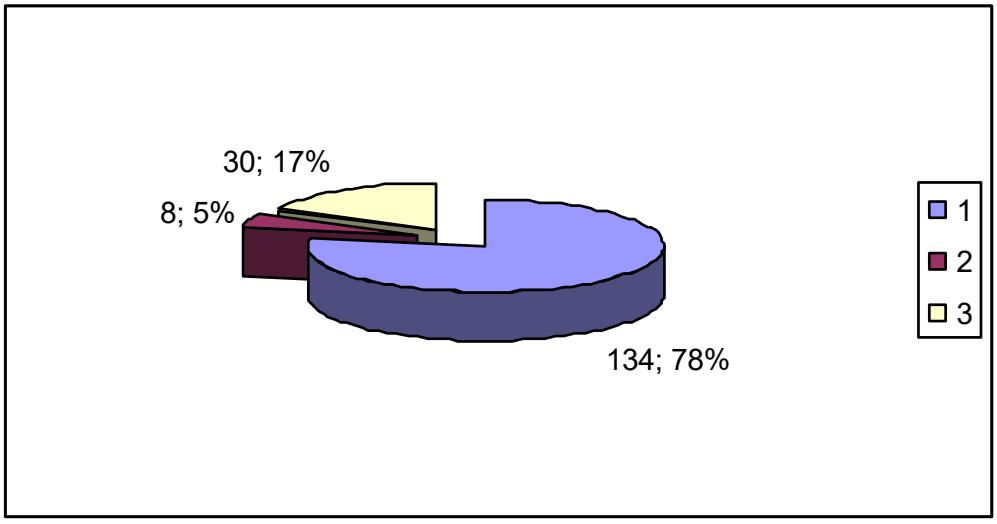

diagram 1. Results of receiving tourists in 2021 of "Shakhriyor Tur Servis" LLC

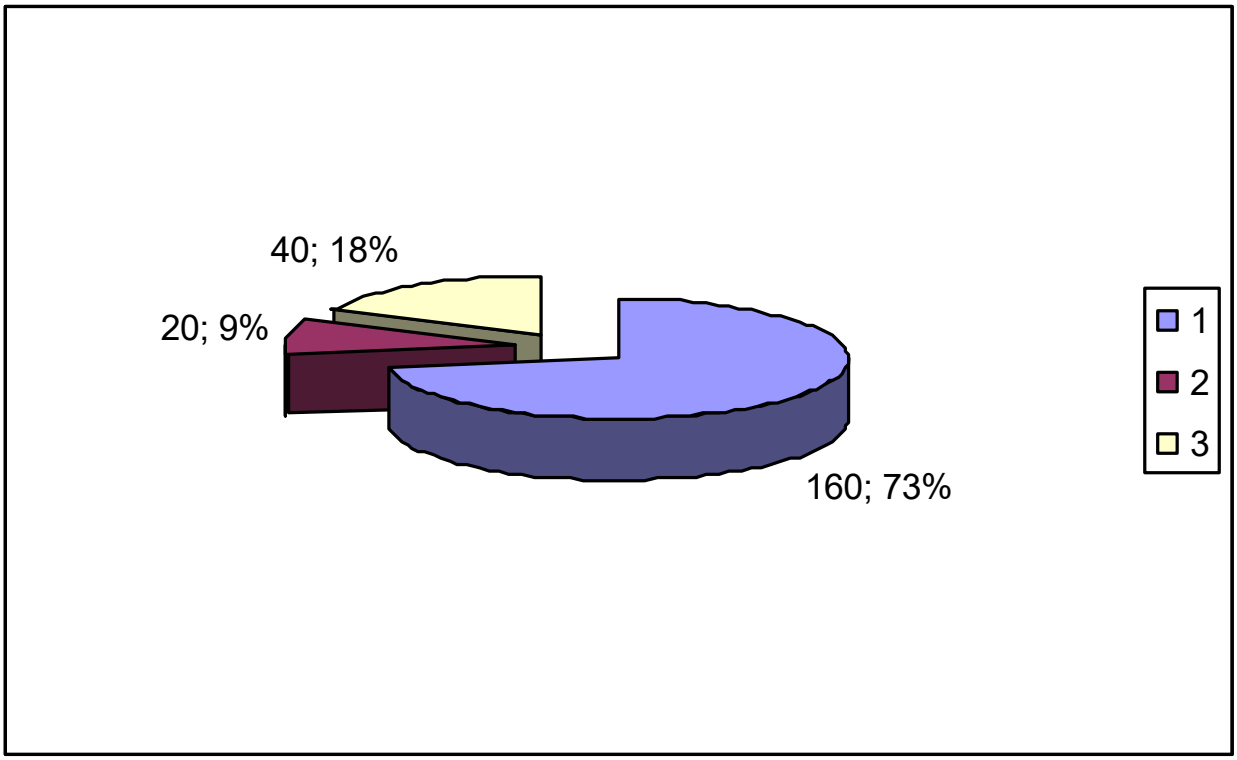

Diagram 2. Number of tourist admissions in 2021 at "Shakhriyor Tur Servis" LLC.

Formation of the flow of tourists has a positive effect on the economic indicators of "Shakhriyor tour servis" LLC. (Table 2)

Table-2

Financial and economic indicators of "Shakhriyor Tour Service" LLC in 2020-2021

t/r	Indicator name	Unit of measure	2020 year	2021 (1 sq.)	2021 (expected)	change	in % compared to 2020
1	Net income	m. sum	105281.2	16005.6	130416	+25134.8	123.9
	Including						
2	Tourist services	m. sum	41586	7125.2	56861.4	+15275.4	136.7
3	Hotel services	m. sum	46534	6870.4	54122.6	+7588.6	116.3
4	Transport services	m. sum	12212.6	1684.9	12780.8	+568.2	104.6
5	Excursion services	m. sum	4948.6	324.5	6651.2	+1702.6	134.4

According to the data, the total net income in 2020 was 105,281.2 thousand soums. In the first quarter of 2021, it was equal to 16,005.6 thousand soums. Based on the concluded contracts, the net income expected for 2020 is equal to 130,416 thousand soums and is expected to increase by 123.9% compared to 2020. Of course, since the receipts from tourists include all services, there is a need to analyze their sources. If we analyze the composition of the receipts in 2020, tourist services accounted for 39%, services provided by hotels accounted for 44%, and transportation services accounted for 12%. and 5% is the result of excursion services (diagram 3.) So, most of the net income should be transferred to hotels and transport organizations based on the Agreement.

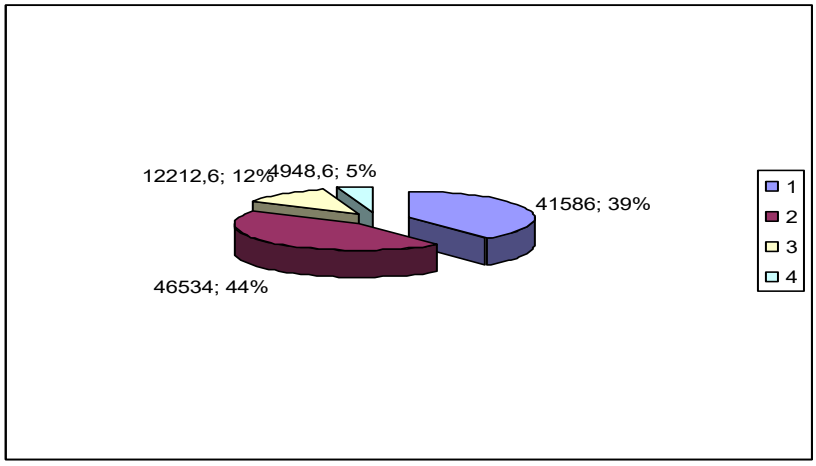

diagram 3. The composition of the net income of "Shakhriyor tour servis" LLC in 2020

In 2021, the activity was extended by "Shakhriyor Tour Service" LLCincreased attention to increase its share in the structure of income through improvement. As a result, concrete measures have been developed to increase the weight of tourist services. If these measures are effective, the share of tourist services will be increased to 44%, hotel services will be reduced to 41%, and the share of transport services will be reduced to 10%.

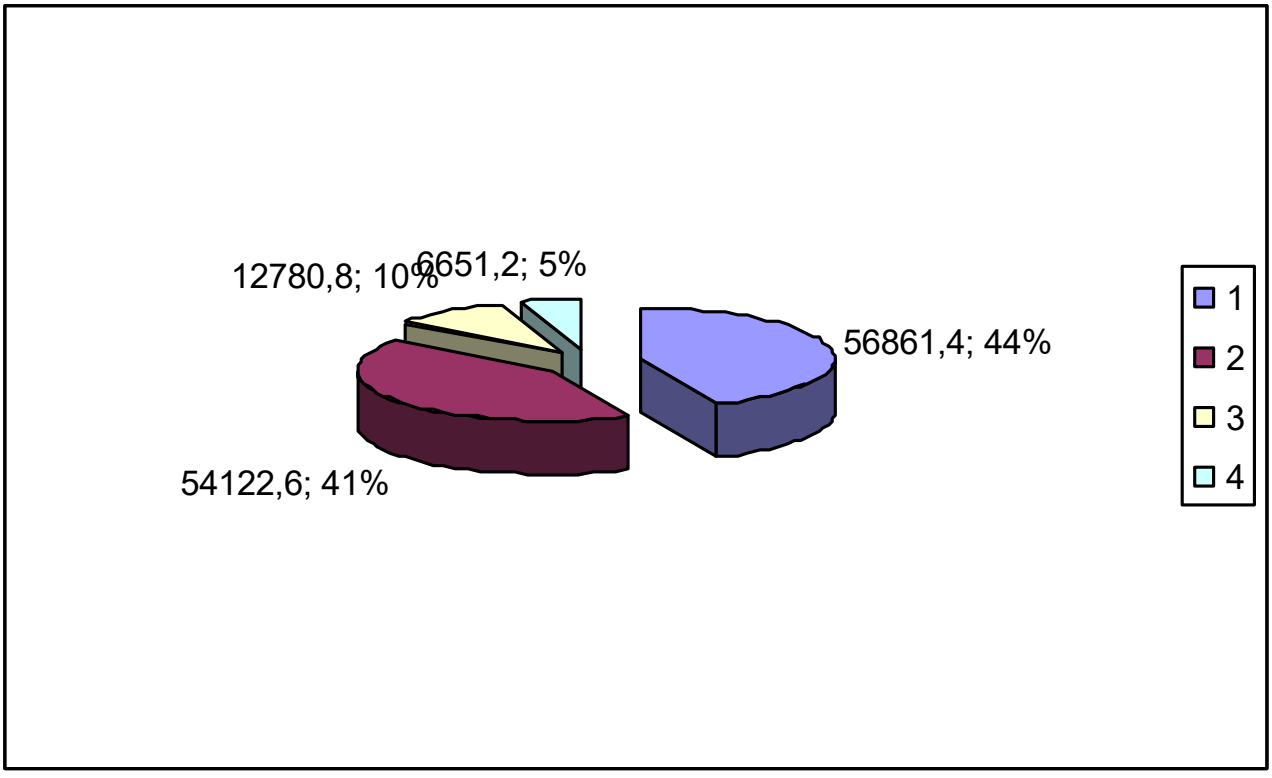

diagram 4. The composition of the net income of "Shakhriyor Tur Servis" LLC for 2021

In 2020, the "Shakhriyor Tour Service" tour company paid great attention to the financial result, therefore, according to the results of the year, a net profit of 9924.4 thousand soums was achieved, which is 9.6% of the net income. (table...) This indicator is not bad for tourism companies. However, in 2020, the management of "Shakhriyor Tour Service" LLC plans to further increase the profit and it is expected to reach 15,400,000 soums.

Table -3

In 2020-2021, the relative indicators of the "Shakhriyor tour service" tour company per 1 tourist

t/r	Indicator name	Unit of measure	2020 year	2021 (1 sq.)	2021 (expected)	change	in % compared to 2020
1	Net income	M.sum	105281.2	16005.6	130416	+25134.8	123.9
2	Net profit	m. sum	9924.4	1684.8	15400	+5475.6	155.2
3	Net income per 1 tourist	M.sum	612.1	592.8	592.8	-19.3	96.8
4	1 net profit per tourist	M.sum	57.7	62.4	70.0	+12.3	121.7

In 2020, the net income per tourist amounted to 612,100 soums, while in 2012 it is expected to be 592,800 soums, that is, it is planned to lower the prices. At the same time, the net profit per tourist in 2020 is equal to 57,700 soums, which is much lower than the average figure.

"Shakhriyor Tour Service" LLC we believe that the importance of his professional partners is high in his success in the market. As mentioned above, the company has made contracts with a number of companies to increase competitiveness. If we analyze the main tourist services provided at the moment, hotel and catering services are provided by other organizations, because they have much higher capabilities in their field and have many years of experience in providing quality services.

Table-4

Types of services provided to tourists by the "Shakhriyor Tur Servis" tour company

No	Service types	Posted by Kim
1	Registration of documents of accepted tourists	"Shakhriyor Tour Service" LLC
2	Organization of individual trips	"Shakhriyor Tour Service" LLC
3	Reception of group tourists	"Shakhriyor Tour Service" LLC
4	Reception and monitoring of tourists	"Shakhriyor Tour Service" LLC
5	Organizing the departure tickets of tourists	"Shakhriyor Tour Service" LLC
6	Accommodation of tourists	
7	Organizing meals for tourists	Restaurants "Samarkand", "Standard", "Afrosiab", "Karimbek".
8	Organization of transport services	"Shakhriyor Tour Service" LLC
9	Organization of domestic tourism	"Shakhriyor Tour Service" LLC

10	Organization of ecotourism	"Shakhriyor Tour Service" LLC
11	Organization of mountain tourism	"Shakhriyor Tour Service" LLC

In order to implement the marketing concept in the tourist enterprise, the relevant marketing service is implemented. In the organizational structure of this type of enterprise, the marketing service is a link that performs the activities of each department. The main organizational types of the marketing department are:

- functional organization;
- organization according to the product principle;
- organization according to the regional principle.

The functional organization of the marketing department means that the responsibility for solving each issue is attached to a separate person or group:

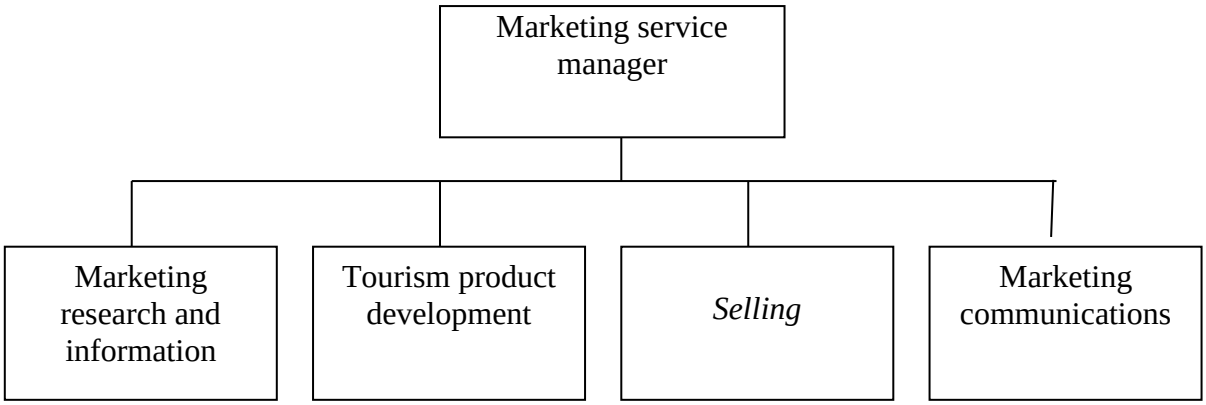

Figure 3. Functional organization of the marketing department.

The schedule may vary depending on the scope of activity of each tour company. It also depends on the form of the travel agency, or the attention allocated to the marketing department. Some firms have separate advertising and public relations departments.

When organizing a marketing department according to the product principle, the main focus is on offering certain types of products. In this case, each product or set of products has its own manager.

Large travel companies with a wide distribution network often organize marketing services on a regional basis. In doing so, they have functional independence depending on the working conditions in the national and regional market. It should be noted that there is no ideal structure for organizing a marketing service that can be used in any situation. The organizational structures we have presented have their strengths and weaknesses.

A firm to organize a marketing serviceit is necessary to analyze the performance indicators and choose the main goals.

The analysis of the indicators of the firm's activity is multifaceted, and during this analysis it is necessary to consider many variable indicators. At the same time, it should be emphasized that when assessing each direction of the company's activity, limited criteria - indicators are involved. They represent the set goal and show the contribution of each direction in achieving this set goal.

The level of realization of the set goal, in turn, shows the effectiveness of management, the interest of each employee in the success and, in general, whether the choice of marketing strategy is correct or incorrect.

The goals of any firm (especially a large firm) are very diverse, and they can be graded according to their nature.

When analyzing each major line of a firm's activity, any intended goal for that line of activity is taken into account. The conclusion (result) of the analysis comes from the conclusion that the result of the activity is being carried out correctly or incorrectly in order to achieve the highest result.

Marketing research scheme.

1-stage. Defining the problems and the purpose of the research

Stage 2. Selection of information sources.

3rd stage. Gathering the necessary information

4th stage. Analysis of collected information

Stage 5. Show results

Any organization strives to achieve its goals. These objectives are the main chapter in the planning of marketing programs. A marketing control system is used to evaluate the work done to achieve the goal. Marketing control is a continuous, continuous review of the marketing process. In other words, it is a comparison of the norm and the real situation. The control process usually consists of 4 stages:

- determination of plan amounts and standards (goals and standards);
- determining the real state of indicators;
- comparison;
- analyze the results.

The main purpose of marketing control is:

- determining the degree of achievement of the goal (deviation analysis);
- determining the possibility of improving conditions (feedback);
- examination of the level of the firm to changes in the environment.

Marketing control also implements special forms of systemic control:

- control of results, control of the implementation of the annual plan, control of income, control of the effectiveness of marketing activities;
- strategic control to verify that the firm is fully utilizing its marketing opportunities.

It is difficult to imagine modern tourism without advertising. It is such a wide and multifaceted activity that it is often separated as a separate direction. However, practice shows that high advertising efficiency can be achieved only with the help of marketing. Advertising is an integral part of marketing communications.

The purpose of advertising:

- organizational activities aimed at attracting consumers and promoting something widely,

- spreading information about something or a person for the purpose of popularity.

Advertising is the most convenient means of providing information to customers in the field of tourism. Based on the behavior of customers, drawing their attention to various services, raising the expectations of the firm, strengthening its position in society is carried out with the help

of advertising. Therefore, effective advertising activity is an important tool in achieving the goals of the marketing strategy of the company.

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WAYS TO DEVELOP THE ORGANIZATION OF MARKETING RESEARCH IN AGRICULTURE

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Abstract. *In this article, the competitiveness of agricultural products will be sharply increased, the economic efficiency of production will be increased to the optimal level, cluster analysis will be conducted in marketing research, the group of countries with wide export opportunities will be separated, and the countries that import fruits and vegetables will be segmented based on clustering and on the basis of hypothesis. will be considered.*

Keywords: *agricultural products, market, competition, marketing, hypothesis, export, segment, analysis.*

INTRODUCTION

The development of the market infrastructure, along with the improvement of the processes of delivery and sale of agricultural products to consumers, encourages them to produce, store and process more and better products. In order to adapt to the market conditions that arise as a result of such a process, it is important to establish a marketing service in enterprises that grow and process agricultural products, in particular, farms and their councils.

Modernization, first of all, requires technical-technological, spiritual renewal of the network based on re-equipment of production with the most advanced modern technologies. The effective implementation of all activities in this area, defined in the main directions of agricultural modernization, will create an opportunity to raise the economic efficiency of production to an acceptable level based on the sharp increase in the competitiveness of primary agricultural products grown in agriculture. farms, which are considered the main form of economic management. These things can only be done by relying on today's marketing.

Research methodology

Systematic approach, abstract-logical thinking, grouping, comparison, factor analysis, selective observation methods were used in the research process.

Conducting marketing research in all sectors of the economy acquires its own complexity. Today, in the agriculture of our republic, farmers and peasant farms, partly agro-firms are operating. It is known that farms produce products mainly for state orders and partly for their own needs (police and horticulture). This, in turn, creates problems related to the production, sale and transportation of products at the lowest cost. The purpose of these studies is to determine the strategy tactics of agricultural enterprises in the market and ensure that they achieve greater success and advantage over competitors.

Analysis and results

Cluster analysis methods are used effectively in marketing research and are among the most common methods. The cluster method is also known as the clustering method in statistics. Cluster analysis of Uzbek scientists is mainly recognized as "statistical grouping" in scientific literature. Many scientific studies have been conducted by scientists of the world and our country on the use of cluster analysis methods in the segmentation of the food products market. Problems

related to these have been sufficiently studied by SG'ulomov, SH.Abdullaeva, SH.Ergashkhodjaeva, M.Kasimova, L.Abdukhalilova, J.Jalolov, Yu.Yusupov, SH.Musaeva and other economists. However, the researches of these scientists were carried out more in the manufacturing and service industries.

The use of cluster analysis in marketing research and its methodological aspects are widely studied in the scientific literature of N. Malhotra, M. Porter and A. Aayker. In particular, N. Malhotra and A. Aayker explained the use of cluster analysis in marketing research using segmentation methods that are mainly implemented in the consumer sector. M. Porter's theories used cluster analysis methods to distinguish specific aspects of countries' competitive advantages and conducted research on the formation of network clusters. V. Smid and Y. Vindlar conducted the first scientific studies on the use of the cluster analysis method in market segmentation. These studies are similar to marketing meta-studies on market segmentation.

It was emphasized that it is necessary to introduce a modern management system in the food and alcohol industry in our country, to increase the volume of production, to increase the type and quality of exported products, and to find new markets with extensive use of marketing and production tools. innovation. The assigned task determines the need to select the most target markets for Uzbekistan and develop marketing strategies aimed at penetrating these markets.

To conduct a cluster analysis, first of all, it is necessary to form information on determining the main competitors of the Republic of Uzbekistan and their position in the world market of juice products. The main source of data is the data of the "Market Access MapITC" database (www.trademap.org), which is the official portal of the International Trade Organization. Developed by ITC to support the needs of exporters, trade promotion institutions, trade policy makers and academic institutions in developing countries. It provides information on customs definitions (including tariff preferences) applied by more than 200 countries and 239 states and territories. In addition,

Taking into account the main purpose of providing marketing services in agriculture, based on demand, supply, price, quality level and other economic indicators, based on the market conditions that may occur at a certain time, all it can be said to use the opportunities effectively. .

To achieve this goal, the following main tasks must be solved:

- to collect information about the markets of agricultural products to determine the changes in supply and demand;

- the selection of a suitable market segment for the targeted activity, allows producers of agricultural products to use them effectively based on their capabilities;

- organization of funds and material resources necessary for implementation of activities, monitoring and evaluation of results.

Farms, councils and even individual farms now have to operate in a competitive market environment. They do not have the ability to independently study the market and conduct special marketing research. Therefore, organizing seminars and consultations for them with the participation of experts from special education and scientific institutions is considered as one of the urgent issues of today. Improving the marketing culture of enterprises and organizations that grow and process agricultural products is one of the activities aimed at increasing the efficiency of their activities. We believe that it is appropriate to take into account the following suggestions when organizing a marketing service for the production of agricultural products:

- organization of adaptation of producers' capabilities to market demands and needs;

- organization of raising the economic knowledge of producers of agricultural products, that is, farmers and agricultural specialists;

-selection of a responsible employee to conduct marketing service in the production of agricultural products;

At the modern stage of economic development, competitiveness is the only criterion for improving and ensuring the quality of agricultural products and services.

A product to increase competitiveness

(goods and services), is characteristic of the enterprise, the region and the whole country and occupies an important place as the main link of the economy.

Work in the field of agriculture in the market economy agricultural enterprises to success reach effective development of economic activity and careful planning of one's opportunities and prospects depends on being armed with the necessary information about

Among the important conditions for the emergence of competition in the conditions of the modern market economy, the following can be included:

complete economic (economic) independence of each product-producing and service-providing firm;

the full dependence of the producer's activity on the market situation;

face all other producers of goods in competition for demand.

Currently, there are different directions of researching the concept of "competitiveness". The famous Austrian economist Y. Schumpeter, the founder of the evolutionary theory of economic development, described competition as a struggle between the new and the old.

The main purpose of cluster analysis in marketing research is to identify a group of countries with great export potential. The grouping of countries based on objectively determined criteria is based on the assumption of some degree of homogeneity for exporting enterprises. Based on this hypothesis, clustering is divided into 5 main areas of fruit and vegetable importing countries. The "Ward" method of hierarchical clustering is used, assuming that the measurement units have different forms according to the selected criteria. This method divides countries into groups based on the spread of values for selected criteria. Using the "Ward" method, countries are divided into 5 main segments.

The competitiveness of the enterprise is the ability to achieve effective economic activity and profit in a competitive market.

Competitiveness of an enterprise is a set of characteristics that reflect the superiority of an economic entity over a competing enterprise in terms of indicators such as financial and economic, marketing, production, technological, personnel potential and ecology in certain market conditions. . This is the ability of the business entity to operate without crisis and quickly adapt to the changing external environment. English economist A. Smith, a famous representative of the classical school, explained competition as a behavioral category. Individual sellers and buyers compete in the market to profitably sell and buy, respectively. Competition is the "invisible hand" of the market and regulates the activities of its participants. The purpose of competition is to make more profit.

A. Smith's contribution to the development of the theory of competition can be shown in the priority directions of farm development: achievements, experiences and prospective plans. He was one of the first to define competition as struggle. The main principle of competition is the principle of "invisible hands". He developed a competitive mechanism that theoretically equalizes

the rate of profit in a network, leading to an efficient allocation of resources between networks. Given the existence of a large number of sellers and buyers, he defined the basic conditions of effective competition, which did not allow each seller to significantly influence the change in the market price of the commodity.

The competitiveness of the enterprise includes the price and quality of agricultural products, as well as the regulation of the flow of financial resources, the level of management. The level of competitiveness is affected by various situations that occur in one or another market, such as the introduction of innovations, financial stability, motivation of employees with advanced methods and methods, division into categories.

Effective marketing activities play an important role in increasing the competitiveness of an agricultural company. Because it is marketing that is aimed at realizing the most necessary requirements of buyers, taking into account changes in consumer tastes, and forming effective and practical methods of increasing competitiveness.

Table 1

Product competitiveness indicators

No	Naming	Explanation	An example
1.	Normative	How well the product meets the standards and requirements established by law response rate	Compliance with minimum requirements, DAST, etc
2.	Technician	Purchase removable anddirectly known needto satisfy referrerof goods feature and description	Available on certain parameters to the descriptions suitablecoming in useamenities, service life, service showduration etc
3.	Economical	What the consumer does in the process of buying the product and using it in the future expensesmonetary value	Selling price based on product description The cost of materials and spare parts necessary to maintain the condition of use

One of the important conditions of competitiveness is the quality of the offered product, which is able to meet the needs of the population for agricultural products to one degree or another. Quality management of agricultural products plays an important role in ensuring the competitiveness of an agro-firm. Modeling of the competitive performance of the product is carried out at the stage of its design. The ability to fully satisfy the requirements of customers compared to the products of competitors in the market indicates the competitiveness of the product. The ratio between product quality, service level and prices is the basis for ensuring the competitiveness of agricultural products in the market. In addition, various factors: advertising, brand reputation, etc.

The non-availability of the necessary technical service for the goods sold by the agricultural company leads to the loss of competitive advantage. Therefore, in order to ensure the competitiveness of the product, it is necessary to provide service to the goods even after they are sold. If such supply is denied, the consumer will seek help from competitors and cause him to switch completely to the competitor's side. Therefore, in order to increase competitiveness, the enterprise must clearly and precisely plan the service system, taking into account all the possibilities of technical support.

In the marketing practice of enterprises, it is appropriate to use cluster analysis methods in the analysis of the competitive environment, segmentation, pricing, and product strategy development. The use of the cluster analysis method in the effective capture and segmentation of global markets increases the effectiveness of marketing research.

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MODERN METHODS OF MOVING GOODS IN RETAIL ENTERPRISES

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Abstract. *This article analyzed the methods of selling goods in retail trade, retail trade, the types of activities aimed at moving goods and trademarks, and made the necessary proposals.*
Keywords: *retail, trade, trade aftomati, Trade marketing, assortment, merchandising, brand brand.*

Retail trade involves entrepreneurial activities that are directly related to the sale and service of goods to the population. Retail trade participates in the formation of the assortment of goods. Provides customers with information about the quality indicators of goods. Performs the functions of storing goods, additional work, setting prices and others. As a result, it performs purchase and Sale work with the final consumers of the goods. Retail trade stands by the form of ownership, method and service.

Types of retail firms differ by 4 criteria:

1. Equipment of the store.
2. Customer service level.
3. Assortment of goods.
4. In trade, the service differs in character.

– In the general unified chain of commodity movement, the technology processes of retail trade are an important link. Because in the process of delivery of folk consumer goods from a manufacturing enterprise to consumers, the most necessary conditions for the selection of goods and meeting the growing needs of the population for these goods should be created at the same retail enterprises. The quality of providing sales services to the population, that is, the culture of trade, depends on the level of Organization of technology processes in retail trade, in particular, the sale of goods, due to which the entire operational activity of retail enterprises is subordinated to this task.

– Currently, the following methods of selling goods are used in retail trade:
– sale of goods by counter;
– selling the goods in a way that the buyer serves himself;
– sell by spreading the Goods Open;
– sale showing goods;
– sale of goods according to the order of the population.

Selling goods over the counter is a typical way of selling goods, in which almost all the main elements of the process of servicing buyers, namely, the work of displaying goods and introducing them to its assortment, making calculations and transferring the paid goods, is performed by the seller standing near the counter.

Buyers can freely go to the walls of the sales area or near all the goods picked up in the middle in the way of selling goods on the basis of self-service, independently select and put them

in inventory corzines or strollers themselves, the payment for the goods is paid at the only settlement place at the exit from the store.

When selling goods with open spread, buyers can easily go to the seller's workplace and get acquainted independently, with the advice and help of the seller, choosing the goods they need.

When selling goods with open spread, as in the way in which buyers serve themselves, the goods are released in full readiness for sale to the sales Hall.

In the conditions of the sales method, indicating samples of goods, the buyer, depending on the samples placed in the sales area, chooses the goods he needs independently or with the help of the seller, after paying for it, receives the corresponding goods directly from the store or orders an expedited home for an additional fee. This method can be organized in the sale of large volumes – furniture, refrigerator, washing machine, sewing machine, electric light, snacks.

In the way of selling the goods according to the order of the population, the buyer places a pre-order in the Order Department of the store or at the place of acceptance of the order established at the place of industrial enterprise, construction, institution, field shed, residence. This goods are taken from the store or delivered to the customer's home or to another place specified in the order.

This method can be used in the sale of all food products, as well as in the sale of goods of a complex assortment through shops located in rural settlements inside and trading in goods that are in demand on a daily basis.

One of the advanced trading methods is trading through vending machines. Vending machines occupy an important place in ensuring the socio-economic efficiency of trade, that is, reducing consumer costs in trade is important in conditions when the consumer is a hockey player.

In the current conditions, the use of vending machines with a modern design is an important issue. One of the modern methods of trading is trading marketing. In Trad-marketing, several main tools are distinguished:

– sales promotion;
– special events;
– merchandising.

Merchandising (visual. merchandising) - the part of the marketing process that determines the methodology for selling a brand in a store. Merchandising is a complex of marketing activities that is carried out in commercial premises, first of all, in the conduct of retail trade, and is aimed at creating a favorable situation that will bring the buyer to the goods and ensure the maximum probability of purchase. It is envisaged that merchandising will determine the set of goods sold in a retail store, methods for placing goods, provide them with promotional materials and price indicators.

Merchandising is a type of activity used by large retail enterprises (supermarkets, hypermarkets), aimed at moving goods and trademarks in the regional market, the reason for its occurrence is the lack of qualified sellers. The main requirements for its application are considered:

the enterprise must always have a full range of goods;

special equipment is necessary: Organization of trading halls, including special refrigeration units, placement of equipment throughout the hall, sound environment in the trading hall, color of walls, lighting, etc.;

within the enterprise, as a rule, small points of sale with better quality and more expensive goods should be established;

the placement of goods should be carried out in such a way that the consumer should be forced to walk as much as possible through the trading hall, practically not resorting to the help of sellers.

The placement of goods is counted from the main elements of the merchandising system. Often the introduction of merchandising begins precisely with the control and analysis of the placement of goods. Product merchandising is as important as brand brand development, outdoor advertising or promotional promotions. For this reason, mercandayzing agencies are currently emerging, which provide services to various retailers.

The initial initiative to introduce merchandising abroad came from a wide range of established retailers, consisting of a supermarket chain.

The following advanced methods used in the sale of goods in foreign countries can be used in trade enterprises and organizations of our country:

sale of non-food goods by catalogs at reduced prices in the demonstration hall of retail enterprises;

trading in a limited range of goods with reduced prices in retail enterprises located in the city center and having a strict interior, not more employees to a small shopping area;

"convenience stores", the sale of goods in a limited assortment mainly at trading enterprises that trade in new food products and provide customers with services for a whole day;

increase sales aphtomas in order to prevent and absorb Time from the frustrating situations that arise in the sales process in retail stores.

The ways that ensure the success of advanced methods used in the sale of goods at trade enterprises of foreign countries are considered to be the provision of even more different services to the buyer and lowering the price for goods. It is advisable to use these at Trading Enterprises.

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STUDYING THE AMOUNT (SPEED) OF MOVEMENT IN URBAN STREETS (IN THE EXAMPLE OF SHOTA RUSTAVILI STREET)

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Abstract. *The number of vehicles in the city of Tashkent is growing by 15 percent per year, and 800,000 cars are moving per day. The amount of traffic (speed) is classified by the number of vehicles passing through a cross section of the road in a unit of time (car/day or car/hour) - this indicator can be monitored and measured by automatic methods [1]. An observational method was used to quantify movement. Observations were made in the first half of the day, that is, from 8:00 to 12:00 in the 6 regions of the street between Wednesday and Friday.*

Keywords: *amount of movement, movement composition, light car, bus, micro bus, bicycle transport, truck.*

The number of vehicles in the city of Tashkent is growing by 15 percent per year, and 800,000 cars are moving per day. The roads are not suitable for walking and cycling. There are more than 500 major intersections, most of which have low throughput. As a result of this as well as the low traffic culture, there are many traffic accidents [4].

The amount of traffic (speed) is classified by the number of vehicles passing through a cross section of the road in a unit of time (car/day or car/hour) - this indicator can be monitored and measured by automatic methods [1]. An observational method was used to quantify movement. Observations were made in the first half of the day, that is, from 8:00 to 12:00 in the 6 regions of the street between Wednesday and Friday.

The amount and composition of the movement in the Shota Rustavili street in the city of Tashkent.

Table 1.1

	Hour	Light car	Bus	Micro bus	Bicycle transport	Truck			Total
						light	medium	heavy	
Monday	800-900	2395/3223	26/24	17/19	1/2	8/7	1/3	1/3	2449/3281
	900-1000	2350/3186	32/27	15/11	0/1	6/4	0/2	3/2	2406/3233
	1000-1100	2175/3024	24/21	19/23	0/1	0/3	4/1	1/1	2223/3074
	1100-1200	2269/2949	28/29	10/14	2/3	9/5	5/3	1/0	2324/3003
	total	9189/12382	110/101	61/67	3/7	23/19	10/9	6/6	9402/12591
	In percent	97.73/98.34	1.17/0.8	0.66/0.54	0.03/0.05	0.25/0.15	0.1/0.07	0.06/0.05	100.0

Table 1.2

Tu	Hour	Light car	Bus			Truck	Total

				Micro bus	Bicycle transport	light	medium	heavy	
	800-900	2471/3013	31/35	15/21	2/4	1/3	4/1	3/7	2527/3084
	900-1000	2318/3149	29/19	8/5		6/5	2/9	5/3	2368/3190
	1000-1100	2140/2814	21/23	14/8	1/0	13/8	8/7	2/4	2199/2864
	1100-1200	2296/2683	30/18	12/19	0/2	16/7	5/0	1/0	2360/2729
	Total	9225/11659	111/95	49/53	3/6	55/23	19/17	11/14	9473/11867
	In percent	97.38/98.24	1.17/0.8	0.52/0.45	0.03/0.05	0.58/0.2	0.2/0.14	0.12/0.12	100.0

Table 1.3

Wednesday	Hour	Light car	Bus	Micro bus	Bicycle transport	Truck			Total
						light	medium	heavy	
	800-900	2345/3025	28/16	11/9	0/1	13/9	3/2	2/1	2402/3063
	900-1000	2196/3123	29/18	7/3		15/13	5/7	1/5	2253/3169
	1000-1100	2251/2972	25/13	15/19	0/2	4/5	0/4	1/0	2296/3015
	1100-1200	2308/2893	28/17	14/22		8/6	9/6	4/1	2371/2945
	Total	9100/12013	110/64	47/53	0/3	40/32	17/19	8/7	9322/12192
	In percent	97.62/98.54	1.18/0.53	0.5/0.43	0.00/0.02	0.43/0.26	0.18/0.16	0.09/0.06	100.0

Table 1.4

Thursday	Hour	Light car	Bus	Micro bus	Bicycle transport	Truck			Total
						light	medium	heavy	
	800-900	2295/2532	25/34	18/23	2/2	8/13	5/9	4/4	2357/2617
	900-1000	2406/2496	21/25	12/31	1/0	6/11	1/3	7/3	2454/2569
	1000-1100	2217/2361	29/31	16/22	0/1	15/14	9/7	5/9	2291/2445
	1100-1200	2250/2612	25/29	10/15	1/3	11/21	2/8	5/7	2304/2695
	Total	9168/11001	100/119	56/91	4/6	40/59	17/27	21/23	9406/11326
	in percent	97.47/97.14	1.06/1.06	0.59/0.8	0.04/0.05	0.43/0.52	0.18/0.23	0.23/0.2	100.0

Table 1.5

Friday	Hour	Light car	Bus	Micro bus	Bicycle transport	Truck			Total
						light	medium	Heavy	

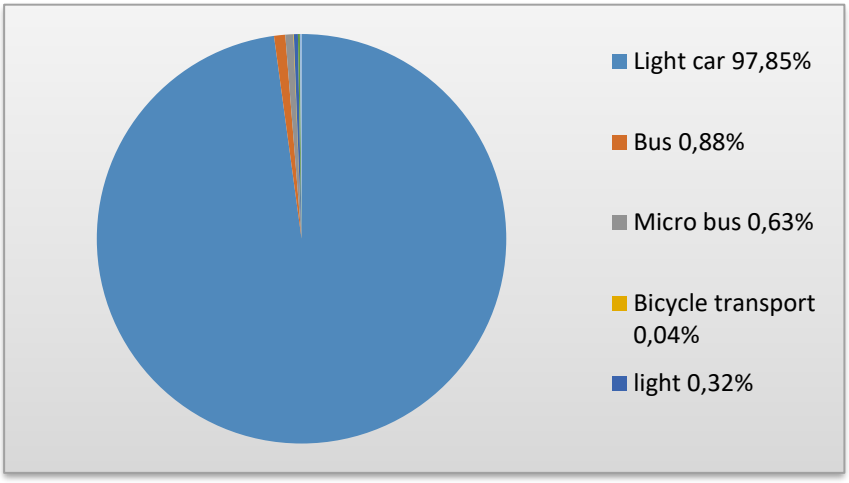
	800-900	2330/2561	35/48	18/37	1/3	4/8	1/3	4/6	2393/2666
	900-1000	2236/2414	18/39	20/36	1/5	9/15	5/9	3/9	2292/2527
	1000-1100	2114/2259	26/28	3/9	1/0	16/12	6/3	9/5	2175/2316
	1100-1200	2275/2343	27/21	18/23	1/4	11/16	4/5	1/3	2337/2415
	Total	8955/9977	106/136	59/105	4/12	40/51	16/20	17/23	9197/10324
	in percent	97.37/96.6	1.15/1.33	0.64/1.02	0.04/0.12	0.43/0.5	0.18/0.2	0.19/0.23	100.0

Explanation: The values of the data given in the tables represent the right direction (that is, in the direction of entering the city from Ring Road), and the values in the denominator represent the opposite direction.

If we analyze the data obtained on determining the composition and amount of traffic on the street, the average share of light cars in the stream is 97.85%, trucks 0.6%, buses 0.88%, minibuses 0.63%,bicycle transport is 0.04%. Traffic jams often occur along the street during "peak" times with high traffic speeds[2].

In % by types of vehicles

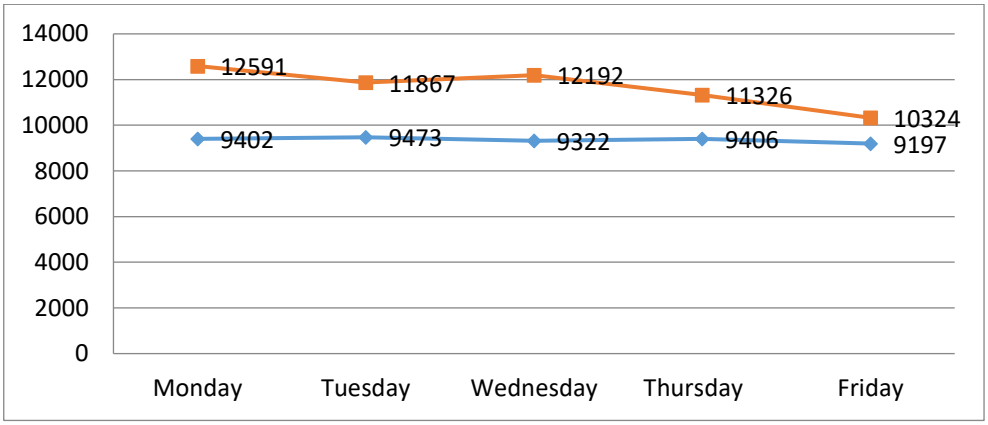
Figure 1.1



Note: observations show that light cars 97.85%and the remaining 2.15% were buses, minibuses, and trucks.

The graph of the change of the volume of vehicles in the time interval from 8.00 to 12.00 by days of the week.

Figure 1.2



Blue line – Back direction

Red line – Right direction

Note: Observations show that the speed of traffic in the right direction is less than the speed of traffic in the opposite direction, because in the morning, the majority of people come to the city for work, so the traffic is dense and heavy.

Conclusion: Observations show that the number of cars entering the city was more than the number of cars leaving the city. One of the main reasons for this is that people coming to the city for work were very busy between 8:00 a.m. and 11:00 a.m. In order to properly organize the movement of these cars, we need to properly organize the operation of traffic lights, we need to prevent all kinds of heavy traffic on the road, and we need to do other similar things.[5]

It is also possible to use modern technologies to calculate the amount of movement [3].

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THEORETICAL ASPECTS OF MARKETING TOOLS IN INCREASING THE INTERNATIONAL COMPETITIVENESS OF THE TEXTILE ENTERPRISE

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Abstract. *In this article, the level of competitiveness of the market, the solvency of the population, the quality of transport and logistics services, their cost, the efficiency of enterprise management, the use of marketing, innovative activities, and the reduction of service costs compared to competitors are considered.*

Keywords: *enterprise, competition, service, production, cost, innovation, integration, export.*

INTRODUCTION

The socially oriented model of Uzbekistan's own market economy is related to the development of foreign economic activity, as well as the determination of the ways of integration into world economic relations, and the perspective of the market economy is related to its international integration.

After the independence of our country, the implementation of structural changes in the economy, the establishment of export-oriented production enterprises and the production of competitive products through technical and technological updating, the acquisition of new territories, and the measures aimed at further increasing the country's export potential were given great importance.

One of the tasks set by the President included the following:In order to further stimulate export, it is necessary to harmonize the technical regulatory system with international standards. One of our main goals is to export quality and certified products to the foreign market under the name of "Uzbek brand".The light industry of Uzbekistan is one of the multi-faceted, innovative and attractive sectors of the country's economy. Today, the share of light industry in the GDP is 3.8%, 26.2% in the volume of industrial products, 44% in relation to non-food products, also shows that the sector has a great role in the economy of our republic. The average annual increase in the volume of product production in industrial enterprises is 20%, and the increase in the volume of export is 10%.

Based on foreign experiences, it should be noted that the competitiveness of the enterprise in the market is determined by the effectiveness of its market-oriented policy. Many economists have been engaged in the development of marketing principles and their practical application. Among them, we include famous scientists such as F. Kotler, M. Porter, D. Evans, I. Ansoff, M. Berman, M. Golubkov, P. Samuelson, D. Marshall possible

It is necessary to acknowledge the scientists who made a great contribution to the development of the theory of marketing, while the research carried out in the field of marketing in our country for many years was based on national characteristics. R. Ibragimov to them. Yo. Abdullaev, A. Saliev, M. Sharifkhojaev, D. Rakhimova, Sh. Ergashkhodjaeva, Sh. Musaeva and others can be included.

Research methodolog

Systematic approach, abstract-logical thinking, grouping, comparison, factor analysis, selective observation methods were used in the research process.

Competition is a serious struggle of people, especially in economic, as well as in other spheres of social life. From the point of view of economy, competition is the struggle of sellers (producers) to meet the demands of consumers, as well as the struggle of buyers to buy the most useful goods for themselves under the most favorable conditions. On the one hand, competition prevents economic stagnation and is a guarantee of social development, on the other hand, loss of stability, conflicts, bankruptcy, and dismissal of employees are integral parts of competition.

Analysis and results

M. Porter justified the fact that the competitive advantage of the enterprise in the domestic and foreign markets is highly dependent on the conditions formed in the country where the enterprise is located, that is, the availability of labor, the abundance of natural resources, the state's protectionist policy towards local enterprises, differences in the management practices of enterprises and other factors.

In today's advanced market conditions, a method of competition that is not related to price is to distinguish one's own goods from similar goods of competitors, to give it unique characteristics for the buyer, to increase the level of technical service, to develop advanced forms of selling goods, to improve the functional aspects and structure of the company's activities, to meet customer requests. such as taking into account the uniqueness is preferred. For this, competitors use the release of new goods, their improvement, quality improvement, various additional services and offering after-sales service guarantees. In non-price competition, relative financial stability is ensured and this allows for effective management of the enterprise. The non-price method of competition is more effective, because competitors cannot respond as quickly as in price competition. That is why non-price competition is also called effective competition. Although the method of non-price competition requires more effort and financial expenditure than price competition, these costs are fully justified in cases of success. Depending on the company's goals and capabilities, one of the following options for competitive behavior can be chosen: Although the method of non-price competition requires more effort and financial expenditure than price competition, these costs are fully justified in cases of success. Depending on the company's goals and capabilities, one of the following options for competitive behavior can be chosen: Although the method of non-price competition requires more effort and financial expenditure than price competition, these costs are fully justified in cases of success. Depending on the company's goals and capabilities, one of the following options for competitive behavior can be chosen:

creation of new products, technology, sales methods, service and advertising;

"copying" from innovators in the short term with low costs;

to maintain the achievements as long as possible by improving the quality and expanding the assortment.

Companies engaged in business are often called "first movers".

Factors affecting the effectiveness of the enterprise's marketing policy can be divided into two main groups: external and internal factors.

The level of competitiveness of the market, the solvency of the population, legal-regulatory, natural-climate and geographical conditions belong to the external factors, and the quality of transport and logistics services, their cost, the efficiency of enterprise management, the

use of marketing, innovative activities, the financial situation of enterprises, etc. belong to the internal factors. enters.

One of the components of the marketing policy is the ability to correctly define the pricing policy, which strengthens the competitive advantage:

a) achieving resource savings, that is, reducing the cost of providing services compared to competitors;

b) increase the volume of transport and logistics services;

c) to reduce the cost of service and increase the volume at the same time.

In all three cases, the price emerges as a derivative factor with a positive effect.

When developing the product policy, the following information is taken into account: the level of freshness of the product; assortment of the produced product; the number of similar goods or imitation goods in this market segment; its level of compliance with the needs of specific buyers of this market segment; product quality; technological complexity; the level of requirements for pre-sale and after-sale service; the appropriateness of standardization or commodity flexibility; for new goods; patent protection and patent purity; that the existing organizational structure of the company is compatible with the new development; the size of the costs of creating a new product; Compulsory product certification in the target market; profitability of production and sale of new goods in the target market; investment payback period; the period of development of the new assortment and its optimization;

Modernization and diversification of the leading branches of industry, introduction of modern technologies of processing of raw materials and semi-finished products, targeted support of productions highly competitive in the world market, helped to increase the share of processing industry in production.

If in 2015, the share of the processing industry in the total volume of industrial production was 73.8%, by 2021 it will increase to 80.3%.

In the total volume of industrial production, the volume of production of products with high added value increased in the following sectors: food, textiles, chemicals, pharmaceuticals and other sectors.

Only in 2021, compared to the previous year, the increase in the volume of production in the processing industry - 6.4%, including the production of basic pharmaceutical products and preparations - 40.3%, chemical products, rubber and plastic goods - 34.4%, other non-metallic mineral products - 20.9%, food products, beverages, tobacco products - 10.8%, textile products, clothing, leather products - 9, was 0%.

Table 1

Production of industrial products by types of economic activity*(in percent)*

	2015 year	2021 year	Growth rate 2021 compared to 2015, in percent
Total	100.0	100.0	156.1
including:			
mining and open pit operations	15.0	9.6	121.0
processing industry	73.8	80.3	166.6

of which:			
textile products, production of clothes and leather products	14.4	16.7	168.8
electricity, gas, steam supply and air conditioning	10.7	9.4	125.2
water supply, sewage system, waste collection and disposal	0.5	0.7	165.9

As can be seen from the table above. light industry, including the textile industry, is gaining an important place in the industrial sectors of our country. At the same time, the importance of textile products in the export structure of our country is increasing. in 2021In the structure of Uzbekistan's exports, the group of other goods has a certain place with a share of 35.7%, and the volume of textile products included in this group is 1133.2 mln. was USD and increased by 22.8% compared to the same period last year.

Modernization and diversification of the textile and sewing-knitting industry is the most important condition for expanding the volume and types of ready-made competitive products that are in high demand in foreign markets, increasing the efficiency and profitability of growing and processing raw cotton.

Today, a textile network with high production potential has been formed in the republic, where about 7,000 enterprises are operating. Cotton fiber production capacity of 1.4 million tons has been created, of which about 60 percent is used to meet the needs of local textile enterprises.

First of all, the existence of systemic problems related to the establishment of the production of finished products, the organization of network management, the distribution of resources and production capacities, and the lack of high qualification of personnel lead to the low profitability of the cultivation of raw cotton and its processing, the production and export of finished products. due to the fact that it is not at the levelis coming

Decree of the President of the Republic of Uzbekistan "On Measures for the Rapid Development of the Textile and Sewing-Knitting Industry" defines the first complex of measures to solve existing problems, as well as to expand the production of high-quality textile products and promote them to world markets. gave

With this document, the following important directions of further reform of the textile industry were defined, in particular:

- increasing the share of the textile industry in the economy, increasing the volume and quality of textile products produced in the country;
- a fundamental revision of the management system of the textile industry;
- further improvement of the standardization and certification system in the field of textile industry;
- wide introduction of advanced information and communication technologies to the network;
- implementation of the cluster model of textile industry development;
- ensuring the balance of the distribution of raw material resources and the location of the network enterprises being established in the interrelationship with the development of logistics and engineering infrastructure;

- wide implementation of advanced innovation technologies, know-how, design developments in the production process, localization of production of modern samples of fittings and accessories;

- radical improvement of the system of personnel training, retraining and advanced training for the textile industry.

JSC "Uzbekengilsanoat" is actively attracting investments, ensuring stable growth of production and export volumes. The share of semi-finished textile products in the total volume of export was equal to 14.4%. In 2021, the export volume was 1090 million dollars. In 2015-2021, the volume of export of light industrial products is 660 mln. 1090 million dollars. dollar, or in other words, the export volume increased by 1.6 times.

If we analyze the export structure of the product, we can see that the share of cotton kalava yarn in the total export of light industrial products is decreasing, and the share of yarn yarn and ready-made knitted and crocheted goods is increasing (Table 2).

Table 2

Export structure of JSC "Uzbekengilsanoat" in 2020-2021

Export of light industrial products, %	Cotton thread	Ready-made knitwear	Threading	Silk products	Other products
2020 year	44.2	16.8	4.4	1.0	10.6
2021 year	35.4	18.7	6.9	3.1	15.9

As can be seen from this picture, today cotton kalava yarn occupies a large part of the export. However, according to the order of the President, the share of ready-made knitted garments should be increased sharply in the coming years.

Until today, local textile enterprises had to buy cotton fiber from the monopoly supplier at export prices - "Uzpakhtasanoatexport" JSC. This procedure reduced the profitability and competitiveness of textile production.

According to the experiment initiated by the President of the Republic of Uzbekistan, enterprises of the textile industry will finance the main expenses of farms for the cultivation of cotton raw material by giving an advance of at least 60% of the contracted value. In this case, the cotton raw materials supplied to the enterprises are used only for further deep processing and production of ready competitive products.

Today, a textile industry with a huge production potential has been formed in the republic, and nearly 7,000 enterprises are effectively operating in its system. Also, capacities for the production of 1.4 million tons of cotton fiber have been created, and about 60 percent of this raw material is used to meet the needs of textile enterprises of our country. If only 436 organizations were part of JSC "Uzbekengilsanoat" before, now all enterprises and organizations of the textile industry can become members of "Uztoqiliksanoat" Association.

This provides a number of advantages for local manufacturers. In particular, enterprises that are members of the "Uztogamichiliksanoat" Association are exempted from paying customs fees for imported cotton, artificial and synthetic fibers, wool, raw materials and other materials necessary for the production of textile products that are not produced in the republic (except for fees for processing documents at the customs office). In addition, the Association "Uztogamiliksanoat" has been given the right to file a claim in the interests of its members, to file

complaints about the decisions of state bodies and other organizations, actions (inaction) of officials during the court process without paying the state duty.

In particular, this year, 34 investment projects aimed at modernization of existing enterprises, technical and technological re-equipment and creation of new capacities were implemented. The total cost of these projects is 356.9 million. is equal to 151.7 million dollars, export potential. made up the dollar.

At the same time, the export indicators of the industry were also discussed at the press conference. 1.16 billion in 2021. it was noted that the dollar product is expected to be exported. Products produced in our country are delivered to more than 50 countries of the world. The share of products with high added value was more than 40 percent. If at the beginning of 2021 there were 293 exporting enterprises in our country, by the end of the year their total number reached 350. Meanwhile, the efforts of 64 trading houses operating in different countries of the world serve to further increase the export performance of the industry.

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SOME FEATURES OF DAMAGE TO UN-CUT REINFORCED CONCRETE BRIDGES UNDER SEVERE EARTHQUAKES

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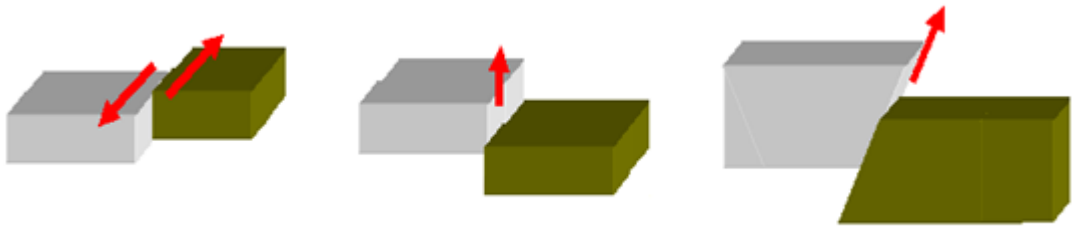
Abstract. *The main types and reasons of the initiation of specific damage to un-cut reinforced concrete bridges under strong and destructive earthquakes are discussed in the article. A brief review of the features of the destruction of un-cut reinforced concrete bridges and railway tracks under severe earthquakes in Europe and Asia is presented.*

Keywords: *un-cut reinforced concrete bridges, earthquake, bearing part, seismic intensity scale, railway track, superstructure, support, expansion joint.*

An earthquake is a tremor and vibrations of the earth's surface. Movements in the upper mantle make layers of the earth's crust collide with each other and cause earthquakes. If the distance between the moving parts of the earth's crust is small then its elasticity is not high, and when the stresses in the rock masses reach a certain level, it exceeds their tensile strength, and fractures are formed, the edges of the rocks move apart, and the ground moves. In most cases, earthquakes occur in sites where the strength of the earth's crust is less strong. According to the type of thrusts, the mechanism of earthquakes in fault areas is divided into three types - shear, fault, and thrust (Fig. 1) [1].

Fig. 1.

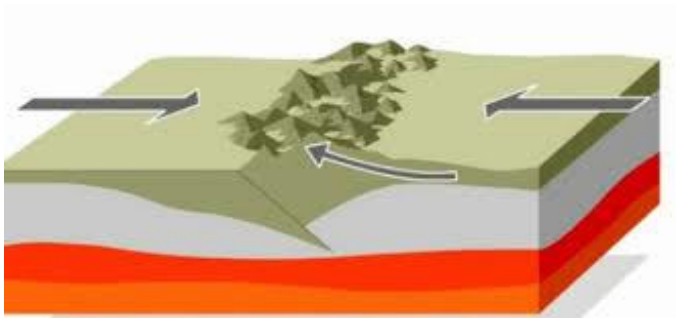
Types of tectonic fractures



Earthquakes are usually caused by tectonic strains in the earth's crust. Under such strains and the impact of certain values of tension, sudden distortions arise - displacements of one form or another are formed. In this case, a large amount of strain energy is released and waves that propagate in all directions are formed. Reaching the earth's surface, the waves cause earthquakes - vibrations of the upper part of the soil layer [1].

Fig. 2.

The process of tectonic earthquakes



The problem of seismic resistance of bridges and bridge structures is extremely important due to the fact that severe earthquakes destroy them, making it difficult for them to function normally. Bridges and bridge structures are made up of many elements, the most important of which are piers and bearing parts [2].

Factors that cause the destruction of bridges during an earthquake are numerous. These include the discontinuous tectonic motion of the crust, seismic ground vibrations, landslides, caving-ins, avalanches, mudflows, tsunamis, liquefaction, and soil settlement.

Among the devastating earthquakes of the second half of the 20th century and the beginning of the 21st century, the following seismic events should be mentioned: The Tokyo earthquake of 1923, in Japan, with the magnitude of 8.2 points, claimed 143 thousand people dead. The damage caused by the earthquake to Tokyo and its environs amounted to 3 billion dollars in 1923 prices. The earthquake and tsunami in Japan caused damage to 582 roads and to 32 bridges. The roads were mostly cracked, but in some cases, there was complete destruction of the roadbed and bridges.

Another strong earthquake occurred on September 17, 2022, on the east coast of the island of Taiwan (destructive at the epicenter according to the Seismic Intensity Scale "SIS-17") with M = 6.7. After 17 hours and 3 minutes, on September 18 at 9:44 (Moscow time), the second shock occurred (catastrophic at the epicenter according to the SIS-17) with M = 7.3. The epicenter of the earthquake, which originated on the northeast coast of Taiwan, at a depth of 10 km, was located 127 km east-northeast of Taiwan, 137 km southeast of Taichung and 210 km south of Taipei. The epicenter of the second shock was located 13 km northeast of the first. During September 17-19, the Geophysical Service registered 14 shocks with magnitudes from 4.5 to 5.7. Bridges, roads, buildings, and infrastructure were damaged. A three-story house collapsed in Yuli Township, Hualien County. In Hualien County, at the Dongli railway station, several wagons of the train derailed (Fig. 3). In a number of mountainous areas, landslides and rockfalls were observed, which led to the evacuation of hundreds of tourists from there. The epicenter of the first earthquake was located 39 km southwest of the epicenter of another severe earthquake on March 22, 2022, with M = 6.7, 105 km south-southwest of the epicenter of the strong earthquake on February 4, 2018, with M = 6.3, 109 km south-southwest of the epicenter of the strong earthquake on February 6, 2018, with M = 6.5 and 95 km southeast of the devastating earthquake on September 20, 1999, with M = 7.7. More than 1,500 people died and 3,800 were injured. In Puli, 98% of the buildings were damaged or destroyed [3].

Fig. 3.

(a) Train derailment at Dongli station in Hualien. (b) - (c) Collapsed train platform roof at Dongli Station in Hualien County.

(a)

(b)

(c)

In 2022, (September 11, at 2:46 Moscow time) on the island of New Guinea, Papua New Guinea, a strong earthquake occurred (significant at the epicenter according to the SIS-17) with M = 6.9. The epicenter of the earthquake (the focus of which was on the island of New Guinea in the province of Morobe, Papua New Guinea, at a depth of 90 km) was located 72 km northwest of Lae, 140 km southeast of Madang, 367 km north of Port Moresby, the capital of Papua New Guinea. The Geophysical Service registered one aftershock with M = 5.2 after 56 min [3].

On October 14, 2022 (at 03:53 Moscow time), a tangible earthquake occurred in the area of Lake Baikal (significant at the epicenter according to the SIS-17) with M = 5.1. The epicenter of the earthquake, the focus of which was in the waters of Lake Baikal at a depth of 10 km, was located 16 km east-northeast of Bolshoi Goloustnyi, 99 km east-southeast of Irkutsk and 108 km northwest of Gusinoozersk. The epicenter of the earthquake was located 10 km west-southwest of the epicenter of the tangible earthquake on June 8, 2022, with M = 5.2 and 41 km northeast of the epicenter of the tangible earthquake on December 15, 2021, with M = 4.9 in the area of Lake Baikal [3].

Fig. 4.

Severe damage and displacement of railway tracks after the 2022 Taiwan earthquake.

Given the complex nature and aftermath of seismic hazard, many outstanding scientists from around the world (A.A. Gelfer, G.N. Kartsivadze, G.S. Shestoperov, A.M. Uzdin, T.R. Rashidov, I.O. Kuznetsova, U.Z. Shermukhamedov, E.N. Kurabatsky, V.K. Musaev, Yu.I. Nemchinov, Wai-Fah Chen, Lian Duan, Charles Scowthorne, Steven L. Kramer, et al.) conducted research on the development of anti-seismic measures in roads and bridge construction. Studying the consequences of earthquakes, scientists and engineers in Japan, the United States and Russia have proposed many methods for the construction of particularly stable buildings and structures that can withstand strong ground motion.

The most typical seismic damages of bridge structures indicate that, in the general case, they are caused by a number of reasons that make up the main factors of seismic impact. Analysis of various data allows us to distinguish two groups of damage to bridge structures [4, 5]:

– *damage to span structures*, their shift on bridge seats or falling from supports under relatively minor damage to the latter;

– *destruction or severe damage to the supports*, resulting in the complete or partial collapse of the bridge.

The most important source of information is the earthquakes that occurred in the CIS countries, Europe and Asia. Based on the study of the earthquake aftermaths, conclusions can be drawn about the vulnerable objects of the national economy and possible risks of destruction of bridges and transport infrastructure in countries with high seismic activity.

As is known, man-made structures such as bridges and overpasses are complex design solutions with many coupling elements. For example, in the longitudinal direction, spans can be continuous (monolithic), free or fixed to the structure. Thus, for the structure to be effectively strong, the connections at the top and bottom of the piers must be strong enough to operate in plastic hinge mode. If the bearings are poorly designed, then most of the damage occurs in those places, which leads to less reliable results. Most often, damage of this type occurs due to insufficient reinforcement at the joints. This occurs between decks and piers, as was observed during the 1995 Kobe earthquake (Figure 5), or between piers and foundations, as occurred during the San Fernando earthquake (Figure 6).

Fig. 5.

Devastating earthquake in Kobe (Japan) January 17, 1995

Another type of joint damage often observed after earthquakes is related to the lack of stiffness at the joints between the pier and the foundation. If a connection should transmit bending moments and shear forces between elements, then a large amount of reinforcement is required to prevent shear damage at the joints [6]. Figure 6 shows weak reinforcement of the piers located in pile clusters that contributed to the overturning of the bridge during the 1971 San Fernando earthquake.

Fig. 6.
Overturning of the bridge during the earthquake in San Fernando, 1971

One of the most recent destructive earthquakes in the history of mankind was the Wenchuan earthquake, on May 12, 2008, which reached a magnitude of M 8.0, the epicenter was in the city of Yingjiu, Wenchuan County, the focus depth was 14 km; it was a shallow earthquake, its aftermaths spread to most regions of China, including Sichuan, Gansu and Shaanxi, and even abroad. The affected areas have mostly mountainous relief, which led to destructive secondary disasters such as landslides and rockfalls. The infrastructure of expressways, national and provincial highways, and rural roads suffered various levels of damage [6].

Of the 2,154 bridges surveyed after the earthquake, erected on national and provincial highways, 401 bridges were damaged, of them, 52 were completely destroyed, 70 were seriously damaged, and 279 were moderately damaged [6].

Seventy-three bridges built on the national highways and expressways from Dujiangyan City to Yingjiu City suffered such damage as collapse, displacement of the road paving (bridge deck), abutment shear failure, and pier failure.

The Shoujiang Bridge (Fig. 7) suffered serious damage, such as the displacement of beams, sliding of the bearing parts, abutment shear failure, and subsidence of the bridge deck.

The fifth span of the Baihua Bridge collapsed, and the others were badly damaged, making them unusable (Fig. 8). Fig. 7.

Bridge Damage in Shoujiang

Fig. 8.

Baihua Bridge: (a) destruction of the connection of tier with a tie beam; (b) tie beam fracture, destruction of bearing parts

(a) (b)

In addition, local bridges in various cities in China were damaged to varying degrees. The piers of the Mianzhu Huilan overpass collapsed under shear, one span of the Gaoyuan Bridge in Dujiangyan city collapsed; The Mianyang Airport Terminal Bridge sustained damage such as shear failure of supports (Fig. 9) and displacements of the superstructure.

Fig. 9.

Mianyang Airport Terminal Bridge, bearing shear failure

It should be noted that the practice of seismic design and construction of man-made structures in Italy is still relevant, despite the fact that four major earthquakes have occurred in the country in recent years, which severely damaged the infrastructure and artificial structures in various cities: in Friuli (1976, M6,4), Irpinia (1980, M6.9), Umbria and Marche (1997, M6.1) and L'Aquila (2009, M6.3). Bridges and viaducts are the most common types of man-made structures in Italy and have sufficient capacity to withstand horizontal forces.

Thus, a total of 10 viaducts showed various degrees of earthquake damage, affecting more than 250 spans. The type of damage, as expected, was limited to the destruction of the bearing parts with more or less serious consequences in the form of obstacles to movement at the expansion joints of the superstructure. There was a single case of subsidence of the support backfill. In one case, significant residual bending cracks were recorded in some bearings [6].

Figures 10 and 11 show some typical cases of bearing failure, the displacement of the bearing hinges, up to complete offset, damage to the trusses, and significant permanent displacements. The latter, in turn, often led to relative displacements and destruction of the expansion joints of the superstructure, as shown in Fig. 12.

Fig. 10.

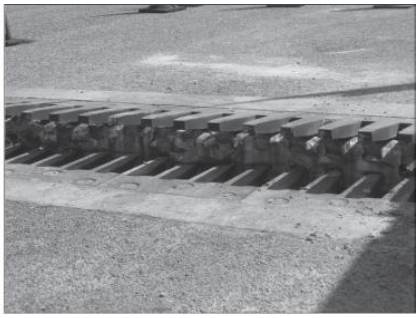
Damage to hinge bearing elements

Fig. 11.

Damage to the abutment: offset of the hinge of the bearing part and damage to the abutment stone

Fig. 12.

Consequences of the destruction of supports at the level of the roadway: rubber expansion joints (left) and steel expansion joints of the abutment (right)



World experience shows that in the field of seismic resistance of bridges, many problematic issues have not yet been resolved. The methods for calculating the anti-seismic strengthening of bridges that exist in regulatory documents do not fully ensure their seismic resistance, durability, and reliability. To ensure their seismic strength, it is necessary to use seismic protection devices in bridge engineering [5].

At present, the world practice of earthquake-resistant construction applies a multi-level approach to the design of seismic-resistant structures. In accordance with this approach, the structure is calculated for several levels of seismic impact at the corresponding limit states. This approach is adopted in Eurocode-8, where it is recommended to consider at least two levels of impact and two limit states - a violation of normal operation (serviceability limit state (SLS)) and a collapse of the structure (ultimate limit state (ULS)) [4].

So, the following conclusions can be drawn:

–- in order to eliminate such damage, it is necessary to ensure a sufficient width of the dimensions of the head of the supports in order to ensure sufficient displacement of the superstructures and to provide special damping and seismic protection devices;

– it is necessary to carefully carry out calculations of the optimization of the supporting parts for the effect of the design and maximum-design earthquake when designing artificial structures;

– a multi-level approach to the design of artificial structures allows the accounting for many characteristic features of their seismic vibrations: the presence of a temporary load, the degree of responsibility, and the features of seismic isolation and seismic attenuation of bridges.

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WAYS TO DEVELOP "GOODS-MARKET" MARKETING STRATEGIES IN FREE ECONOMIC ZONES

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Abstract. *This article discusses the importance of developing marketing strategies in free economic zones, including the procedure for applying "good-market" strategies. Relevant proposals for the development of "goods-market" strategies in free economic zones have been developed.*

Keywords: *free economic zone, marketing strategies, "product-market" strategies, market penetration strategy, market development strategy, product development strategy, diversification strategy.*

Introduction

The beginning of the 21st century is characterized by the widespread use of such forms of international cooperation as free economic zones (hereinafter referred to as FEZs). In the context of globalization and increased economic competition between large companies, the establishment of free economic zones allows to increase the competitiveness of the national economy by using modern innovative technologies for the production and distribution of goods and services that are in high demand in the domestic and international markets.

In order to attract foreign and domestic investments in the establishment of high-tech modern productions for the deep processing of mineral raw materials and agricultural resources, which ensure the production of high-added-value competitive, quality products that are popular in foreign markets in our country. A new system of managing free economic zones and small industrial zones has been introduced in order to create a very favorable business environment, as well as comprehensive and effective use of the production and resource potential of the regions of the republic, on the basis of this, to organize new jobs and increase the income of the population, and to increase the export of local products. In particular, free economic zones have been established in our country and new ones are being established.

The use of international marketing strategies in the diversification of the production activities of the free economic zones operating in our country and the development of export activities is one of the urgent issues. Because in the countries that are leaders in free economic zones in the world, ensuring the activity of the network in the global value chain, effectively organizing international market research, developing marketing strategies for free economic zones, establishing an electronic trade system at the international level , improving the scientific and methodological foundations of increasing the reputation of national brands in the world are important directions today.

Analysis of literature on the topic

Many foreign and local economists have conducted studies on the issues of establishing free economic zones, their role and importance in the economy, and their development. In this regard, one of the foreign scientists, R. J. McCalla, states that the organization of free economic zones is a separate territory of a country in terms of the provision of logistics services and geographical location [7]. Another foreign specialist, M. Guangwen, researched the organization

of free economic zones, requirements for it, the theory and practice of economic activity in free economic zones [11]. The role of free economic zones in the national economy of the country, the organizational and economic mechanisms of free economic zones were studied in the scientific works of Ya.S. Druzik [12]. The activity of free economic zones in the international economy, the role of free economic zones in the world economy is reflected in the scientific works of N.V. Chernenko [21].

From the middle of the 20th century, the issues of organizing the activity of FEZs, increasing investment attractiveness, developing foreign trade, increasing the export potential of FEZs, which have become the main points of the economy, have been studied by foreign and local experts. Among the studies, T. Farole and F. Dobrogonov emphasized the practical aspect of these regions and said, "These structures create an opportunity for developing countries to capture additional consumer markets and increase the export potential of the countries. At the same time, he claims that these economic structures serve as a means of strengthening the processes of regional economic integration [5].

There are also studies on the geographical location of the FEZ, including regions to establish the FEZ. According to V.G.Ignatov, V.I.Butov, FEZs are limited territories, consisting of seaports and air borders. They create a favorable business environment for national and foreign businessmen in foreign trade, general economic and other areas [13].

Russian economist V. D. Adrianov has stated: "Free economic zones

is a part of the national territory and creates wide opportunities for finding solutions to economic problems" [3].

Also, one of the synonymous concepts of these regions in world practice, special economic zones (SEZs), is defined by R.I. Zimenkov as follows: SEZ is a part of the national economic space. There is a special preferential economic regime for national and foreign entrepreneurs. Their task is manifested in solving socio-economic, scientific and technical problems [6].

I.R. Tazutdinov, who continued this direction, stated "FEZ is a separate part of the state, in its territory there is an institutional infrastructure, and in its territory there will be a special legal and administrative regime regulating economic relations with the outside world. ” [20]. Some researchers, taking into account modern integration processes, do not give a separate definition to FEZs. In particular, we see it in the research works of V.I. Baronov and G.M. Kostyunina. In their works, the legal status of FEZs in the specific region or country where FEZs are located, and their economic situation are analyzed [9].

Advanced economists of our country approach differently, paying more attention to the preferential procedure and administrative management in FEZs. Therefore, according to the opinion of A.V. Vakhabov, Sh.Kh. Khajibakiyev, N.G. Muminov, Free Economic Zones are such geographical areas in which a preferential tax payment procedure is introduced compared to the procedure of economic activity adopted in the country. In other words, state intervention in economic processes will be reduced in this region, and it will be a part of the national economic space, and a system of certain privileges will be introduced, which are not used in other regions of the country [10].

If we look at the results of the research carried out in our country in recent years, we can see that special attention is paid to the features of FEZs that help to eliminate economic and social problems and the liberalization of the country's economic system. In particular, Sh.I. Mustafaqulov said that the free economic zone is also the image of the country. Free economic zones serve to liberalize a country, even if they function poorly. A free economic zone is a social project in any country, in any part of it. The creation of the region not only brings additional income for the region, but also provides useful returns for the whole country in various forms [14].

Also, in A.A. Ostonakulov's opinion, the free economic zone is a territory established for use as a territorial method of economic diversification and introduction of modern technologies into the economic structure [8].

S.S. Bozarov stated that "Free economic zone is a regime that is established in an economically and geographically favorable region of the country, develops the country's economy in a comprehensive way and ensures its integration into the world economy, and includes a set of special privileges; is a specially designated area where various legal relations complicated by the foreign element are carried out" [4].

Also, we have local specialists who are conducting scientific work related to marketing issues in the free economic zones, in particular, the issues of developing marketing strategies. For example, D.H. Kholmamatov, M.Sh. Mukhiddinov carried out scientific work on the development of international marketing strategies to increase the export potential of free economic zones [15], the use of SWOT analysis in studying the activities of free economic zones [16]. Wholesale trade, marketing and logistics issues are also paid attention to a certain extent in managing the flow of goods in free economic zones [17,18]. The export geography of FEZ operating in our country, including Jizzakh FEZ, was analyzed [19].

However, the development of marketing strategies for the comprehensive development of free economic zones has not been sufficiently studied.

Analysis and results

The analysis of the world experience of the activity of special economic zones shows that their organization and development are mainly aimed at solving priority production and investment tasks, as well as at the implementation of strategic programs and projects. FEZs are usually established in regions rich in local raw materials for transport and production and with developed social infrastructure. However, the lack of development of a constructive marketing strategy for the established SEZ significantly slows down the development of FEZs.

Our research shows that ensuring the competitiveness of FEZs can be implemented only on the basis of a scientifically based marketing strategy for the development of the territory as a complex socio-economic system. At the same time, in general, the SEZ strategy can be sufficient when using a promising marketing direction - territorial marketing or regional marketing, which ensures the increase of the competitiveness of the region. The strategies of individual enterprises of SEZ residents should be developed based on the principles of marketing management, but taking into account the specific characteristics of the SEZ.

The development of marketing strategies in free economic zones is based on the following approaches:

market segmentation;

selection of target markets;

finding ways to enter the market for companies operating in the SEZ;

selection and application of marketing tools and methods;

determining the time to market.

Based on market segmentation, each element of the market, different product groups, buyers with different behavior and requirements, regions and countries are determined.

To strengthen the position of free economic zones in the market, the following "good-market" strategies are also used:

1. "Old market - old product" (strategy of deep market penetration). Companies operating in free economic zones are achieving this by increasing the market share, reducing production and transaction costs, activating advertising, changing goals, and expanding the field of use of the manufactured product.

He defined 5 main conditions for the successful implementation of the strategy of deep penetration into the market.

Table 1

Conditions for effective use of the strategy

Situations of strategy implementation	Content
Situation 1	In the situation where the existing products in the free economic zone have not reached the level of market coverage, the source of growth is distribution and coverage of the target audience.
Situation 2	It is possible to increase the share of existing consumers in the free economic zone.
Situation 3	Due to the competitiveness of the products of the free economic zone, it is possible to obtain market share from other sources.
Situation 4	The existing economic scale of the free economic zone
Situation 5	The free economic zone has a high level of investment

2. "New market - old product" (market expansion strategy). The strategy envisages the activation of business activities at the expense of capturing new markets. In addition to new geographic markets, new market segments are constantly sought, that is, expansion and deepening of groups of consumers of these goods.

For the realization of this strategy, he distinguishes the following situations:

Table 2

Conditions for effective use of the strategy

Situations of strategy implementation	Content
Situation 1	Firms operating in free economic zones are able to enter new markets through successful experience in existing activities: when the free economic zone has unique products, unique technology, unique construction and business management, and others.
Situation 2	New markets are not saturated, barriers to market entry are low, and there is unsatisfied demand in the field in which the enterprise has been successful in the new market.
Situation 3	New markets have high growth rates.
Situation 4	The company has additional capital to develop and strengthen the free economic zone in new markets.

3. "Old market - new product" (strategy of new product production) - developing, mastering, expanding the assortment of new goods for this market, modifying goods and introducing new goods to the market, reducing the price, introducing better quality goods, selling at the same price, providing an additional guarantee to the buyer, providing consumer credit, providing additional free services and other methods of sales promotion, using direct and hidden forms of competition.

The strategy of product development is to expand the innovation related to the current product as a result of deepening the current assortment as much as possible. If the new product can

completely replace the existing product, ensure sales growth and profitability, then the profitability of the production of the new product will be high.

Table 3

Conditions for effective use of the strategy

Situations of strategy implementation	Content
Situation 1	Success in the free economic zone industry depends on innovation and continuous delivery of new products.
Situation 2	If the existing product in the free economic zone is at the maturity stage of its life cycle.
Situation 3	In the strong competition of competitors in the free economic zone
Situation 4	If a free economic zone starts a new type of activity related to a new product.

4. "New product - new market" (diversification strategy). It is the most common marketing strategy, involving the management and employees of the free economic zone and the introduction of large amounts of funds. Searching for new markets in new regions with demand for new goods, their types and models, new product range, as well as new segments in the old market where demand for new goods has arisen.

Such a strategy is implemented by firms rich in production resources, which are sufficient to produce a new product and sell it in a market not occupied by competing free economic zones. If the free economic zone intends to gain leadership in one segment of the international market, such a strategy is called single-segment concentration. If the free economic zone wants to achieve success in several segments of the international market, such a strategy is called multi-segment concentration.

Summary

Based on the results of our research, the following main conclusions were reached:

1. Marketing strategies are the use of opportunities and resources of free economic zones in the most optimal way based on the international market situation. Based on the goals of the free economic zones, marketing strategies are the fulfillment of the tasks set by the manufacturing enterprises for the individual international market and for each product. Marketing strategies are formed in order to implement production and commercial activities in full accordance with the market situation and the company's capabilities.

2. Most free economic zone strategies include growth goals: increase in sales volume, market share, revenue or size of the free economic zone. Growth is a factor that affects the activity of the free economic zone, stimulates the initiative and increases the motivation of the team and management of the free economic zone.

Growth objectives are expressed at three different levels:

 growth compared to the main market; we call it intensive growth;

 growth in relation to the production chain, "forward" or "backward" integration in relation to the main activity, this is integrative growth.

 growth based on opportunities outside the usual area of activity: growth through diversification.

3. "Product - market" strategy is aimed at the entry of the free economic zone into new markets and the assimilation of new products. This strategy is formed depending on the opportunities of the free economic zone, products, markets, competitive situation, consumers and

direction of activity. Basically, the free economic zone develops international marketing strategies for its resources and developing industries.

This strategy envisages the development of a strategy depending on the market and product renewal. The starting point is the difference between the real and planned development of the free economic zone. This means that the goal of a free economic zone cannot be achieved using the previous strategy. A goal is necessary, or it needs to be corrected, or a new strategic path must be sought.

4. Expansion of the product production portfolio of the free economic zone within the framework of the "Product-market" strategy, in particular, the production of new industrial products.

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MODERN TRENDS IN THE DEVELOPMENT OF THE GLOBAL TEXTILE INDUSTRY

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Abstract. *The article presents the components of the world textile industry, the pace of development. Also analyzed are current trends in the development of the main products of the world textile industry. The factors influencing the development of the world textile industry are systematized, and the levels of their impact are studied.*

Keywords: *textile, textile industry, world textile industry, yarn, pandemic, fiber, recycling.*

The clothing market, which is a large segment of the textile industry, is developing rapidly. This market is conventionally divided into three segments at the international level: women's clothing, men's and children's clothing market. Each segment consists of a number of sub-segments, consisting of components such as coats, jackets, blazers, shirts, skirts, sweaters, trousers, sportswear and underwear [1].

Overall, the apparel market is expected to grow at a CAGR of 4.1% through 2026. All segments of the clothing market have almost the same growth trend. Between 2020 and 2026, the growth rate of the women's segment is 5.4%, and that of the children's segment is 5.6%, and it is expected to continue at this rate for the next four years. According to forecasts, in 2026, the highest indicator in the male segment will reach 5.7% and reach 705 billion US dollars [3].

The growth of online shopping and the continued expansion of large textile chains is putting upward pressure on price levels in the growing general textile market, which will further encourage consumers to shop at affordable and competitive prices. This is the reason why the global textile industry is showing steady growth.

Another segment of the textile industry, the global home textile market, is also showing a growth trend during the period 2017-2021 (excluding 2020). In 2020, the market value of textile products decreased slightly due to the pandemic. In 2021, the value of the global home textile market will be about 111.38 billion USD. According to forecasts, this segment will achieve a constant increase in its market value over the next five years, reaching 145 billion USD in 2026 [4].

In the world, the corona virus pandemic is still affecting the economy of the countries of the world. As a result of mandatory measures taken by governments against the spread of the pandemic, international trade is falling, supply chains are being disrupted and production is coming to a standstill.

The negative consequences have also affected the global textile and clothing market, and cotton prices have been steadily falling. According to a survey conducted by the International Textile Manufacturers Association (ITMF) among textile manufacturers worldwide, current orders have decreased by 8% due to the pandemic and its consequences. The decline in orders ranged from 4% in South America to 13.3% in Africa. In this survey, respondents highlighted the following issues: ensuring the safety and health of workers, closing international supply chains (especially supplies from China at the beginning of the pandemic), supply shortages and delays in the garment industry, and fears of reduced demand for manufactured goods [5].

Today, the range of products of the global textile and light industry market includes products offered by entities (organizations, individual entrepreneurs and companies) producing fiber, yarn, carpets, sheets and other textile products.

Increasing demand for online shopping is expected to boost the textile manufacturing market. Manufacturers can now sell their products on a larger platform than before, increasing the customer base that geographically drives the growth of the textile manufacturing market. For example, in countries like India, e-commerce portals have boosted sales of traditional garments by giving greater exposure to manufacturers confined to one geography [2].

The outbreak of the coronavirus disease (COVID-19) was a major restraint in the textile manufacturing market in 2021, as supply chains were disrupted due to trade restrictions and consumption decreased due to lockdowns imposed by governments worldwide. Actions by national governments to stop transmission have resulted in production shutdowns and reduced economic activity as countries go into "lockdown" and the outbreak has negatively affected business throughout 2021 and into 2021. However, it is expected that the textile manufacturing market will recover from the shock during the forecast period, as this is a 'black swan' event and is not associated with ongoing or fundamental weaknesses in the market or the global economy.

Advances in wireless technologies and increasing demand for connectivity are fueling the demand for smart textiles. Smart textiles are fabrics that have the ability to interact with the environment. They have the ability to respond to physical stimuli such as thermal, mechanical, electrical and chemical sources. Sensors, actuators and fabrics are the main components of smart textiles. Materials used in smart textiles include optical fibers, metals, and conductive polymers. They are widely used in fashion, entertainment, medicine, transportation, sports and fitness, and military. For example, the Citizen Synthetic D-jacket has a wide range of functions such as heart rate monitor, built-in GPS, accelerometer, altimeter [6].

We will look at the sequence of the world's seven leading textile industry enterprises by market value, which, despite the crises created by the coronavirus pandemic, have managed to reorganize their activities online and maintain a stable economic situation, despite the interruption of traditional forms of trade.

Figure 1.3.

The world's top 7 textile enterprises (by market value, billion dollars)

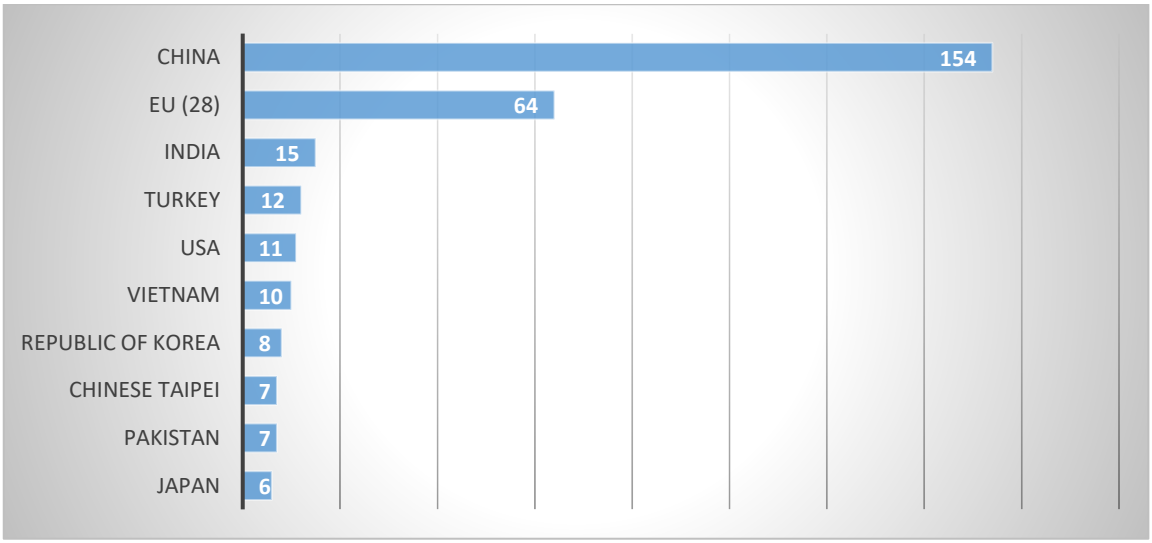
Source: Formed by author based on information from https://www.zippia.com/advice/largest-textile-companies/ . Application date 03.08.2022.

We can see that US companies took the lead in the global textile market (82 and 33 billion dollars), while Chinese and Japanese companies from the Asian continent took the 4th and 7th places in terms of market value (29 and 9 billion dollars) (Figure 1.3). At this point, it should be noted that China is the leader in terms of the share of the textile market, and in this sequence there are Asian representatives such as India, Turkey, Pakistan, Bangladesh, and Vietnam.

China is the largest producer and exporter in the global textile market, with an export turnover of 154 billion US dollars in 2020. Such development of this industrial network is directly related to such factors as cheap production, quality of raw materials, industrial structure, modern high-tech technology and equipment, brand development, internal consumption and optimal organization of the work process in the world market (Fig. 1.4).

Figure 1.4.

Top ten countries exporting textile products in 2020, billion dollars



Source: https://www.statista.com/statistics/236397/value-of-the-leading-global-textile-exporters-by-country/ Accessed 08/06/2022

In general, the world's textile industry has shown stable development dynamics in the last five years. Despite the fact that there are a number of factors that have a negative impact on the development of this industry, the average annual growth rate is 4.1%.

Table 1.3.

Global textile industry development dynamics

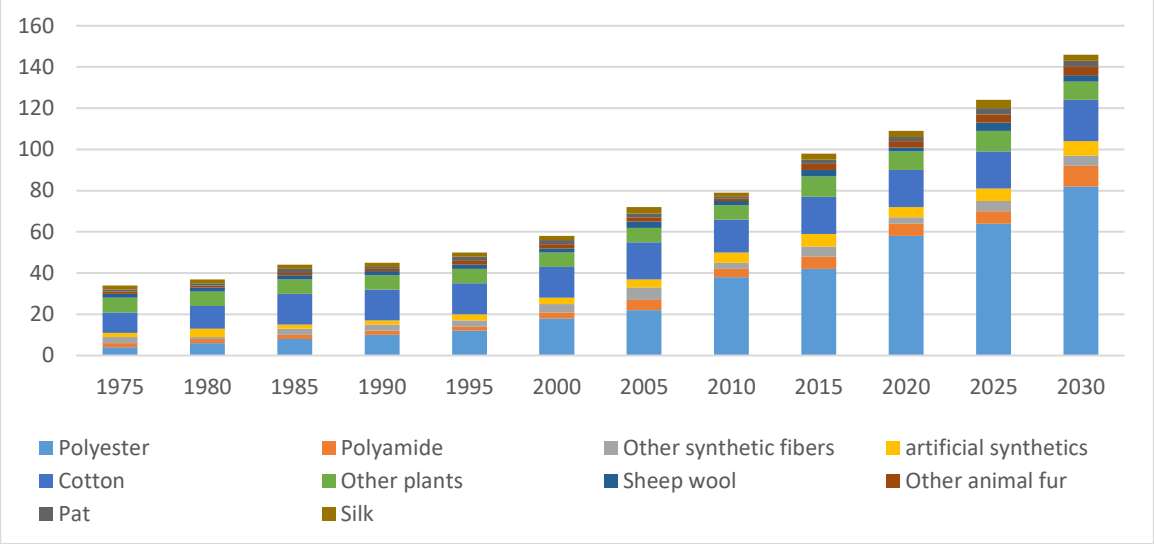
Years	Global textile market value, billion dollars	Growth rate, %
2015	667.5	1.1%
2016	714.0	7.0%
2017	746.1	4.5%
2018	778.2	4.3%
2019	810.4	4.1%
2020	842.6	4.0%

Source: https://shenglufashion.com/2017/06/06/market-size-of-the-global-textile-and-apparel-industry-2015-to-2020/ Accessed 08/06/2022

In 2015, the value of the world textile industry market increased by 1.5% compared to last year and amounted to 667.5 billion dollars (including 83.1% of fabric and 16.9% of fiber). The growth rate of the textile market between 2011 and 2015 was 4.4%. The Asia-Pacific region accounted for 54.6% of the world textile market in 2015, and Europe for 20.6% (Table 1.3).

Figure 1.5.

Dynamics of global fiber production by composition (million tons)



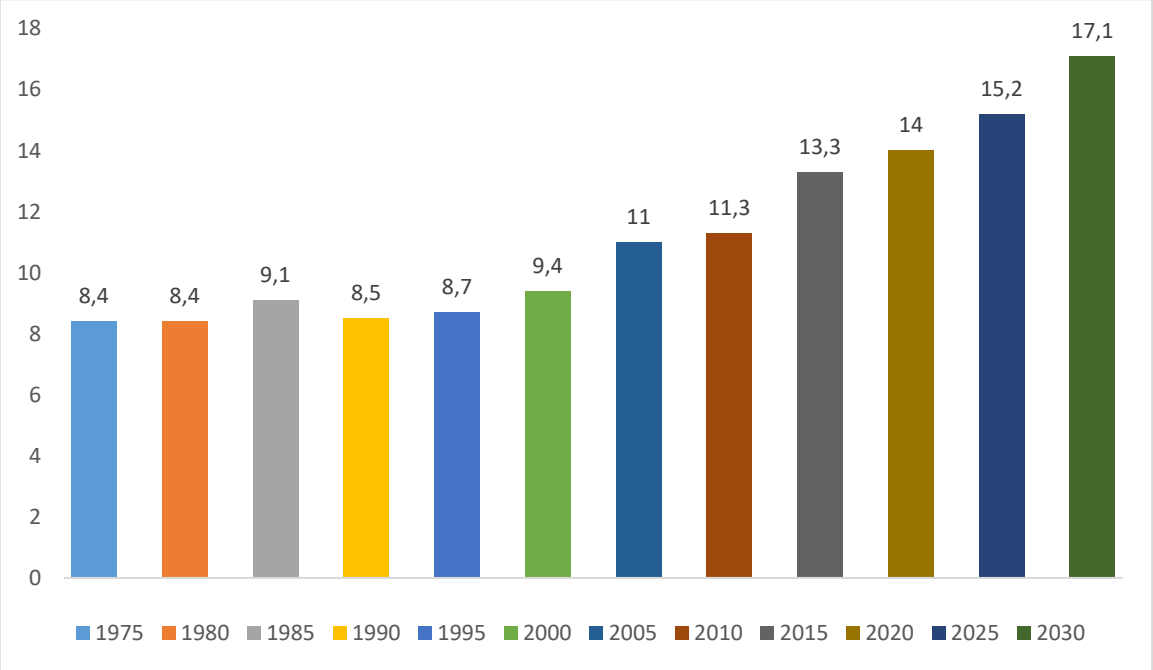
Source: Preferred Fiber & Materials Market Report 2021.

https :// textileexchange . org / wp - content / uploads /2021/08/ Textile - Exchange _ Preferred - Fiber - and - Materials - Market - Report _ 2021. pdf Application date 06.08.2022

the volume of fiber production in the world, which suffered a lot due to the COVID-19 pandemic, in 2019 was 111 million. 109 million per ton in 2020. decreased to tons. World clothing retail in the market significant decline with compared to this relatively small is a decrease . As the main reasons for this, the pandemic cotton season at the beginning of the dry season already hot to the stage entrance , clothes in the market of sales low partially medical such as field and hygiene products another in segments high sales with we can explain it with covered league . The high production volume in the textile industry continued at a great pace, first of all in China. During the last 20 years, fiber production increased to 58 mln. in 2010. tons to 109 million tons in 2020, almost doubled. Although it is not yet known how the pandemic and other factors will affect future development, by 2030, the volume of the textile market is expected to reach 146 million tons and increase by another 34% (Figure 1.5).

Figure 1.6.

Production volume dynamics by global fiber content (capita/kg)



Source: Preferred Fiber & Materials Market Report 2021.

https :// textileexchange . org / wp - content / uploads /2021/08/ Textile - Exchange _ Preferred - Fiber - and - Materials - Market - Report _ 2021. pdf Application date 06.08.2022

Global fiber production per person has increased from 8.4 kilograms in 1975 to 14 kilograms in 2020. As the main reason for this almost two-fold growth, we can indicate the rapid growth of the population on the planet Earth and, accordingly, the intensive increase in the demand for textile products (Fig. 1.6).

Another important point is that the increase in global fiber production has a significant impact on people and the overall state of the planet. Such growth requires additional land, water, labor, animals, use of chemicals, and large amounts of other resources. Guidelines are being developed on the need for more responsible use of resources, the introduction of recycling, reuse, remanufacturing, and the gradual reduction of production of products from primary raw materials and the need to separate primary resources from consumption in the production process. However, the scale and speed of work in this direction is not yet at the level of demand, and additional efforts and resources should be involved.

At this point, we consider it appropriate to form their classification based on the nature of the factors influencing the development of the global textile industry.

Factors affecting the development of the global textile industry can be conditionally divided into two [3]:

1. Controllable factors;
2. Uncontrollable factors.

Table 1.4.

Factors affecting the development of the global textile industry

Let's take a closer look at each factor below:

No	Controllable (internal) factors	Uncontrollable (external) factors
1.	Product	Structural adjustments
2.	Plant and equipment	Natural resources (raw materials, climate)
3.	Technology	Government and infrastructure
4.	Materials and energy consumption	
5.	The human factor	
6.	Work methods	
7.	Management style	

Controllable (internal) factors:

1. Product factor: refers to how well the product meets production requirements in terms of productivity, evaluated by product utility. The cost benefit factor of a product can be increased by increasing the profit for the same cost or by reducing the cost for the same profit.

2. Plant and equipment: they play an important role in increasing productivity. Increased plant availability through proper maintenance and reduced downtime increases productivity. Productivity can be increased by paying proper attention to usage, age, upgrades, cost, investments, etc.

3. Technology: Innovative and latest technologies greatly increase efficiency. Automation and information technology help improve material handling, storage, communication systems, and quality control. Various aspects of technological factors to be considered include:

- The size and capacity of the plant,
- Timely delivery and quality of input materials,
- production planning and control;
- Repair and maintenance;
- Waste reduction;
- Efficient material handling system.

4. Material and energy consumption: Efforts to reduce material and energy consumption significantly increase efficiency.

- Quality material and choosing the right material.
- Waste and Waste Control.
- Effective inventory control.
- Development of sources of supply.
- Optimum energy use and energy saving.

5. Human Factors: Productivity largely depends on human skills and competence. The ability to work effectively is governed by various factors such as employee education, training, experience, etc. Employee motivation affects productivity.

6. Work methods: Improving work methods (methods) improves labor productivity, work learning and industrial engineering techniques and training are areas that improve work methods, which increases labor productivity.

7. Management style: This affects organizational design, communication, policies and procedures in the organization. A flexible and dynamic management style is the best approach to achieve high productivity.

Uncontrollable (external) factors:

1. Structural Adjustments: Structural adjustments include economic and social changes. The following economic changes will significantly affect:

- The shift of employment from agriculture to manufacturing industry,
- Technology import and
- Industrial competitiveness.
- Social changes such as women's participation in labor, education, cultural values, and attitudes are among the factors that play an important role in increasing production efficiency.

2. Natural resources: labor, land, and raw materials are important for productivity.

3. Government and infrastructure: Government policies and programs are important to the productivity practices of government agencies, transport and communication capacity, and fiscal policy (interest rates, taxes) has a greater impact on productivity [7].

Although the processing capabilities of synthetic fibers are high, the existence of a number of environmental problems in their processing and remanufacturing shows that on average their production volume should not exceed 15% of the total fiber production.

Despite of there is a high potential for reducing production costs in the global textile industry, there are still many things that need to be done in this direction. In the course of the research work, we will study ways to reduce production costs in textile industry enterprises in our country without harming the environment.

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DIFFERENT THEORIES AND PERSPECTIVES ON THE DEVELOPMENT OF THE DIGITAL ECONOMY

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Abstract. *The article describes various theories and views on the development of the digital economy, its economic nature and development issues. Also, digital technologies not only increase the quality of products and services, but also reduce excess costs. At the same time, it plays a major role in eliminating the worst evil that hinders the country's development - corruption. Industry economics are also important in setting telecommunications regulations*

Keywords: *digital economy, information technology, information and digitization process, telecommunication networks.*

Enter

Currently, the theoretical basis of regulation of the digital economy in the world is rapidly developing. The theoretical foundations of digital economy regulation and the development of the digital economy allow to fully satisfy consumer demand and increase labor productivity in economic sectors and sectors. E-commerce makes it possible to prevent crises by accelerating the sale of goods and services.

Internet advertising, in turn, makes it possible to expand the advertising audience worldwide. In order to further develop science in our country, to educate young people as possessors of deep knowledge, high spirituality and culture, to rapidly continue the work started on the formation of a competitive economy and to raise it to a new, modern level, 2020 is the "Year of Science, Enlightenment and Digital Economy Development" [1], was named. The task of developing the "Digital Uzbekistan - 2030" program was set, and according to it, the goal of accelerating the process of digital transformation of Uzbekistan was determined. With the development of information technologies, new directions of employment are emerging today. Employers are able to hire employees voluntarily and at will, and geographical location and time difference are irrelevant. Employees are able to perform their tasks remotely using information technologies, and are able to perform the assigned task at any time without leaving the house.

Analysis of literature on the topic

When talking about the process of "digitization" of the economy and society (in English, digitization means digitalization, sometimes digitalization means digitalization), first of all, it is necessary to clarify the terminology. In the broadest sense, the process of "digitization" usually refers to socio-economic change initiated by the widespread use and assimilation of digital technologies.

A number of definitions have been given to the theoretical concept of digital economy regulation. In particular, V. Ivanov, Doctor of Economics, Corresponding Member of the Russian Academy of Sciences, defined "Digital economy as a virtual environment that complements our reality". According to Tomsk State University professor D. Kungurov, there are two approaches to the term "digital economy" [5].

Digital economy based on digital technologies and describing the exclusive domain of electronic goods and services: the first approach is called "classical", classic examples are telemedicine, distance education, sale of medicines (films, television, books, etc.). The second

approach: "digital economy" is economic production using advanced digital technologies. M.L. Kalujskyi defined the digital economy as the economic Internet activity as well as its forms, methods, means, and communication environment for its implementation [6].

According to the sources, "Digital economy" is a model of this type of economy that works to a certain extent. The digital economy is a production complex, a production system that creates products and services that provide life and comfort for a person, where a certain cyber-physical (cyber-physical) system appears. In our opinion, the digital economy is a virtual environment in which the production complex creates products and services that provide convenience for people, and it is an economic production system using digital technologies [3].

Interest in the digital economy has grown significantly due to significant changes in society and the economy. Modern technologies and platforms have helped businesses and individuals reduce costs by minimizing personal interactions with customers, partners, and government organizations, as well as making communication faster and easier. The result is a digital or electronic economy based on network resources.

The word "digitalization" is actually a new term, which implies the involvement of IT solutions in the process of innovative management and administration, and as a result, the use of information technologies in all systems, from Internet of Things to e-government.

Research methodology

The concept and essence of the theoretical foundations of regulation of the digital economy. Digital economy is a system of implementation of economic, social and cultural relations based on the use of digital technologies. It is sometimes referred to as the internet economy, the new economy, or the web economy[6].

In this case, the virtual payment system accelerates the circulation of goods.In 1995, American programmer Nicholas Negroponte coined the term "digital economy." Today, the term is used by politicians, economists, journalists, and entrepreneurs around the world. In 2016, the World Bank published the first report on the state of the digital economy in the world (“Digital Dividends”).

According to an analysis conducted by leading international organizations, the digital economy will increase GDP by at least 30 percent, while eliminating the shadow economy. Turning to international practice, today's digital economy is not limited to e-commerce and services, but covers all aspects of life, in particular, health, science and education, construction, energy, agriculture and water management, transport, geology, cadastre, archives, is rapidly penetrating internet banking and other fields, and in each of them is giving its high results.

The provision of e-services and e-products by the state to its citizens is a key part of the digital economy. Extensive development of this sector in our country will eliminate the scourge of corruption.

Development and implementation of the Digital Uzbekistan 2030 program in Uzbekistan, first of all, the formation of thorough and perfect organizational and legal mechanisms, as well as ensuring the close cooperation of government agencies and businesses in the introduction of innovative ideas, technologies and developments. Coverage of production and services in the networks with digital technologies, the development of intellectually talented personnel with in-depth knowledge in this area, thereby contributing to the creation of an "information society" environment in the country.

At present, the country's development does not depend only on the available natural resources or population, according to the World Bank, 66% of the total wealth of our land - $ 365 trillion - falls on human capital, ie the level of knowledge of the individual. In the United States, that figure is 77 percent of the nation's wealth - $ 95 trillion. Therefore, in this year's Address, the head of our state emphasized the idea that " the greatest wealth is intelligence and knowledge, the greatest heritage is a good upbringing, the greatest poverty is ignorance."

Intelligence and science are the wings of progress. The pinnacle of modern science is in the high-tech, digital world. The Fourth Industrial Revolution marked the beginning of a new form of development - the "digital economy". To date, the world's digital economy is estimated to be worth $ 2 trillion in 20 developed countries. In the UK, the world leader in the development of the digital economy, it has already reached 12 per cent of the country’s gross domestic product. The digital economy implies the digitization of technological and business processes, production, logistics and sales of finished products. In our country, in 2020, it is planned to fully digitize such areas as transport, geology, education, archives, and work in this direction is in full swing. IT-parks with modern infrastructure are also a proof of our opinion.

The launch of a new version of the Single Interactive Public Services Portal, the Prime Minister's Virtual Reception for Entrepreneurs' Applications portal "business.gov.uz" is an important step in the development of the digital economy.

Time and labor resources for consideration of draft regulations by all interested ministries, departments, local executive bodies, for agreement (visa issuance) using electronic digital signatures, including simultaneous discussion of the general public and experts, and prompt dispatch It is also gratifying that the single electronic system "project.gov.uz" has been introduced in order to save significantly.

According to analysts at ERGO Research & Advisory, the main problem in the development of the digital economy is poor telecommunications infrastructure and communication . As a result of low investment in the ICT sector, the density of base communication stations was low. This causes the internet, mobile services to not work well, resulting in reduced digital economic growth, leading to digital outages. Happily, this year the figure has increased significantly.

Analysis and results

According to the information service of the Ministry of Information Technologies and Communications of the Republic of Uzbekistan, a number of measures are being taken to develop the telecommunications infrastructure[6]. The total bandwidth of the Internet connection is 1,200 Gbit/s, access to the Internet at 750 Gbit/s through the switching center, and the network load rate is 76.6%. From January 1, 2020, the tariff for Internet services for operators and providers was reduced by 34% compared to the same period last year and amounted to 56.0 thousand soums per 1 Mbit/s. The number of Internet users exceeded 22 million, of which the number of mobile Internet users reached 19 million. The main telecommunication networks have been expanded at 237 facilities across the country, telecommunication equipment has been modernized, the capacity of the main telecommunication networks has been increased to 200 Gbit/s at the interregional level and 40 Gbit/s at the inter-district level. There are positive results, but that doesn’t mean enough.

After all, the digital economy continues to accumulate an incredibly large amount of digital data. In 2022, global IP traffic volume is expected to reach 150,700 Gbit/s (compared to 45,000 Gbit/s in 2017), which calls for not lagging behind the period.

Insufficient digital skills in all segments of the population has been another obstacle to the development of the digital economy. Digital turnover was also considered low. In this regard, it is worth recalling the opinion of Bill Gates, the founder of Microsoft, who is well known in the world of technology : "Soon there will be only two types of companies on Earth. The first is companies that do business online, and the second is companies that go out of business . ” With this in mind, it is expedient for entrepreneurs to organize their activities on the basis of the principles of world-famous business for the consumer, business for the business, consumer for the consumer.

Despite the availability of payment systems that allow Click, Payme, M-bank, Upay, Easy and other online payments, the rate of making online payments for mobile payments, internet, utilities is not high. In 2017, 34 percent of account holders made a digital payment. For comparison, the figure is 96 per cent in the UK. It is noteworthy that the number of payments through the terminal is growing. For example, in 2018, payments through the terminal amounted to 53 trillion soums.

Another problem in the introduction of the digital economy was the fact that for a long time, information technology specialists, who were technical staff in budget organizations, were not paid high salaries. The reason is that qualified programmers did not stay in this position for long. They preferred to work for international organizations, joint ventures, foreign clients. Now they have a mechanism of overpayment.

Along with the achievements, there are problems, there is a lot of work to be done, as President Sh.Mirziyoyev said, “Of course, we know very well that the formation of a digital economy requires the necessary infrastructure, a lot of money and manpower. But no matter how hard it is, if we don’t start this work today, when will we start? It will be too late tomorrow. Therefore, the active transition to a digital economy will be one of our top priorities for the next five years. ”

All systems in Uzbekistan are being digitized. In particular, the demand for online goods and services in the quarantine regime introduced due to the coronavirus has further increased, the range of digital features has expanded in all areas. Today it is possible to make payments without leaving home, receive distance education without any problems, use and even work in the world's largest libraries. Digital services have a number of advantages over the traditional type, such as paperwork, lack of formality, saving time. For example, if you receive public services in digital form, you will be offered a discount of 10 percent of the established fee[6].

All this is a sign of the active transition of our country to the digital economy. Another factor in the development of the digital economy is to ensure cybersecurity. Under quarantine conditions, there have been cases of the spread of viruses on the global network under the label of Coronavirus Protection Guidelines, which disable software systems. Financial fraudsters who deceive ordinary people by promising to sell and deliver drugs overseas and asking to transfer money to an account in advance have used fake online stores, websites, social media accounts and email addresses. This also reaffirms the need to ensure information security.

The concepts of digitalization and cybersecurity always come side by side. Because along with the digitization of all systems and processes, it is important to ensure their technically perfect and flawless operation, security. The more attention is paid to the development of the digital economy in our country, the more urgent is the provision of cyber security. Uzbekistan is strengthening its position in the global cybersecurity index. In 2017, our country took 93rd place in this ranking, and in 2018 it rose to 52nd place.

Cybersecurity is a different concept from the high spirituality that serves to sort information by being a form of information security. It refers to more technical processes and means for the average user to set secure and strong passwords in mail, social networks, payment systems, protect their personal computer and smartphone from viruses. In a broader sense, cybersecurity is a set of measures aimed at protecting networks, mobile applications and devices. This means maintaining the confidentiality of data, protecting their integrity, the full operation of this or that site, application, program.

According to the analysis of the State Unitary Enterprise "Cyber Security Center", in 2019, 268 cybersecurity incidents were detected on the websites of the national segment of the Internet. This means that the number of offenses in the digital world has decreased by 44% compared to the previous year. Of these, 222 accounted for unauthorized uploading of content, 45 accounted for defeats (a hacking attack that meant a website page was replaced by another, for example, an ad page) and one for covert mining (covert activity on a cryptocurrency platform).

69% of the incidents were detected on the websites of hosting providers in Uzbekistan, and the remaining 31% were related to the sites of hosting providers in foreign countries. Investigations were conducted in 80 cases and practical recommendations were made to address the identified vulnerabilities, while the remaining 188 cases were resolved independently by the website owners. Security problems in cyberspace are caused by managing content that contains security errors in the code, working with outdated versions, ease of access passwords, templates downloaded from unsafe sources, managing websites on computers infected with viruses.

Monitoring of the national segment of the Internet has identified more than 130,000 cybersecurity threats. Of these, 106,508 cases belong to hosts who have become participants in botnet networks. 13,882 cases are related to blocking of blacklisted IP addresses by various services due to spam email or password violation. 8,457 cases are related to the use of the TFTP (Trivial File Transfer Protocol) protocol and appropriate ports , which can lead to the download of third-party content due to the lack of authentication mechanisms. 2 114 cases are related to the use of the weak protocol RDP (Remote Desktop Protocol). 1042 cases are related to the lack of authentication mechanism in software and database management systems, as well as expired or invalid signature SSL-certificates.

These analyzes once again confirm the urgency of the issue of cybersecurity, as software vulnerabilities can cause an intruder to access an information system or website, as well as remote access to files and data, leaking personal data of citizens. Cybersecurity measures prevent such cases.

The Action Strategy on the five priority areas of development of the Republic of Uzbekistan in 2017-2021 in the " Year of Science, Enlightenment and Digital Economy", the National Cyber Security Strategy for 2020-2023 and the draft law "On Cyber Security" were developed.

The legal strengthening of cybersecurity standards is a necessary and appropriate measure. The digital world has not yet been able to clearly define its status legally. In this regard, new types and forms of threats are emerging, which need to be reflected in the legislation. The development of a national cybersecurity strategy will regulate activities in the field of combating crime in the national cyberspace. After all, the harm and risk of crime in the virtual world is no less than in the real world.

Also, according to the National Cyber Security Strategy for 2020-2023, a unified system of cyber security and a legal framework in the field of protection of critical infrastructure from cyber-attacks have been formed.

The Law on Cyber Security is expected to protect the information and communication technology system from modern cyber threats, introduce modern cyber security mechanisms for different levels of systems, define the rights and obligations of government agencies, enterprises and organizations in this area, and coordinate their activities. Indeed, there was a need to unify the normative and legal documents in this area.

At the heart of all the reforms being carried out in our country is the goal of creating conveniences for our people. Particular emphasis on cybersecurity has led to the reliable and secure use of digital capabilities.

In our country, special attention is paid to the training of personnel who have mastered modern programming technologies. In particular, the project "One Million Programmers" is being implemented for this purpose.

The importance of this project is explained by the fact that digitalization is a criterion of economic development, integration into the world community, the main condition for the integrated development of all areas. In today's world, there is a high demand for programmers who can implement digitalization, mobility, artificial intelligence. This is because the infrastructure that provides the digital economy, and the large amount of investment in ICT, does not justify itself without programmers who can effectively use electronic capabilities.

Trainings on the project aimed at launching the digital economy and training one million programmers to ensure its effective operation are currently being conducted through the educational portal uzbekcoders.uz. Video lessons are provided with Uzbek subtitles. Anyone can register and take online classes. Classes are free of charge remotely.

In the first phase of the project, an advertising campaign was conducted to introduce the project to the population and promote lessons that will help them acquire digital skills. At the initial stage of the "One Million Programmers" project, more than 62,000 students were covered, and 5,400 of them were awarded certificates. The project is included in the free services of the educational portal ZIYONET, mobile operator UZMOBILE and Internet providers UZONLINE. In the framework of this project, training in programming skills is being introduced in digital technology training centers.

The digital economy [6] is not any other economy that has to be created from scratch. This means moving existing economies to a new system by creating new technologies, platforms and business models and introducing them into daily life.

Symptoms:

- high level of automation;
- electronic document exchange;
- electronic integration of accounting and management systems;
- electronic databases;
- availability of CRM (customer interaction system);
- corporate networks.

Conveniences:

1. Costs for payments are reduced (e.g. travel to the bank and other resources are saved).
2. More and more information about goods and services will be obtained.

3. The opportunities for goods and services in the digital world to enter the world market are great.

4. Goods and services will be rapidly improved due to the rapid acquisition of feedback (consumer opinion).

5. Faster, better quality, more convenient.

Conclusions and suggestions

Taking into account the above, the theoretical foundations of regulation of the digital economy [6], its economic nature and development issues are highlighted. In the development of the digital economy, it is necessary to pay special attention to the application and use of digital technologies, their availability and quality, preparatory stages and increasing the various levels of development.

The emergence and spread of information and communication technologies (ICT) has had such an impact on the global economy that a new phenomenon has emerged - the digital economy. Under the influence of information and communication technologies, the way of life of people began to change, the relations between users changed - it became possible to establish communication between people in different geographical regions, spheres of activity, etc. This is the rapid growth of information communication, which is the basis of the digital economy. The impact of digital technologies is felt both globally and locally. The digital economy is a rapidly growing part of the global economy as a combination of new productions. New technologies have a transformative effect on some aspects of the activities of well-established business entities, which mainly consists of replacing functional mechanisms - communication tools or industrial machines with digital or digital mechanisms, as well as their further modernization.

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REVERSIBLE MEDIUM FOR RECORDING AND STORING INFORMATION BASED ON VANADIUM DIOXIDE V_2O_5

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Abstract. *X-ray diffraction analysis of materials is a standard method for phase identification and characterization of polycrystalline materials [1]. Experimentally, various peaks were detected in the X-ray phase analysis (XRD) spectra of vanadium penta oxide V_2O_5. Based on the data (XRD) of sample of vanadium penta oxide V_2O_5 obtained for samples with different modes of powder production, Miller indices and lattice parameters were determined. The experimental data obtained are in good agreement with the data obtained by other methods.*

Keywords: *vanadium penta oxide, powder, wide-gap semiconductor, Miller indices, microstructure.*

Introduction

In this work, the powder X-ray phase analysis method was used to study the structure, composition and properties of the raw material of a sample of vanadium pentoxide obtained under various conditions. Mineralogical [1] and phase compositions [4] were studied with its help. The study of the physicochemical properties of vanadium oxides is of considerable interest from the point of view of micro and nanoelectronics. In particular, a sharp and reversible change in the physical properties of vanadium dioxide during the metal–semiconductor phase transition in combination with interference phenomena in thin films makes it possible to use this material as a reversible medium for recording and storing optical information, controlled mirrors with variable reflection, visualizers and detectors of IR and microwave radiation and other devices [1]. In addition, [2] reports on the production of highly sensitive and effective bolometers based on vanadium oxides — both V2O5 and higher oxide (V2O5), as well as films representing a mixture of VO2–V2O5 phases. In the latter case, the most successful combination of optical and electrical properties of the material can be achieved, which is necessary to optimize the parameters of IR detectors. The amorphous V2O5 also exhibits an electrochromic effect [3], which is used in electrochromic displays, controlled filters and optical media with variable light transmission (”smart windows”) [2]. One of the convenient ways to obtain thin films of metal oxides is electrochemical (anodic) oxidation. Anodic oxide films are, as a rule, structurally disordered, and their stoichiometry (during oxidation of transition metals with variable valence) corresponds to a higher oxide. However, in the case of anodic oxidation of vanadium, the phase composition of the oxide film is identified in some works as V2O5, and in others as VO2 or a mixture of V2O5 with lower oxides (see, for example, [3] and references there). Preliminary results were reported in [4] showing that the phase composition of vanadium anode oxide can be controlled by the choice of appropriate oxidation modes and conditions (electrolyte composition, anode current density, anodizing time), i.e. oxygen stoichiometry of the oxide film can be varied from VO2 to V2O5.

Research methodology

Powder X—ray diffraction is a method of studying the structural characteristics of a material using X-ray diffraction (X-ray diffraction analysis) on a powder or polycrystalline sample

of the material under study. Also called the powder method. The result of the study is the dependence of the scattered radiation intensity on the scattering angle.

The corresponding device is called a powder diffractometer. The advantage of the method is that the debaegram for each substance is unique and allows you to determine the substance even when its structure is not known. The X-ray phase analysis method was used to study the structure, composition, properties of raw materials and firing products. Mineralogical and phase compositions were studied with its help [5]. A monochromatic beam of X-ray radiation is directed to a sample of the test material, ground into powder. On a photographic film rolled up by a cylinder around the sample, the image (debaegram) is obtained in the form of rings. The distance between the lines of the same ring on the debaegram allows you to find the Bragg angles of reflection. Then, using the Bragg–Wolfe formula 2d sinΘ=nλ, we can obtain the ratio d/n of the distance between the reflecting planes to the order of reflection.

X-ray analysis allows you to solve the following tasks: Determination of the qualitative composition of the sample, semi-quantitative determination of the components of the sample, determination of the crystal structure of the substance. As well as precision determination of the unit cell parameters, determination of the location of atoms in the unit cell (full profile analysis — Rietveld method), determination of the size of crystallites (coherent scattering region) of a polycrystalline sample. Study of texture in polycrystalline materials. In addition, the study of the phase composition of the substance and the study of state diagrams, the estimation of the size of crystals in the sample, the precise determination of lattice constants, the coefficient of thermal expansion, the analysis of minerals. Fig.1. shows a device - a powder diffractometer.

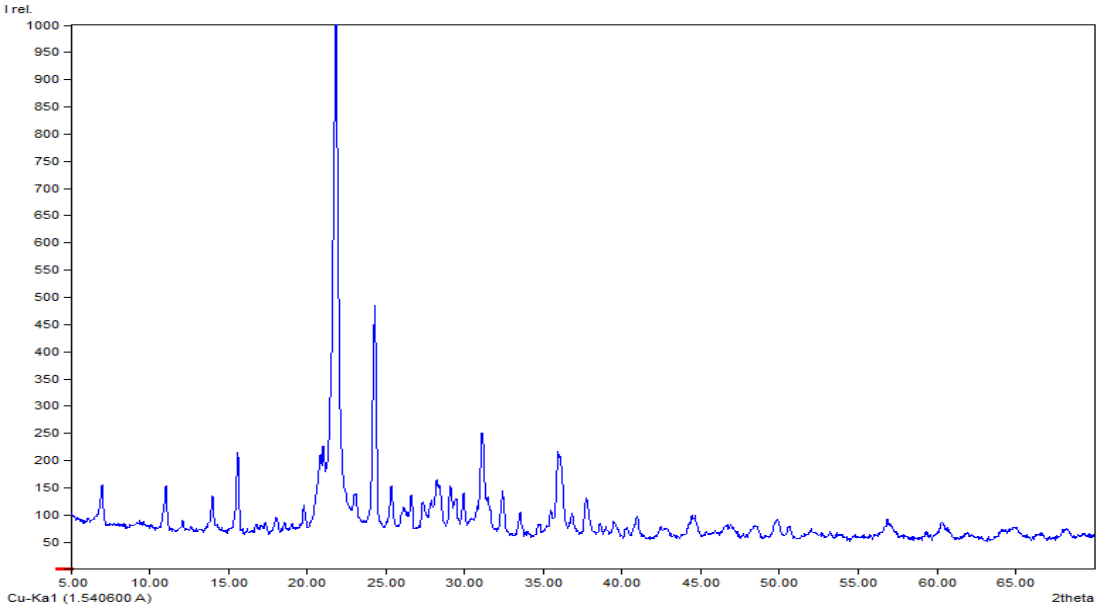
Fig.1.

Powder X-ray diffractometry. XRD-6100. Main results and their discussion

This paper presents the results of a study of the optical properties of vanadium pentoxide. The studied samples were obtained by anodic oxidation of vacuum-sprayed layers of metallic vanadium on quartz, glass and citall substrates. Two different oxidation modes were used [4] and, accordingly, two types of samples were obtained: practically stoichiometric VO2 (type I) and films with an increased content of phase V2O5 (type II). Measurements of transmission T and reflection R were carried out by the spectrophotometric method in the range λ from 300 to 2000 nm.

Fig. 2.

Diffractogram of a sample of vanadium pentoxide V2O5.



To study structural changes in the electrochromic effect, samples of vanadium pentoxide films obtained by sol-gel method on a glass substrate were radiographed in symmetrical geometry for reflection on an XRD-6100 diffractometer in automatic mode. Cu radiation (λ = 1.540600 Å) was used, monochromatized by a pyrolytic graphite crystal mounted in reflected rays. The survey was carried out in the range of scattering angles from 2 to 80 degrees. The shooting step is 0.5° the shooting time of each point is 25 seconds. The X-ray power was 2 kW. The calculation of the interlayer distance was carried out using the Wolf-Bragg formula, the scattering angle 2 was determined on the basis of the obtained radiographs. The results were analyzed using a database [6]. The penetration depth of Cu-Ka radiation is about 1 mm (980 microns) for light elements (carbon), and several microns for heavy elements (Ag, W). For most inorganic substances, simple compounds, Cu-Ka- is tens of microns (microns). Using this method, we determined the dhkl interplane distance and Miller indices (hkl). For a sample of vanadium pentoxide- V2O5 measured by X-ray diffraction analysis using the “Search and Match” software technique [6], the degree of crystallinity and amorphousness was evaluated. The amorphous phase for vanadium pentoxide V2O5 is - 77.36%, the crystalline phase is only -22.64%. This indicates that our film is mostly amorphous.

Conclusions

To study structural changes in the electrochromic effect, samples of vanadium pentoxide films obtained by the sol-gel method on a glass substrate were radiographed in symmetrical geometry for reflection on an XRD-6100 diffractometer in automatic mode. Cu radiation (λ = 1.540600 Å) was used, monochromatized by a pyrolytic graphite crystal mounted in reflected rays. Using this method, we determined the dhkl interplanar distance and Miller indices (hkl). For a sample of vanadium pentoxide- V2O5 measured by X-ray diffraction analysis using the “Search and Match” software technique [6], an assessment of the degree of crystallinity and amorphousness was carried out. The amorphous phase for vanadium pentoxide V2O5 is - 77.36%, the crystalline phase is only -22.64%. This indicates that our film is mostly amorphous.

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NEW GENERATION OF BIOREACTORS: THE BAREHOLE BIOREACTOR

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Abstract. *Biogas reactors are a huge technical and technological installation that operates mainly as a result of the solar heat on earth and serves to produce biogas, but in areas where air temperatures are meant to vary (although in Uzbekistan, where there are four seasons), sunlight cannot heat the bioreactor enough during 12 months. Therefore, for the purpose of producing and storing biogas, the drilling hole's diameter is as wide as possible (1600-2000 mm), and the depth of the drilling hole is calculated normally (based on geothermic conditions) for the formation of biogas We drill wells of up to 1700 to 2500 m and strengthen the side walls through special preservation and build a biogas storage and harvesting reactor.The geothermal gradient of the underground does not depend on the sharp change in weather on earth based on its depth, so enough temperatures (+30º, +40º) to produce biogas are provided by selecting the required depth for biomass.The difference and advantage of technology over other types of bioreactors is: the length of service life of the wells produced, the low human factor in the course of the process, and the low likelihood of problems resulting from external influences in the environment, as well as one of the most positive indicators of it, is that the process of biogas separation does not slow down due to the likelihood of cooling air.*

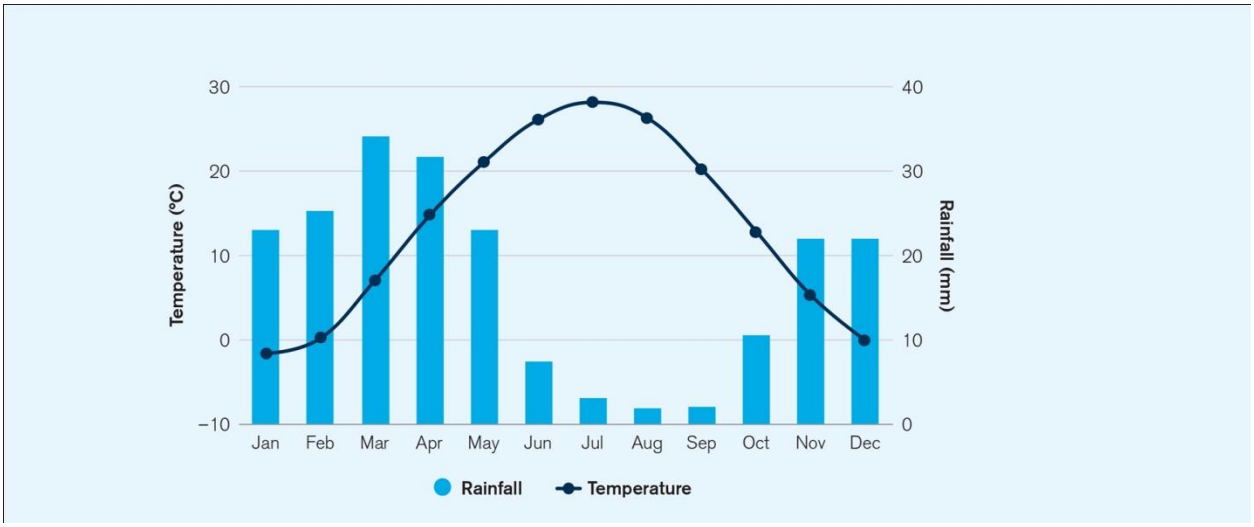
Keywords: *biomass, temperature, biogass, biodigester, well, anaerobic decomposition, bactery, mesophil, pathogen microorganisms, hydrothermal gradient, biofuel,* groundwater, biofertilizer.

INTRODUCTION

It is known that the demand for biofugradation is now increasing day by day.It is noteworthy that global biogas production reached 59 billion m^3 between 2000 and 2014 [1]. Naturally, this indicator demonstrates how high the demand for renewable energy is. Currently, the main working principle of large bioreactors in operation is based on natural heat energy and sunlight therefore, in countries with warm climate, the efficiency indicator is higher. But in many countries with temperate temperatures, the efficiency indicator of this technology is relatively low.However, the average daily temperature in Uzbekistan for June 1991-2020 was +27.2º and in some cities (Kharshi, Termiz) was +35º C, while between December and February of winter the temperature was -1º and -3°C. (Figure 1) [2].

Figure 1.

(1991-2020) Average monthly temperature and precipitation indicators for Uzbekistan.



In the case of the Republic of Uzbekistan, if we consider 4-5 months of summer and spring to be hot (conditions favorable for bioreactors), the efficiency of biogas reactors will decrease as a result of moderate and cold air for the remaining 7-8 months.It is noteworthy that the anaerobic breakdown process in the bioreactor is divided into three types of thermal stages: psychrophilic (below 25ºC), mesophilic (+25ºC , + 45ºC), and thermophilic (+45ºC, + 70ºC) (Table 1) [3].

Table 1.

Influencers of thermal phases on biogas separation times.

Thermal stage	Process temperatures	Minimum retention time
psychrophilic	< 20 °C	70 to 80 days
mesophilic	30 to 42 °C	30 to 40 days
thermophilic	43 to 55 °C	15 to 20 days

It is known from the above table that if the effect of heat on the bioreactor decreases, the process of biogas release also decreases respectively, and even the production of biogas due to the absolute stoppage of the activity of biofermenting bacteria caused by cold weather also becomes zero.

In 1875, in the experience of Russian scientist Popov, an increase in temperature did not affect the biogas structure, accelerating its separation process. [4] In the experiment, it was found that temperature is a big factor for biogas. Most methane-producing bacteria of this type achieve optimal growth in the mesophilic temperature range from +37º to +42º. Biogas plants operating in the mesophilic range are the most common in practice, because in this temperature range high gas yields and good process stability are achieved [5].

Anaerobic microbes in the bioreactor generally break down organic matter in order to obtain energy and nutrients for growth and reproduction, and due to this process, biogas is released (which is mainly composed of CH4-methane) [6].For almost all types of biogas installations, the heat source is of great importance, and the effectiveness of solar heat is not always as beneficial as noted above because in some regions seasonal temperature cooling takes a lot of time (up to 5-8 months in Central Asia), resulting in a decrease in the activity of biogas-producing mesophiles (bacteria), and the process also slows down. For this reason, we need to choose and improve suitable conditions for bioreactors in such a way that we need to control not only temperature, but also pressure changes in the process.

Currently, biofugradation using public methods is carried out using the following processes:the creation of a bioreactor, the placement of biomass in it, and, of course, the

temperature, the emptyim, and the biomass that break down biomass (Table 2). However, in rural farms, bioreactor and biogas systems also include mechanical and biological processes to work together or in a whole system [7].

Table 2.

Factors that contribute to the formation of biogas in bioreactors using a common method.

HUMAN'S FACTOR	NATURAL FACTOR
Making biodigester	Temperature
Placing biomass	Preasure
	Bactery

However, it is also true that through human influences, pressure, temperature, and even bakeries are possible to control, and in this case the process is an intellectual factor, not a tablet, but we should not forget the golden rule that "as human factor increases, efficiency decreases." That is, in order to increase the biogas process, we need to raise the temperature in various unnatural ways, which leads to a violation of the efficiency balance.

Taking into account all the above issues and problems, we introduce unusual technology to create bioreactors of an unusual style for generating and storing biogas, maintaining a moderate balance of natural temperature for biogas and serving for a longer period of time than conventional bioreactors: on-site hydrothermal, geologic and after exploring the hydrological environment, drilling boreholes suitable for use as bioreactors in the earth's crust and using them as bioreactors is the basis of the technology

METHODOLOGY

The technology of using it as biogas reactors by producing a known-sized drilling hole in the earth's surface includes three main stages:

1. Choosing an environment acceptable by studying and researching geothermal, geological, and hydrological conditions.

2. In the selected place, form a drilling hole with a diameter of an average of 1500-2000 mm and a depth of 1.7-2.5 km.

3. Fill a certain part of the harvested environment with biomass and hide the drilling hole for a certain period of time.

1st stage.

In order to create underground bioreactors in a convenient and necessary environment, the first thing to be done is to choose the location of the surface of the area in a geographical and hydrologically favorable relief and thereby create a situation that does not harm the objects of the population. In general, the lithosphere of the earth is quite favorable, which allows to study up to 11-15 km with boreholes [8]. After choosing a suitable terrain, the following are determined by conducting a small borehole for analysis: the amount of ground water (moisture), the level of impact of technology on underground water, the increase of the internal heat of the earth with increasing depth, namely the indicators of the geothermal gradient and geological conditions are also studied. After the research results return to a positive indicator, the second main stage will be passed.

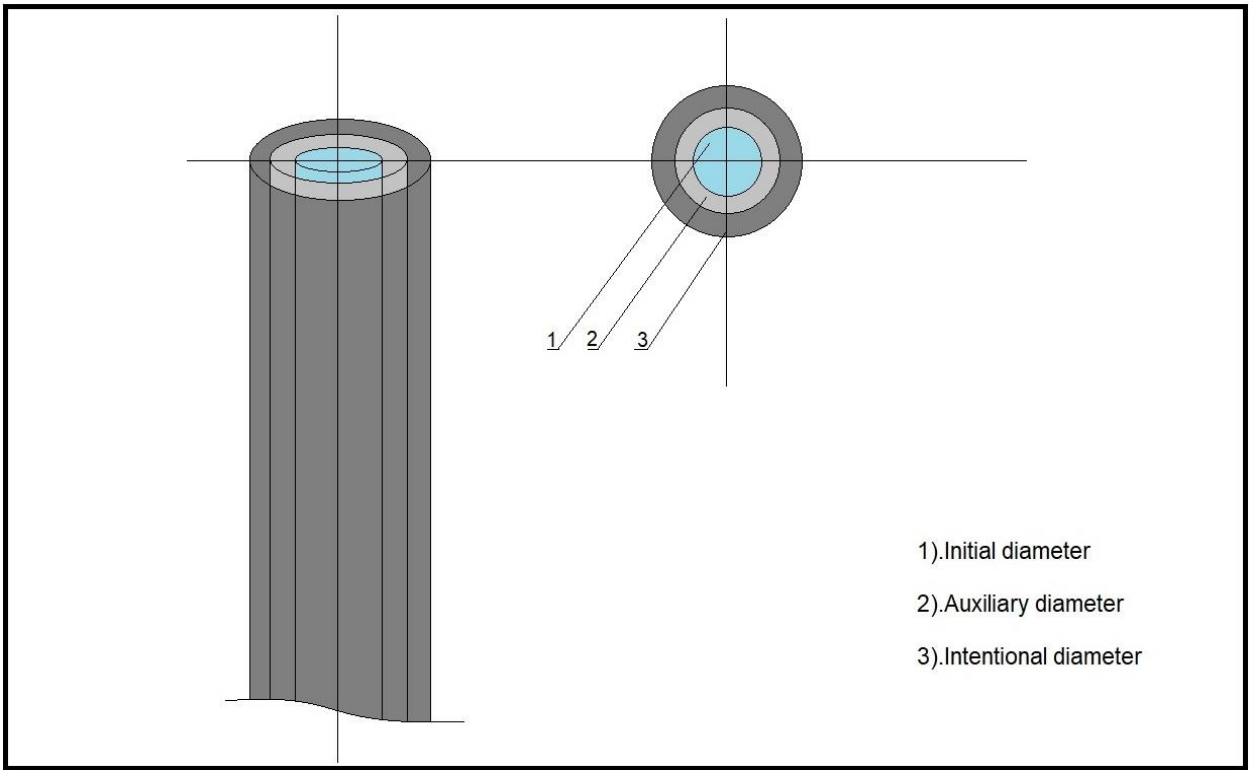
2nd stage.

The average increase in temperature in the lithosphere by +25^{o}, +30^{o} degrees per 1 km is called geothermal gradient [9], and the geothermal stage is below the constant temperature region

indicates the depth corresponding to an increase in temperature by 1 degree [10]. Taking into account this geothermal gradient, a normal depth should be chosen for the decomposition of biomass components and the release of biogas through it. After carrying out studies based on the above information, a well with a small diameter (120 mm) will be drilled with an average length of 1.7-2 km relying on the geothermal conditions, the main reason for drilling a small-diameter well is to achieve the target (for example, 1700 mm) diameter on the drilling well, namely it is very difficult to create or work with a 1700 mm diameter well-drilling device in just one step and due to high labor cost of large-sized drilling tools, the required size is achieved by increasing the drilling diameter step-by-step in the process.

Figure 2.

Step-by-step drilling to achieve target size.



Considering the location of that environment, the different distribution of underground heat along its layers, it can be determined the depth of the well differently, for example, the geothermal gradient in the Baltic Shield (Kola and Gravberg) is very low and returned to +16^{o} C/km, while in the bathalites of South West England, this indicator was a very high +35^{o}C. [10]. In addition, the world's deepest ultrawell dug by the USSR (Kazlovsky-1984) was 12226 m in depth, and the main reason for the suspension of drilling in 1995 was the sharp rise in geothermal temperature (above than +200^{o}) [11]. On average, the temperature of the normal area at a depth of 1.7-2 km can be defined as +40^{o}, +50^{o}, which is a very favorable environment for the decomposition of biomass and the activity of mesophiles.

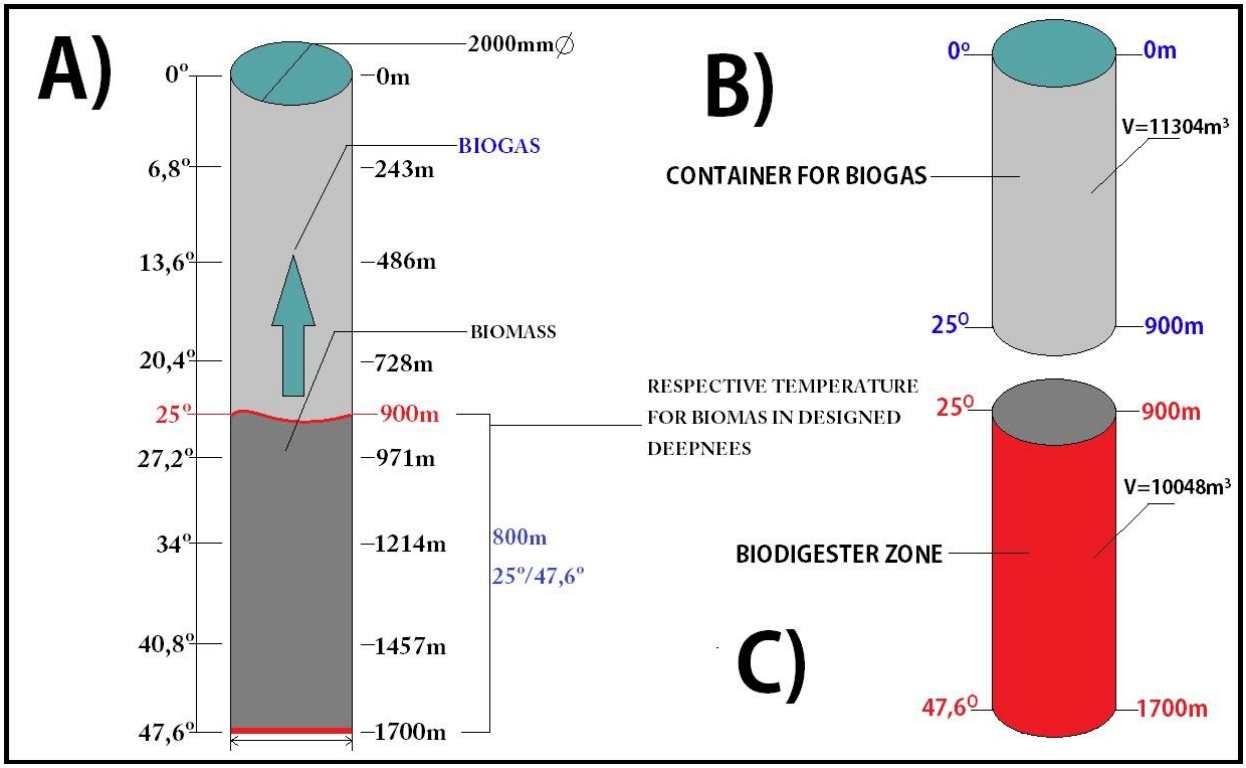
3rd stage.

The main part of the last stage is to fill the known amount of the well with biomass, based on the exact values of the temperature in the created well. The initial doing that should be done in this process is to measure the temperature and pressure in different parts of the well. Of course, after all accounting work is carried out through the initial well of a small diameter, auxiliary and main wells are conducted, biomass is placed based on the pressure exerted on the bottom of the

borehole with an average depth of 2000 meters and a diameter of 1.7 meters, taken as an example above, and the temperature at different points. Due to the temperature is various at different points of the depth, the biomass is placed in the interval from the central point where the average temperature of the well returns +25ºC to the bottom where the average temperature returns +45 ºC, +47ºC (Figure 3).

Figure 3.

Distinctions of the volume and temperature at depth as an alternative for biomass. (B-respectively, the volume of the reserve space for biogas. C-the part of the well used as a bioreactor.)



RESULT

The lower part of the well serves as a bioreactor, and its upper part serves as a storage block for collecting the produced biogas (Fig. 3 situations B and C.). After the biomass is placed in the specified part of the well, the upper part (lid) of the well is closed, and the biogas produced as a result of biomass decomposition is collected in the upper reserve section of the well. After the main mechanical processes (selecting a favorable environment for the constructing of a well, creating a well based on its geological, hydrological and geothermal conditions, analyzing the hydrothermal gradient of the created environment and placing biomass in a certain part of it), biogas is released in a natural stage.

If we take local and industrial waste as the main composition of biomass for process, we can reduce environmental pollution as a result. The main composition of local waste is depicted in Table , and the amount of biogas released from these substances and methane storage properties are also shown[12]. (For instance Cow dung can be, and is, directly burnt as fuel after drying it. But the conversion efficiency to heat is only 8%. Much better (25%) energy efficiency is achieved in the conversion of biogas to electricity. The most energy-efficient utilization of cow dung,

however, is as heat via combustion of biogas (efficiency 55%) (Table 4) [13].

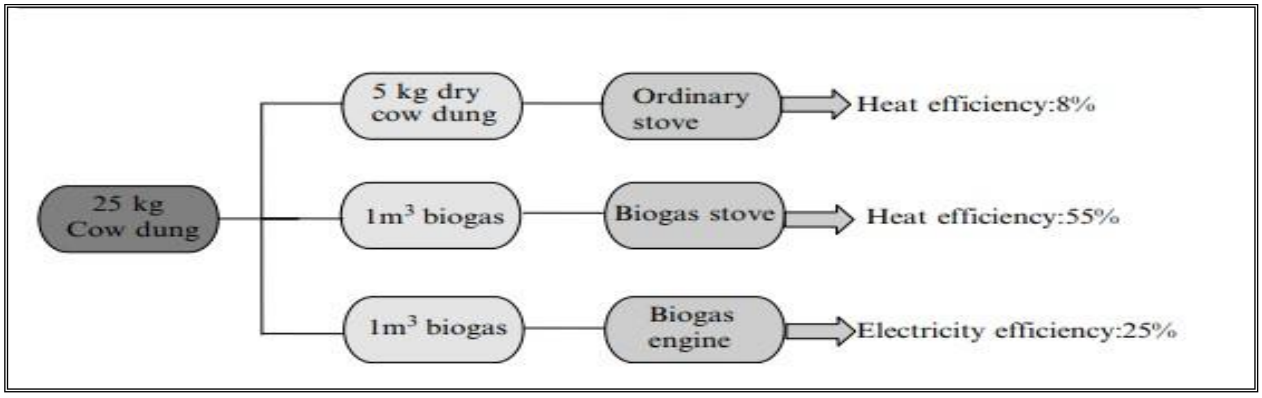
Table 3.

Indicators of methane storage and release of organic waste.

Organic substance (garbage)	The amount of gas released from 1 kg of product (m^3)	Methane storage property (%)
Fertilizer for domestic animals	0,4-0,5	64-65 %
Vegetable waste	0,35-0,4	55-65 %
Plants	0,33-0,4	60 %
Waste water	0,3-0,7	70 %

Table 4.

Efficiency of energy conversion from cattle dung



According to the data, on average, 1 kilogram of organic matter is separated 0.18 kg of methane, 0.32 kilograms of carbonic anhydrite and 0.3 kilograms of other non-degradable residues when 70% biological decomposition occurs [12, 14]. Preliminary calculations show that 350 m^3 of gas (methane, hydrogen) can be obtained from 1 ton of natural (plants) biomass mixed with waste[12]. The volume of the bioreactor portion of the borehole shown in Figure 5(C) above is approximately 1050 m^3, and this medium is composed of 30% wastewater, 30% vegetable and plant waste, 20% animal manure, and 20% other is filled with various types of waste, and biomass with a density of about 1300 kg/m^3 is formed. As a result, the total weight of biomass in the specified part of the well (1300kg/m^3 * 1050m^3) is 1 365 000 kg. Taking into account the conversion of 1t of natural (plants) biomass into 350 m^3 of gas, it is possible to obtain 477 750 m^3 of biogas on average from 1 365 000 kg of biomass. These indicators constitute only one cycle of bioreactor use, and we can further increase the result by adding additional well bioreactors to the process.

DISCUSSION AND PROBLEMS

Although the main advantages of well bioreactors are fundamentally different from conventional bioreactors, there are main considerations and controversial points that arise in the process of implementing this technology, whereas in the process of creating a well bioreactor, increasing the depth is not a problem, the process of increasing its diameter to 2 meters is the main sensitive point. In order to solve this problem, we can achieve the result with the aid of small-sized boreholes before directly drilling a 2 meter diameter borehole. In addition, another main controversial issue is the problems of installing additional structures for mixing the biomass placed at the bottom of the well, the depth of the well is inconvenient for the special mixing devices that need to be installed, but in this case, based on the natural conditions, we can emphasize that one of the solutions to the problem is this environment itself, ie, the main purpose of mixing biomass

is accelerating the process, and another advantage is to prevent the formation of sediment. In order to speed up the process the ambient temperature that higher than conventional bioreactors can be effective instead of mixers. Another drawback of the technology that should be highlighted is the difficulty in obtaining the resulting sediment for use as a biofertilizer, a very small part of them may accumulate at the bottom of the well during the years and cause its volume to decrease.

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THE ROLE OF MATHEMATICS IN THE FORMATION OF DESIGN COMPETENCE OF FUTURE ARCHITECTS AND BUILDING ENGINEERS

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Abstract. *The foundational principles of design have been built on mathematics since the beginning of time. Based on Euclid's classical geometry, mathematics was one of the branches of architecture in ancient Greece. At this time, graduates of the university's construction and architecture disciplines cannot possibly be expected to have advanced mathematical proficiency. We work on professional-focused assignments and projects with students to help future architects and civil engineers strengthen their mathematical proficiency. Mathematical foundations are required for all design solutions in architecture and construction. Therefore, any architect or civil engineer should be familiar with the theoretical underpinnings of mathematics, have the ability to create mathematical models, and be able to use mathematical-statistical approaches to process experimental data in order to address real-world problems.*

Keywords: *architect, builder-engineer, mathematical competence, modeling, model, project, design, practical matter.*

1. Introduction

In ancient times, mathematics was used in the construction of complex objects of architecture. Such a connection between mathematics and architecture and urban planning lasted from antiquity to the eighteenth century. With the establishment of the first school of engineering in Paris in 1747, the science of engineering moved away from architecture, and mathematics and architecture began to develop in parallel. With the development of computer technology, mathematics and its methods have become more firmly entrenched in architecture and urban planning. The use of modern mathematical apparatus in solving several problems in the design and analysis of structures, buildings, and other structures is widespread. These practical mathematical issues include, for example, the determination of the strength of structures, structural optimization, stability, and modes of managing their performance.

2. Relevance of the topic

The study of mathematics in construction majors at the Technical University is very important because mathematics is the basis for the study of professional disciplines. We became familiar with the writings of O. Boyev and O. Imas [1] and R. M. Zainiev [2], who are of the opinion that the University should provide top-notch instruction in fundamental mathematics. In our opinion, teaching mathematics to students majoring in construction at universities should focus on helping them learn the fundamentals of mathematics, develop the mathematical skills necessary to become a future architect or civil engineer, and learn how to use math to solve real-world problems. Since it is impossible to teach students how to solve every type of practical problem they might encounter in their future professional endeavors in the time allotted to mathematics, it is also crucial to foster a culture of unconventional logical thinking and a creative approach to

work-related problems. Developing the capacity to do effective searches in text, reference, and online sources is another crucial factor. Consequently, we concentrate on three topics when instructing mathematics in building specialties at a technical university: 1) enhancing the application of mathematical tasks, 2) fostering logical and unconventional thinking, and 3) encouraging innovation in project execution.

Graduates of the Technical University in the field of construction must be able to formulate a mathematical issue, choose the best mathematical approach and algorithm to solve it, and, if necessary, solve the problem using digital techniques utilizing a computer. draw applications-based findings from research using mathematical techniques.

3. Theoretical part.

A competent architect and civil engineer should know how to calculate the A capable architect and civil engineer should be able to calculate the loads that will impact a building's operation, ensure structural stability, choose the best building materials, and design engineering systems, infrastructure, road crossings, etc. You must understand progression in order to determine the ratio of rhythmic rows and to make the projected object expressive and well-fitted. The knowledge of linear algebra, analytical geometry, mathematical analysis, probability theory, mathematical statistics, mathematical modeling, numerical methods, and other topics is also necessary for future architects and construction engineers.

Higher education mathematics students shouldn't feel cut off from the actual world or their potential careers. As a result, when teaching students about any area of mathematics, we strive to demonstrate them not just the fundamentals but also the practical application of the subject. Solving real-world issues is essentially how this is accomplished.

Here are a few real-world examples of "spinning bodies"-related issues.

1) A cone-shaped pile of wet sand is set up at the construction site. The stack has the following measurements: the slope length is 10 m, and the foundation's circumference is 45 m. Use a 15% discount on moisture to determine the amount of undesirable sand.

2) The gypsum sculpture is shaped like a truncated cone, with a maker that is 20 cm tall and a base that is 35 cm in diameter. How much paint would you need to paint 10 of these gypsum figures on both sides if you need 200 g of paint for every square meter? (The gypsum wall thickness is not taken into consideration.).

For example, when studying the topic of "Integral Computing", you can consider the following tasks:

1) Determine the location of the center of gravity for the figure whose coordinate axes are in the I quarter and are circumscribed by the arcs x = 3cost and y = 4sint;

2) determine a three-axis ellipsoid's volume;

3) A concrete was lifted hemisphere from the river's existing bed using a crane. What work is done if the hemisphere is between 500 and 250 mm in size? Concrete has a density of 2000 kg/m^3, while water has a density of 1000 kg/m^3.

Any construction-related student should be able to design a mathematical model using the relevant information. After instance, many organizational, planning, and construction management tasks are defined by a wide range of potential outcomes, frequently accompanied by significant uncertainty and dynamic processes. It's important to weigh your options and choose the best criteria when creating a construction plan for any construction site. An indicator that is specified, a standard, or a gauge of conformance is called a criteria.

Modeling in planning and construction management, along with the search for the optimal organizational structures, are utilized for the initial examination of the object.

The process of modeling involves building a model that duplicates the key characteristics of the original, learning from the process, connecting pre-existing data about the model with actual data about the item, and experimentally verifying the results. Building system analysis, optimization, and synthesis all benefit from modeling. According to the paradigm, we comprehend an abstract, idealized, and logical-visual representation of the thing under study (a process), which is simpler to learn than the process itself [6].

Through modeling, a researcher can determine key characteristics of an actual thing, facilitating the performance of experiments. The researcher will most likely examine the outcomes of the computations and tests performed on the model with a computer. In other words, since a model is a study tool, it should precisely represent the characteristics of the actual item.

Three steps are involved in the mathematical modeling process: formalization, problem solving within the model, and interpretation. We focus particularly on the formalization and interpretation stages when instructing students in mathematical modeling since these two stages pose the biggest challenges to learners [6].

Students compare actual items and their mathematical models in math classes. For instance, a comparison to the linear function $y = kx + b$ is made in the section on the study of analytical geometry.

a) velocity and time in a plane accelerating motion $v = v_0 + at$;

b) The relationship between the gas's volume and temperature at constant pressure is $V = V_0(1 + at)$;

c) constant volume pressure and temperature of the gas $P = P_0(1 + bt)$.

Students are urged to continue this comparison at home by providing illustrations from architecture or construction.

Subject problems are a crucial teaching tool for students learning about mathematical modeling. In order to put plot difficulties into mathematical language, we use them in the study of several branches of mathematics [7].

Consider one of the tasks.

In the city, there are two concrete plants. One of them will create 300 tons of concrete daily, and the other 450 tons will be distributed to five construction sites from these factories. Each day, 120 tons of concrete will be delivered to the first section, 200 tons to the second, 150 tons to the third, 160 tons to the fourth, and 120 tons to the fifth. It is known how much it will cost to carry one ton of concrete from each factory to each location. Concrete must be transported from factories to building sites in an organized manner that keeps the overall cost of transportation to a minimum.

Let's explain the issue in mathematical terms. If the price of moving one ton of concrete from plant I to the j-construction site through C_{ij} is established, and through x_{ij} - the quantity of tons of concrete that must be moved from plant I to the construction site (these are the necessary dimensions), the price of all transport is determined using the following function.

$$f = \sum_{i=1}^{2} \sum_{j=1}^{5} C_{ij} x_{ij} \qquad (1)$$

$$\sum_{j=1}^{5} x_{1j} = 300, \quad \sum_{j=1}^{5} x_{2j} = 450, \quad \sum_{i=1}^{2} x_{i1} = 120, \quad \sum_{i=1}^{2} x_{i2} = 200, \quad \sum_{i=1}^{2} x_{i3} = 150, \quad \sum_{i=1}^{2} x_{i4} = 160,$$

$$\sum_{i=1}^{2} x_{i5} = 120 \qquad (2)$$

In mathematical language, the problem is structured as follows: If its arguments satisfy the system of equations (2), find the minimum function (1).

Finding the extremum of a given function with few arguments is necessary within the created mathematical model. We employ mathematical programming to resolve the issue.

Probability theory and mathematical statistics are two key areas of mathematics for aspiring architects and civil engineers. Numerous issues with practical significance can be given in accordance with probability theory.

Students are given both plot and table-creation homework to demonstrate the practical focus of the mathematics curriculum.

Creating a table at home on topics like "The Importance of Mathematics in Architecture" (for future architects) or "Mathematics and the Relationship of Construction" (for future civil engineers) has been assigned to students in one of the first math sessions, for instance. Students can compare the definitions of common terminology like symmetry, ratio, point, line, geometric figure, geometric object, space, curve, surface, volume, and others with those of basic mathematical and architectural concepts in this table. The terms used in the table were chosen to show how well their definitions align with those of mathematics and architecture (construction).

Instead, students are given homework to build a table called "Classification of Mathematical Methods Applied in Modern Architecture (Construction)" in one of the university's final math classes. Students realize that mathematical techniques are necessary in architectural design. The principles utilized to build a table are as follows:

1) the choice of methods used in the creation of mathematical models;

2) formation of design tasks for three-dimensional architecture and urban planning;

3) establish connections between tasks and methods.

Students should participate in project activities as they learn mathematics in order to enhance their creative thinking skills and their capacity to look for missing knowledge in a variety of sources. This will help them demonstrate the practical application of mathematics. They work on multidisciplinary integration projects and the bulk of the upper mathematics course. The project's initial focus is on "The Golden Section in Architecture and Life." The mathematical formula known as the "golden section" determines the proportions of architectural structures. The Pearson statistical criterion was employed in the analysis of the experimental work's findings to ascertain the causes of the shift in the pupils' degree of mathematical proficiency. The zero statistical hypotheses predict that there will be no difference in the mathematical proficiency levels of children across all categories.

4. Results of experimental work.

The professional competency of university graduates includes mathematical proficiency. Therefore, in order to improve the pupils' mathematical abilities, we carried out an experimental study. One group of students in the field of "Architecture" and two groups in the field of "Construction" were chosen to participate in the experiment. In "Building and Structure Construction," the final two groups will receive instruction. These groupings, I, II, and III, are defined. The project started with the formulation of criteria and indicators for the students' level

of progress in their mathematical proficiency [9]. An initial assessment of the pupils' level of mathematical skill growth was done in the mathematics groups. This indicated that pupils' enthusiasm in mathematics, creativity, and project-based learning was low. Mathematics is not viewed as having any relevance to students' future employment.

Group III received instruction in a typical fundamental mathematics course throughout the experiment. Groups I and II participated in project activities, worked on real-world assignments, and received basic mathematical instruction. A revised diagnosis was given at the conclusion of the university's mathematics course. According to the experimental work's findings, more pupils now have average or high levels of mathematical proficiency, and the majority of them are aware of the value of mathematics in their future professional endeavors. The children were quite excited to talk about their project-related activities.

Table 1. Changes in the levels of development of students' mathematical competence as a result of the experiment

Group	Number of students	Period	Level of knowledge			Pearson criterion
			Low	Medium	High	
I	23	Initial	14	7	2	0.13
		Last	2	15	6	10.52
II	24	Initial	14	9	1	0,17
		Last	2	17	5	7,66
III	22	Initial	13	7	2	-
		Last	9	11	3	-

As a result of the experiment, the condition of using professionally focused activities and projects in the process of teaching mathematics in experimental groups I and II is statistically significant for the growth of students' mathematical competence. As a result, a different theory was chosen. As a result, the successful development of mathematical abilities among the builders and architects in the first and second groups under consideration is not a coincidence; rather, it is a result of the use of mathematical preparation tasks, projects, and assignments that are practical and professionally oriented.

5. Conclusion

Any design solutions used in construction and architecture must be supported by mathematics. This means that every architect or civil engineer must understand the theoretical underpinnings of mathematics and be able to develop mathematical models, solve real-world issues, and interpret experimental data using mathematical-statistical techniques. He must, then, possess a strong foundation in mathematics.

The experiment's findings demonstrated that students of architects and builders have higher levels of professional competency when they apply their mathematical skills to practical tasks and carry out practical assignments and projects.

Students participate in project-based learning activities in math classes, have the ability to translate professional assignments into mathematical terms, learn their specialized subjects more quickly, and are better able to adjust to contemporary economic circumstances. They should have a high level of professional competence by the time they graduate from university.

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ANALYSIS OF THE DEVELOPMENT OF SMALL BUSINESS AND PRIVATE ENTREPRENEURSHIP IN THE SAMARKAND REGION

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Abstract. *This article analyzed and studied the cases of small business and private entrepreneurship in the Samarkand region over the past years, and examined the work to be done on the development of small business in the coming years and made appropriate suggestions and recommendations.*

Keywords*: small business, entrepreneurship, Services, Export, import, production, wholesale trade, retail trade, capital, income, employment.*

Favorable conditions created for the development of small business and private entrepreneurship not only in the Samarkand region, but also in the region of our country serve to further strengthen the role of the industry in economic development, employment and income growth of the population, and increase the share of GDP, exports and sectors, and production indicators of industries.

Thanks to the socio-economic reforms carried out in our republic, the implementation of national programs clearly and carefully developed by the head of our country and our government, favorable conditions, opportunities and appropriate benefits created by our state for entrepreneurs, entrepreneurship is developing rapidly in the region. In the future, changes will also occur in the sectors of the economy. This situation also occurs on the basis of the development of small business and private entrepreneurship.

1-table

The share of small business and private entrepreneurship in the Samarkand region

(in % compared to the total volume)

Years	GRP	Industry	Construction	Employment
2015	79,1	56,0	93,2	84,1
2016	80,1	60,1	94,5	84,5
2017	81,5	56,0	91,3	84,5
2018	79,7	57,2	98,5	83,1
2019	74,0	40,6	96,6	82,9
2020	75,0	47,5	86,8	81,9
2021	73,4	42,5	84,5	80,8
2022	63,8	37,7	82,3	79,7

As can be seen from the data of Table 1 Above, the share of small business and private entrepreneurship in the Samarkand region is listed from 2015 to 2022, while the share of small business and private entrepreneurship in GRP in 2015 was 79.1%, as of today it is 63.8% in 2022. As a result of the creation by the state of a large number of regulatory legal conditions for the development of small business and private entrepreneurship in our country, significant work is also being carried out to increase the employment of the population. In terms of population employment, it accounts for 84.1 percent in 2015 and 79.7 percent as of 2022.

Small business and private entrepreneurship, as a sphere of rapid adaptation of the economy to changes, are becoming important in filling the domestic market with consumer goods, expanding new and modern types of services, developing export potential. As a result of the widespread implementation of decisions made in support of small business and private entrepreneurship, the reduction of verification work, the reduction of financial and time costs for doing business, the introduction of a registration notification system, the number of registered and operating small businesses is rapidly increasing, and positive trends are also taking place in their economic indicators.

The small business and the private business sector make up the bulk. The share of the product of private entrepreneurship (property of citizens) in the total volume of products (work, services) created in small business and private entrepreneurship in 2021 is expressed as follows (Table 2).

2-table

The volume of the main indicators of small business and private entrepreneurship in the economic sectors for 2021 in Uzbekistan and the share of small business and private entrepreneurship in the economic sectors

	The size of the main indicators of small business and private entrepreneurship in the sectors of the economy	Share of small business and private entrepreneurship, in %
Industry (billion. sum)	121719,2	27,0
Construction (billion. sum)	77762,0	72,4
Trade (billion. sum)	204787,4	78,2
Services (billion. sum)	144812,7	51,1
Shipping (mln. tons)	678,9	60,7
Passenger traffic (mln. passenger)	5237,6	82,7
Export (mln. USA. D)	3711,2	22,3
Import (mln. USA.D)	12389,0	48,7

Source: based on the data of the State Statistics Committee of the Republic of Uzbekistan (site: www.stat.uz) compiled by the author based on his data.

The total number of small businesses and private businesses registered as of January 1, 2022 was 98886.

This year, 54.9% of the gross regional product was produced by small businesses and private businesses. This figure was 55.5 percent during this period of 2020.

The production of industrial products by small businesses and private businesses increased by 3.7% from the ratio of 2021 to 2020. and 3130.9 billion. sum (55.4% of the industrial production of the region), agricultural production grew by 107.2% and amounted to 4918.9 billion. sum (98.4% of the gross agricultural product).

In the economy of Samarkand region, 61.3% of the total volume of investments in fixed capital was investments made by small businesses and private businesses. 93.5% of construction work fell on the contribution of small businesses and private businesses.

The freight turnover of small businesses and private businesses in automobile transport increased by 109.7%, and regional automobile transport increased by 96.8% of freight turnover, and passenger turnover by 110.8%, making up 82.9% of total passenger turnover.

Retail turnover is 89.6% of the total volume or 5404.1 billion. Sumi (the increase was 116.6 percent) and 58.8 percent of the total volume of paid services to the population, or 1630.1 billion. Sumi (increased by 115.8 percent) corresponds to the contribution of small business entities.

Foreign trade turnover of small businesses and private businesses amounted to 65.5% of the volume of foreign trade turnover of the region. 272.5 million dollars this year. Export of products in the amount of 82.2% of the total volume of exports in US dollars or 403.3 million. Imports of products in the amount of US dollars or 57.6% of total imports were carried out by small businesses and private businesses.

The results of small businesses and private businesses in Samarkand region as an important factor in organizing new jobs, increasing the income and well-being of the population, ensuring the development of the region's economy are becoming significant. In conclusion, we can say that with the development of small businesses and private businesses, we will achieve a direct solution to the task of forming a class of middle owners in our country. Small business and private entrepreneurship become an important area that provides employment for the population and is its main source of income.

Based on the above, the priority tasks that should be carried out in the Samarkand region in 2023 and in the following years in the field of state support and further development of small business and private entrepreneurship in rural areas are as follows:

- To regularly examine and take timely measures to eliminate the problems that may or may hinder the effective activities of small businesses and private businesses in urban and district areas of Samarkand region;
- effective organization of the processes of obtaining accurate information on empty or not effectively used buildings and structures in the region for short periods and their provision to small businesses and private businesses;
- to identify specific features in each area and mobilize all available opportunities based on them in order to create a more favorable environment for small business and private business activities;
- elimination of any bureaucratic obstacles to the organization and implementation of small business and private business activities;
- focusing on the processes of connection of small businesses in the regions to energy, gas, water and sewerage, Heat Supply and other similar engineering and communication networks, as well as applying advanced experience in this regard;

- it is necessary to provide comprehensive support to small businesses and private businesses in the region and make them a solid economic sector that can compete in the domestic and foreign markets, consistently establish the production and provision of quality products and services.

In conclusion, we can say that with the development of small business and private entrepreneurship, we will achieve a direct solution to the task of forming a class of middle owners in our country and in the Samarkand region. Small business and private entrepreneurship become an important area that provides employment for the population and is its main source of income.

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FACTORS AFFECTING THE FINANCIAL ACTIVITY OF STATE-OWNED ENTERPRISES

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Abstract. *The analysis of the capital structure of state enterprises and the factors influencing its capital profitability are analyzed. At the same time, the limit values of own funds and debt funds in relation to total assets and the limit values of leverage indicators of the capital structure were calculated.*

Keywords: *state enterprise, assets, ROE, capital and liabilities, capital structure*

1. Introduction

In the manufacturing sector today, human capital is still essential for most factories to carry out a variety of The main objective of this study is to study and analyze the phenomenon of state-owned enterprises (SOEs) to investigate the impact of government subsidies on financial performance.

Large state-owned enterprises with the potential to operate efficiently and gain a large market share must independently meet their financing needs for commercial operations, both operations and investments.

Financially, the company has a cost structure that is more efficient if it is optimally managed, that is, it can attract investments to acquire the necessary technological capabilities for production and provide opportunities to set the price at an optimal level.

Although there is a high rate of return on investment and opportunities to grow the business more widely and efficiently, SOEs are financially threatened due to poor financial performance.

This study examines some of the important factors that can affect the financial performance of a public enterprise and also analyzes the role of these factors. It is analyzed on the basis of logical and empirical facts that are able to influence the relationship between the independent variables of financial performance or the financing by the government in the form of subsidies or additional capital

2.Literature review

SOEs can address market failures by providing public goods and financing key infrastructure projects. State-owned enterprises can contribute to smoothing the business cycle through investment spending and employment (Telegdy, 2016). At the same time, public enterprises can expand access to public utilities at low prices (Matuszak and Kabacinski, 2021).

State-owned enterprises differ significantly from private enterprises in terms of effective management and the main goal of serving the population (Sokol, 2009). State enterprises - "an economic entity whose main part of the property belongs to the state and is controlled by the government, and whose main income is obtained from the sale of goods and services". State-owned enterprises, unlike private firms, do not have a primary objective of making high profits (Pratuckchai and Patanapongse, 2012). The main purpose of SOEs is to provide a high level of social welfare (Whincop, 2005).

According to the World Bank's definition (1995) of state-owned enterprises - "State-owned or state-controlled economic entities that receive the main part of their income from the sale of goods and services".

The World Bank and the Organization for Economic Co-operation and Development (2005) identify a number of reasons for state ownership, including state-owned enterprises:

- Provides public goods (public parks) and utilities (health and education), both of which benefit all members of society, and consumers may prefer collective payments through taxes rather than individual payments;
- Improvement of labor relations in strategic industries;
- Restriction of private and foreign control in the domestic economy;
- Expansion of access to public services - sale of certain services at reduced prices for the benefit of the public through subsidization and performance of a number of other tasks is required.

In order to ensure the financial stability of state-owned enterprises, it is necessary to analyze the financial activity and financial independence of the enterprise. Losses incurred through the price reduction policy carried out by state-owned enterprises are covered by the state budget. But as a result of this, a number of situations can be observed in the management of enterprises.

Schreiner (1997) stated that the allocation of subsidies by the government is to stimulate the growth of the national economy through state-owned enterprises as a key factor in the development of industry, business development and other areas that are beneficial to the socio-economic society in general, such as education, health and other areas.

Gonzalez (2005) and Assagaf and Gunawan (2017) argue that the negative rate of return serves as a basis for determining the amount of subsidy, and if subsidies are given to enterprises, it will promote innovation and development. But if the subsidy is not given, the company may suffer losses due to higher costs than revenue. Subsidy is essential to maintain the continuity of the company's activities and has a positive effect on other areas so that the social life of the community increases well-being and creates a wider impact multiplier.

The results of a study conducted by Schreiner & Yaron (1999) showed that subsidies help to develop a company with research and development programs that can produce new innovations that help to increase profits or sales. According to the results of this study, through subsidies given by the government to public and private business entities, it ensures the implementation of government programs aimed at the growth of industry, business development and the development of social sectors and other economic sectors of society in general, such as the development of education, health services and the improvement of the welfare of society.

It is emphasized that the government should allocate funds to support state-owned enterprises in the form of subsidies or additional capital in order to implement state socio-economic programs. It is the main necessity of state enterprises, and it is classified as the main instruments of market economy regulation of developing countries and as a state tool for getting out of crisis situations. This requires improvement of the corporate management system of enterprises with a state share (Choriev, 2022).

Based on the research of Assagaf, Yusoff and Hassan (2017), the following conclusions are presented:

 government subsidy has a negative impact on the financial condition of state-owned enterprises. Subsidy policy is a burden on government spending by reducing the costs of other sectors in the local economy. Subsidy by the state is not a good opportunity for the development

of state-owned enterprises. Management behavior that tends to be less concerned about the level of financial strength and relies on government subsidy to meet the needs of operating costs and investment companies;

 strategic profitability in terms of income management has a positive effect on increasing financial income. The strategic profitability of real income management involved by the management of the company increases the level of financial stability;

 A sound strategic return on account revenue management has a positive impact on financial returns. Providing strategic profitability practices with company management revenues can increase the level of financial stability of the company;

 Capital composition does not have a positive effect on financial income. State-owned entrepreneurs borrow investments based on economic disadvantage or social benefit (social cost) or pay little attention to financial feasibility or net present value (NPV);

 The interaction between capital structure and independent variables showed that capital structures strengthen the relationship between public subsidies and financial independence, because debt financing strengthens the cash flow position at the level of company operations and investments.

3.Methodology

The methodology of this study requires consideration of a number of hypotheses regarding the impact on the financial stability of state-owned enterprises. In doing so, correlation and regression analyzes of profitability indicators of enterprises, shares of subsidies in the structure of capital and other indicators.

4.Results

A correlative analysis was conducted on the financial indicators of the state-owned enterprise. According to the correlation analysis, we can see that there is a weak inverse relationship between ROE and the share of subsidies in capital. Similarly, we can see that there is a strong positive relationship with return on assets, a weak inverse relationship with the amount of leverage, and a positive relationship between total debt and total assets. (Table 1)

Table 1.

Results of correlational analysis of financial indicators.

	ROE	S/E	ROA	Leverage	KP	LP	SHP
ROE	1	1					
S/E	-0,45	1					
ROA	0,89	-0,44	1				
Leverage	-0,48	0,94	-0,59	1			
KP	0,67	-0,9	0,73	-0,97	1		
LP	-0,85	0,36	-0,97	0,54	-0,68	1	0
SHP	-0,15	0,9	-0,12	0,83	-0,75	0,02	1

A correlative analysis was conducted on the financial indicators of the state-owned enterprise. According to the correlation analysis, we can see that there is a weak inverse relationship between ROE and the share of subsidies in capital. Similarly, we can see that there is

a strong positive relationship with return on assets, a weak inverse relationship with the amount of leverage, and a positive relationship between total debt and total assets. (Table 1)

According to this table, we exclude from our analysis the variables that do not have correlations. In this case, the profitability index of assets and the value of short-term debt relative to assets are not used in further analysis.

In the further analysis, we will perform regression analyzes of capital profitability as a dependent variable and other indicators as independent variables. According to the statistical analysis, the correlation coefficient is R=0.996, the coefficient of determination is R2 =0.993, and the standard error is 0.0036. It can be seen that there is a strong relationship between the factors and that 99 percent of the variance of the dependent variable is accounted for in the model and the influence of the factors included in the model.

Table 2.

Table captions should be placed above the tables.

	Coefficient	standard error	t-statistic	P-Value
Y	-0,155	0,065	-2,384	0,14
X1	-0,177	0,039	-4,57	0,045
X2	0,113	0,013	8,649	0,013
X3	0,37	0,073	5,052	0,037
X4	-0,193	0,038	-5,028	0,037

According to the results of the analysis, we can see that the P- indicator is less than 0.05. But we check the significance of the regression equation based on Fisher's F-criterion. The calculated value is F(count) = 76.09 and the next indicator we need is F(table) = 19.2. It follows that since F(calculation) > F(table), the regression equation can be recognized as true.

We evaluate the significance of regression coefficients using Student's t-test. In this case, the calculated t-criterion indicators for all factors are calculated and compared, and the coefficients can be considered significant only when the condition $[t_{x1\ count}]>t_{table}$ is fulfilled.

The calculated t_{table} = 4.3 and is smaller than the values of $t_{x1\ count}$, $t_{x1\ count}$, $t_{x1\ count}$, $t_{x1\ count}$ according to Table 2. We can consider that all regression coefficients are significant.

According to the results of the analysis, the model is significant:

(1) $$Y_{\chi} = -0.16 - 0.18X_1 + 0{,}11X_2 + 0{,}37X_3 - 0{,}2X_4$$

According to the model, we can see that a change in the share of subsidies in the capital structure of a state enterprise by a factor of 1 reduces the profitability of capital by a factor of 0.18, and a change in the amount of long-term debt funds by a factor of 0.2. It can be noted that the leverage of the state enterprise, i.e., the ratio of total debt to total capital and the value of total liabilities in relation to assets by 1 unit, increases the return on capital by 0.11 and 0.37 units, respectively.

In addition to the study of the factors affecting the capital profitability of the state enterprise, the main focus of the analysis is the effective management of short and long-term debt funds during the financial activity of the state enterprises. In this case, it is appropriate to determine the required limits of the capital structure for keeping profitability indicators in a stable state for enterprises.

In this case, the total amount of capital structure indicators for the state enterprise shows that the share of own funds is 43.5% and the share of total liabilities is 56.4%, and the share of long-term liabilities is more appropriate.

$$Y_{ROE} = 0.9475\,Xcap^2 - 0.8257\,Xcap + 0.1822 \quad (2)$$

$$Y_{ROE} = 0.9475\,X_{Liab}{}^2 - 1.0693\,X_{Liab} + 0.304 \quad (3)$$

$$Y_{ROE} = 0{,}0748\,X_L - 0.2194\,X_L + 0.1485 \quad (4)$$

The capital structure and purposeful management of capital are important for the financial activity of state enterprises. In this case, it is necessary to organize strategic planning by creating management reports along with financial reports, as well as effective use of long-term debt funds, in addition to carrying out activities at the expense of own funds. We can also see that the maximum leverage ratio is 1.47 or 147%.

5. Conclusion

The financial activities of state enterprises are carried out in a way that is coordinated with their goals and tasks, and they mainly carry out activities aimed at meeting the needs of the social classes to which their activities are directed, or regulating the established state goal directions, and implementing the state policy. While all state-owned enterprises are commercial organizations, their activities are not high profit making.

It was found that the targeted funds provided by the state to the state enterprises have a significant negative effect on the capital profitability of the enterprise, and the total debt funds and long-term debt funds have a positive effect.

In addition, the threshold amounts of the capital structure for the researched state enterprise were calculated. In this case, for the stable growth of its capital profitability, the amount of own funds of the state enterprise will be 43 percent and debt funds will be 57 percent, that is, it is possible to attract debt funds to the amount of 57 percent of the total value of assets in the financial activity of the state enterprise. It is desirable that long-term obligations make up a large share of these obligations.

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CALCULATION OF THE ABSORBED DOSE IN PHANTOMS USING THE DOSXYZNRC SOFTWARE PACKAGE

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Abstract. *Based directly on the DOSXYZ code created for the EGS4 code system, DOSXYZnrc is a Monte Carlo simulation code for determining dose distributions in a rectilinear voxel phantom. The OMEGA-BEAM system of codes created at NRC includes DOSXYZnrc. Every voxel may have a different density and substance. A variety of beams, including complete phase-space files from BEAMnrc and beams described using Beam Characterization models, may be incident on the phantom. A CT data set of Hounsfield numbers may be read in and converted by the companion application ctcreate into the details required by DOSXYZnrc to simulate transport in a phantom (i.e. the appropriate material and density are specified in each voxel)[1]. This CT phantom can be incident on any of the available beams. The code has a restart feature and may be executed on platforms for parallel computing.*

Keywords: *Monte Carlo, phantom, absorbed dose, simulation, dose distribution, shielding.*

Introduction

It is known that one of the most important factors of radiation therapy is the destruction of a malignant tumor and the protection of healthy tissues from radiation. Excessive exposure to radiation leads to the destruction of living tissues in the body. Therefore, various protective devices are used to avoid radiation. According to the ALARA principle, protection is based on three principles: time, distance and shielding[1].

DOSXYZnrc is the Monte Carlo code. Its general purpose is to calculate the absorbed radiation dose in three dimensions. EGSnrc/DOSXYZnrc models the transport of photons and electrons in Cartesian coordinates and calculates the energy distribution in given voxels. This program works in a semi-offline mode and allows saving the dose distribution in ASCII format. There is also a graphical user interface (GUI) that allows us to create input files in graphical mode[2].

Theory

A common batching method was used to do the statistical analysis in the original DOSXYZ code. The statistics on the doses are calculated starting with DOSXYZnrc by grouping scored quantities (i.e., energy deposited) on a history-by-history basis, and then figuring out the uncertainties. For the majority of sources, this only entails classifying quantities by incident particle. Quantities are classified by primary history for phase space sources, when it is possible to link several incident particles to a single primary history. It's important to point out that the technique utilized considers the latent variance in any phase space file being used as a source (i.e. the uncertainty introduced by the statistical variations in the phase space file)[1].

As a result, repeatedly recycling the data won't be able to lower the uncertainty in any dosage calculation below that threshold. If the phase space source is permitted to restart the phase

space file instead of using the recycle option, the statistical result will be artificially low and overlook this latent variation. Restarting the phase space file should thus be avoided in order to get correct uncertainty estimations[1].

The following rules should be followed for radiation protection.

The principle of justification. Any alteration brought on by radiation exposure ought to be beneficial rather than detrimental.

The principle of protection optimization. When taking into account economic and social aspects, the likelihood of exposure, the number of people exposed, and the size of each individual dosage should be as low as possible.

The principle of using the dose limit value. When radiation exposure is intended, the overall dose that people receive from regulated sources shouldn't be more than the stated limit value.

To protect against ionizing radiation, you need to know the following characteristics of the source[3]:

- radiation type (n, p, γ, β)
- geometric parameters of the radiation source:
- point - the size of the source, very small ($d \ll r$) than the distance from it to the target
- linear - $d \ll L$
- surface - $d \ll S$
- volumetric - $d \approx r$
- source power - Q (particles/sec per point charge)

Model

The distribution of doses produced when a 25 MeV electron beam strikes a tantalum plate has been studied using the DOSXYZnrc software program. To do this, the input file contained the principal dimensions, beam attributes (source), medium parameters (medium), and geometric dimensions of the phantom (geometry).

Figure 1: Choosing the beam's settings

```
########################################
#### SOURCE
########################################
:start source definition:
    :start source:
        name = pencil_beam
        library = egs_parallel_beam
        charge = -1
        direction = 0 0 1
        :start spectrum:
            type = monoenergetic
            energy = 25 #MeV
        :stop spectrum:
        :start shape:
            type = point
            position = 0 0 -10 #cm
        :stop shape:
    :stop source:

    simulation source = pencil_beam
:stop source definition:
```

Figure 2: The phantom's geometrical characteristics

```
####################################
#### GEOMETRY
####################################
:start geometry definition:
    :start geometry:
        name = slab
        library = egs_ndgeometry
        type = EGS_XYZGeometry
        x-planes = -5, 5 #cm
        y-planes = -5, 5 #cm
        z-planes = -10, 0, 0.1, 10 #cm
        :start media input:
            media = vacuum tantalum
            set medium = 1 1
        :stop media input:
    :stop geometry:

    simulation geometry = slab

:stop geometry definition
```

The monochromatic beam with a 25 MeV energy is shown in Figure 1. The source is decided upon as a point source.

Since we are aware that the rest energy of electrons is 511 keV, the minimum value for the total energy of electrons was established at 521 keV. The "medium" or "carrier" is made of tantalum plates. The program automatically selects density values for tantalum, lead, and water from the NGS library.

Figure 3

Setting up the media.

```
###############################################################################
#### MUHIT
###############################################################################
:start media definition:
    ae = 0.521 #elektronlar uchun minimal energiya, kinetik energiya + 0.511 (MeV)
    ap = 0.01 #fotonlar uchun minimal energiya (MeV)
    ue = 50.511 #elektronlar uchun maksimal energiya, kinetik energiya + 0.511 (MeV)
    up = 50 #fotonlar uchun maksimal energiya


#### Tantal
:start tantal:
    density correction file = tantalum
:stop tantalum:


#### Qo`rg`oshin
:start qo`rg`oshin:
    density correction file = lead
:stop qo`rg`oshin:


#### Suv
:start suv:
    density correction file = water_liquid
:stop suv:

:stop media definition:
```

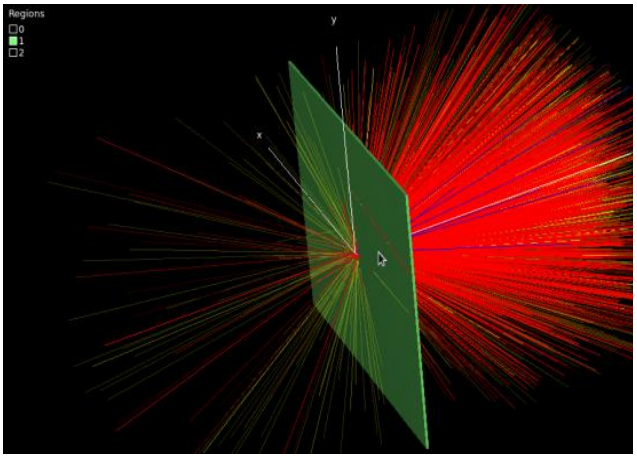
When all the necessary information had been supplied, the program was launched by entering the following command in the terminal:

```
$myapp -i slab.egsinp
```

Figure 4. The simulation.

Figure 5. Dose distribution on a tantalum plate.

Results and conclusions



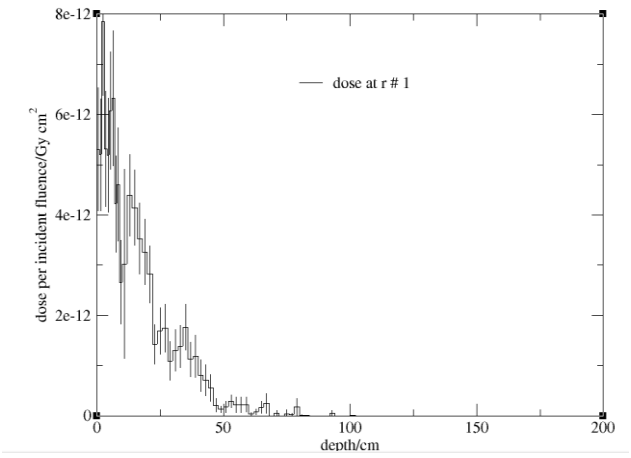


Figure 6.

The value of the radiation dose generated on the tantalum plate.

```
==> Summary of region dosimetry (per particle)
ir medium rho/[g/cm3] V/cm3 Edep/[MeV] D/[Gy]
-------------------------------------------------------------------------------
1 tantalum 16.654 10.0000 2.5506e+00 +/- 1.828 % 2.4535e-12 +/- 1.828 %
-------------------------------------------------------------------------------
```

After running the simulation, a graph was drawn using the xmgrace program based on the obtained results (Figure 5). As can be seen from the graph, the absorbed radiation dose is higher near the surface of the plate.

The energy delivered to the tantalum plate was equal to 2.5506 ± 1.828% MeV, and the absorbed radiation dose was equal to 2.4535 × 10−12 ± 1.828% Gy (Fig. 6). It means that it is possible to use a beam of electrons to destroy cancer cells located close to the surface of the skin [4].

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METROLOGICAL SUPPORT OF MEASUREMENT OF KINEMATIC VISCOSITY OF LIQUID MEDIA TAKING INTO ACCOUNT UNCERTAINTY OF MEASUREMENTS

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Abstract. *The articles disassemble the content of the metrological traceability of the presented viscosity of the poor. Viscost is a free liquid liquid backlight transmitted in one direction. Thus, viscosity is a freelance training by the mayor, mainly of which is a hung chemical horse and a dimensional molecule. K naibolee rasprostranym methods of viscosity measurement are capillary, rotary, falling ball methods, vibrational (oscillatory or oscillative), plant. Depending on the measurement method used, the formation of a cinematic, dynamic and assimilated viscous liquid will be determined.*

Keywords: *liquid media, viscosity, measurement, viscometer, metrological observations, metrological provision, calibration.*

Viscosity is the property of liquids to resist the movement of one part of it relative to another under the influence of the applied external force. Thus, viscosity is a measure of internal friction, which mainly depends on the chemical composition and size of the molecules of the substance.The most common methods of measuring viscosity include capillary, rotary, falling ball method, vibration (vibrational), conditional [1-5]. Depending on the measurement method used, the value of kinematic, dynamic or conditional viscosity of the investigated liquid is determined.Many important decisions are based on the results of chemical quantitative analysis; results are used, for example, to estimate yields, to check materials against specifications or statutory limits, or to estimate monetary value. Whenever decisions are based on analytical results, it is important to have some indication of the quality of the results, that is, the extent to which they can be used to achieve the stated goal. Users of chemical analysis results, especially in those areas related to international trade, are facing increasing pressure to eliminate duplication of effort often expended in obtaining them [6-8]. Confidence in data from outside the user's own organization is a prerequisite for achieving the above goal.

In some analytical chemistry sectors, it is now a formal (often legal) requirement for the laboratory to introduce quality assurance measures to ensure the ability and provide data of the required quality. Such measures include: use of proven methods of analysis; использование определенных процедур внутреннего контроля качества; participation in proficiency testing programs; accreditation based on ISO / IEC 17025: 2017 and establishing traceability of measurement results. Depending on the type of information available about the quantity and on the possible variability of the quantity value (statistical or non-statistical), it is known that the uncertainties of the input quantities are estimated by type A or type B [9-14].

If the information about a quantity is statistical, that is, it is obtained experimentally by repeated measurements or tests, then its standard uncertainty due to random effects is estimated by type A (1) [4,5]:

$$u_A(\bar{x}) = s(\bar{x}) = \sqrt{\frac{1}{n(n-1)} \cdot \sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2} \quad (1)$$

where $\bar{x}$ is the estimate (arithmetic mean) of the input X quantity; x_i – result of the i-th observation of the input quantity; n – number of observations.

In this case, the experimental variance of observations is estimated by (2):

$$s^2(x) = \frac{1}{n-1} \cdot \sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2 \quad (2)$$

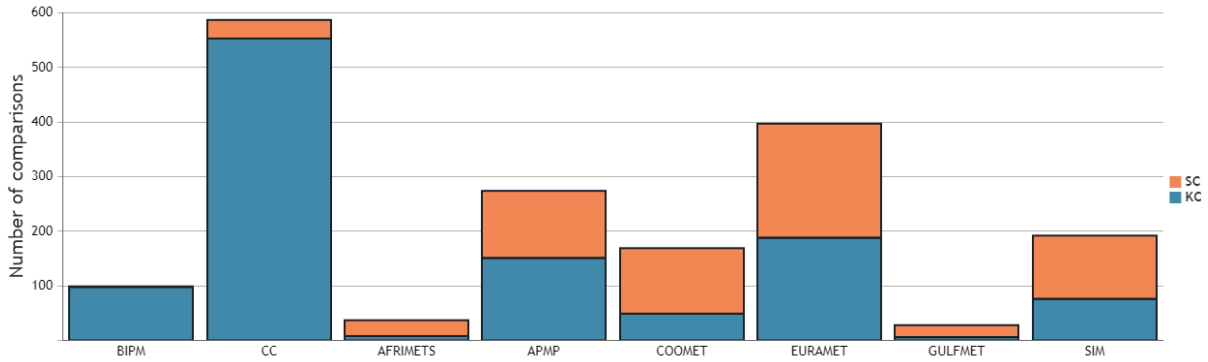
Before measuring, first of all, we compile a list of influencing factors on the expanded measurement uncertainty.

The relevance of this project lies in the wide application in areas such as, quality assessment and safety of agricultural products, dietary dietary supplements (dietary supplements) and other areas mentioned above. At the same time, this Project uses a viscosity meter kit designed to assess the quality and safety of products in the oil, fuel, medical, cosmetology, geological and construction industries and other environmental sectors, as well as to control the technologists.

Uzbekistan is a member of the regional metrological organization COOMET, the indicators of these and other organizations in important comparisons specified in line 2 [15-18].

Figure 1.

Calibration and measuring metrological safety institutes



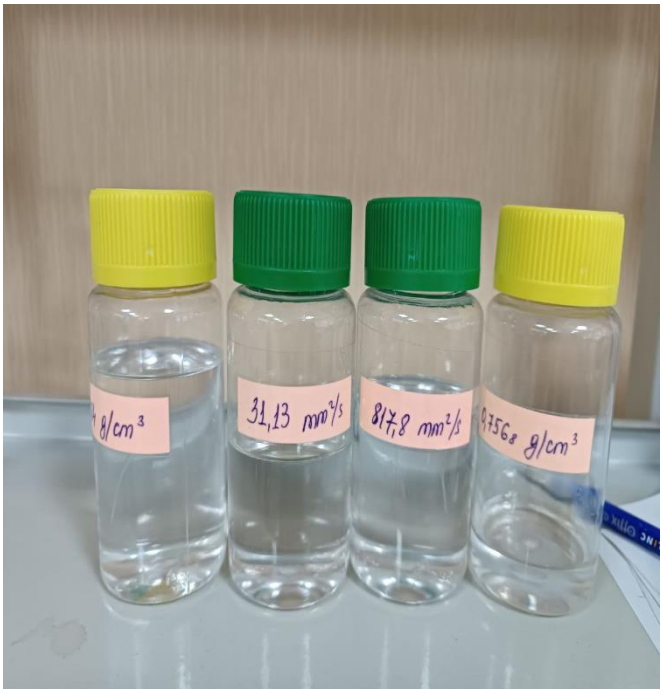
One of the main and no less urgent tasks is the organization of metrological control (comparison, calibration, certification) of operating measuring viscometers used in these areas of the economy.

An urgent issue is the creation of conditions for improving the quality and competitiveness of domestic products through the development and improvement of systems for calibrating measuring instruments, the development of mechanisms for mutually beneficial cooperation in the field of metrology with international and regional metrological organizations.

Fig.2 and 3 show standard images in quality of metrological traceability tools.

Figure 2. Calibration buffer screens for metrological traceability

Figure 3. Working standard images for metrological nature of viscozimeters (metrological traceability established)



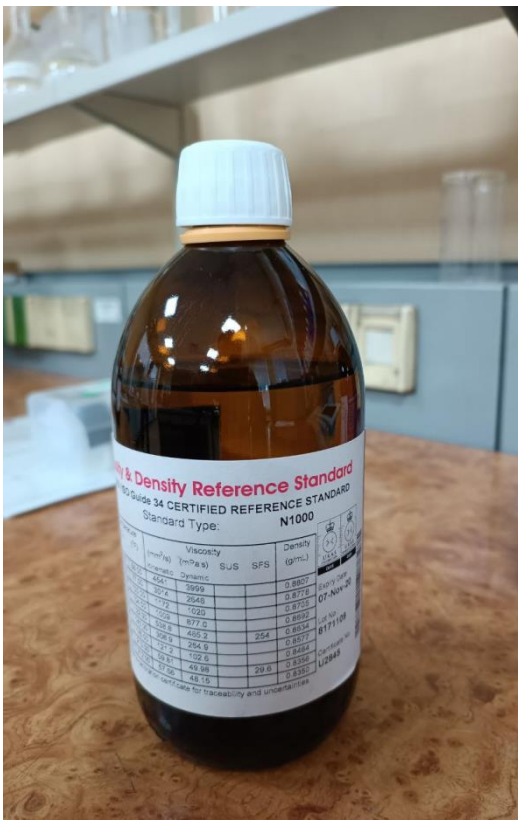
Testing and calibration laboratories for ensuring metrological traceability up to the International System of Units (SI) is one of the main technical requirements of the international standard ISO/IEC 17025:2017 "General requirements for the competence of testing and calibration laboratories," which is achieved with the assistance of the integration of the Republic of Uzbekistan into the international economy and international systems to ensure the uniformity of measurements as an equal partner. To date, according to the State Unitary Enterprise "Accreditation Center," there are more than 600 laboratories in the state register, the technical competence of which has been officially confirmed [17-21]**.**

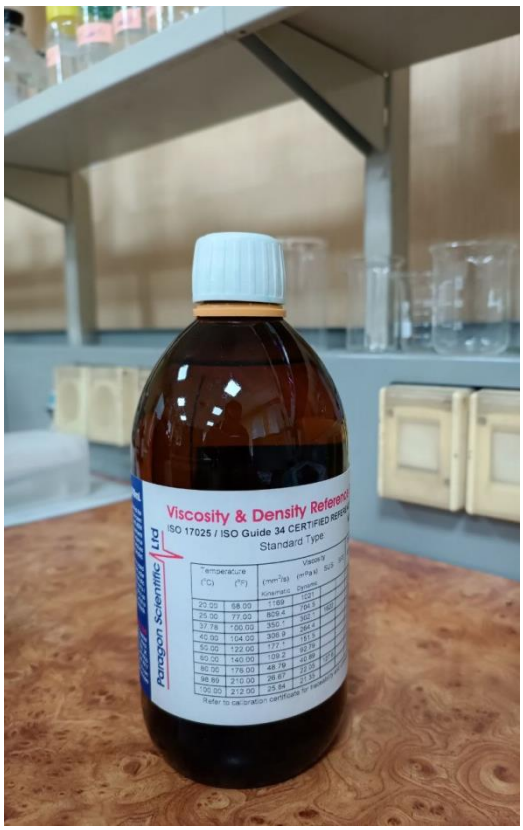
To date, the creation and implementation of a complex of equipment (installations, equipment) for reproducing a unit of kinematic viscosity of a liquid is an urgent task in the implementation of the Agreement "On the mutual recognition of national standards and certificates of calibration and measurements issued by national metrological institutes" (CIPM MRA), approved by the organization of the International Bureau of Measures and Weights (1999, October 14, France, Paris). As a result, an important step is being taken in demonstrating the national measuring and calibration capabilities of the Republic of Uzbekistan in the International Database of Calibration and Measuring Capabilities (KCDB), which will allow modernizing the technical capabilities of the state system for ensuring the uniformity of measurements.

In photo 4, the appearance of the standard image of cinematic viscosity is certified according to ISO 17034.

Figure 4.

Certified standard image of cinematic and dynamic viscosity of liquid according to ISO 17034. certificate of statutory metrological traceability of measurements





In the oil and gas industry, about 30 industrial enterprises operate, which produce products such as gasoline, diesel fuel, jet fuel, various types of oils, fuel oil, bitumen, polyethylene of various grades, marketable natural and liquefied gas, oil and gas chemical equipment, gas balloon equipment, etc.

According to the Department of Oil Refining, Petrochemistry, Storage and Transportation of Petroleum Products, according to the results of January-September 2020, the company processed 1 million 380.9 thousand tons of hydrocarbon raw materials. As a result, 620.1 thousand tons of gasoline, 469.2 thousand tons of diesel fuel, 67.4 thousand tons of jet fuel and 78.2 thousand tons of fuel oil were produced.

In accordance with the Law "On Metrology" No. ZRU-614, MI data must undergo primary, periodic, extraordinary, inspection or expert verification. Verification of viscosity measuring instruments in accordance with GOST 8.025-96 "GSI. The state verification scheme for measuring the viscosity of liquids "should be carried out using state standards of the second category, which are standard samples (CO) of the viscosity of the liquid, or by the method of direct comparison using comparator liquids. The need for a large nomenclature of CO fluid viscosity is determined by the variety and functionality of viscosity measurement instruments.

Thus, the development of stable and uniform CO viscosity of a liquid, certified in the ranges of values of different temperatures (from minus 40 ° C to 20 ° C and from 100 ° C to 150 ° C) is an urgent task. The development and implementation of state working standards that store and transmit units of dynamic and kinematic viscosity of a liquid in the range of temperature values from minus 40 ° C to 150 ° C will increase the number of types of metrologically provided MI, which, in turn, will create the basis for the development of a system for ensuring the uniformity of measurements in this area. The development and study of RS will solve not only the problem of the lack of verification tools for viscometric devices in the temperature ranges

from minus 40 ° C to 20 ° C and from 100 ° C to 150 ° C, but will also allow using these samples as comparator liquids during comparisons, certification and calibration of standards [22-24].

The implementation of the project will allow the implementation of a number of US standards (ASTM D 2162, ASTM D 445-18, ASTM D 2162-17) and other international standards for measuring the viscosity of liquids.

The purpose of this project is to improve the metrological provision of measurements of the viscosity of liquid media in the temperature range from minus 40 ° C to 150 ° C by developing and studying state working standards for units of dynamic and kinematic viscosity of liquid, as well as standard samples.

To achieve this goal, it is necessary to solve the following tasks [25-27]:

─ analyze the state of metrological support for measuring the viscosity of liquids to determine the directions of solving the problem of the lack of verification tools for the viscosity MI in the temperature range from minus 40 ° C to 150 ° C;

─ developing a procedure for transferring the size of the unit of kinematic viscosity of the liquid of the first discharge in the range of values from 0.4 to 1,0·105 mm2/s;

─ training and advanced training of personnel in organizing metrological support of liquid viscosity measurement tools, implementation of the procedure for transferring the size of measurement units to working measuring tools (calibration, comparison, certification);

─ pilot comparisons of a set of equipment for reproducing a unit of kinematic viscosity of a liquid in accredited metrological laboratories within the framework of the Interstate Council for Standardization, Metrology and Certification (MGS), as well as taking into account the recommendation of the Euro-Asian Cooperation of State Metrological Organizations (COOMET) of the COOMET R/GM/11:2006 document "Regulation on Comparisons of Standards of National Metrological Institutes of COOMET" ";

─ development of software for metrological control, evaluation of accuracy characteristics of experimental data at transfer of unit size of kinematic viscosity of equipment complex for reproduction of unit of kinematic viscosity of liquid;

─ selection and justification of methods and means of measuring the density of a liquid suitable for measurements in the temperature range from minus 40 ° C to 150 ° C;

─ development of a draft updated State Verification Scheme for liquid viscosity measuring instruments in terms of traceability of measuring instruments intended for use in the temperature range from minus 40 ° C to 150 ° C.

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GAMMA-IRRADIATION OF ALUMINUM OXIDE Al_2O_3 AND ITS FEATURES DETECTED BY POWDER DIFFRACTOMETRY

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Abstract. *X-ray diffraction analysis of materials is a standard method for phase identification and characterization of polycrystalline materials [1]. Experimentally, various peaks were detected in the X-ray phase analysis (XRD) spectra of aluminum oxide Al_2O_3 samples. Based on the data (XRD) of samples of aluminum oxide Al_2O_3 obtained for sample with different modes of powder production, Miller indices and lattice parameters were determined. The experimental data obtained are in good agreement with the data obtained by other methods.*

Keywords: *gamma irradiation, aluminum oxide, powder, wide-gap semiconductor, Miller indices, microstructure.*

Introduction

In this work, we used powder X-ray phase analysis to study the structure, composition, properties of raw materials and products of aluminum oxide Al_2O_3. It was used to study the mineralogical and phase compositions [2]. Aluminum oxide Al_2O_3 is a binary compound of aluminum and oxygen [3]. In nature, it is distributed in the form of alumina, which is a constituent of clays, a non-stoichiometric mixture of oxides of aluminum, potassium, sodium, magnesium, etc. [4–6]. In the modification of corundum, it has an atomic crystal lattice. Taking into account the above, in this work, we carried out a study by the method of powder diffractometer of the main features of materials used in semiconductor technology. And also an attempt was made to apply the analysis technique for materials of various stoichiometry.

Research methodology

Powder X-ray diffraction is a method for studying the structural characteristics of a material using X-ray diffraction (X-ray diffraction analysis) on a powder or polycrystalline sample of the material under study. Also called the powder method. The result of the study is the dependence of the scattered radiation intensity on the scattering angle. The corresponding instrument is called a powder diffractometer. The advantage of the method is that the debyegram for each substance is unique and allows you to determine the substance even when its structure is not known. The X-ray phase analysis method was used to study the structure, composition, properties of raw materials and calcined products. It was used to study the mineralogical and phase compositions [7]. A monochromatic X-ray beam is directed to a sample of the test material, ground into powder. On a photographic film rolled into a cylinder around the sample, the image (Debyegram) is obtained in the form of rings. The distance between the lines of the same ring on the debygram allows you to find the Bragg reflection angles. Then, using the Bragg-Wulf formula $2d \sin\Theta=n\lambda$, the ratio d/n of the distance between the reflecting planes to the order of reflection can be obtained.

X-ray analysis allows solving the following tasks:

Determination of the qualitative composition of the sample, semi-quantitative determination of the components of the sample, determination of the crystal structure of the substance. As well as precision determination of unit cell parameters, determination of the arrangement of atoms in an elementary cell (full profile analysis - the Rietveld method), determination of the crystallite size (coherent scattering region) of a polycrystalline sample. Study of texture in polycrystalline materials. In addition, the study of the phase composition of the substance and the study of state diagrams, the assessment of the size of crystals in the sample, the exact determination of lattice constants, the thermal expansion coefficient, the analysis of minerals. In Fig.1. the device - powder diffractometer is given.

Fig.1.

Powder x-ray diffractometry. XRD-6100.

Main results and discussion

Al2O3 powder samples were studied by X-ray diffraction and elemental analysis. Samples were identified on the basis of diffraction patterns, which were recorded on a computer-controlled XRD-6100 (Shimadzu, Japan) apparatus. Cu-Kα radiation (β-filter, Ni, λ=1.54178 Å, tube current and voltage mode 30 mA, 40 kV) and a constant detector rotation speed of 4 deg/min with a step of 0.05 deg were used. (ω/2θ-coupling), and the scanning angle varied from 10 to 80°. The X-ray power was 2 kW. The results were analyzed using the database [8]. The penetration depth of Cu-Kα radiation is about 1 mm (980 μm) for light elements (carbon) and a few μm for heavy elements (Ag, W). For most inorganic substances, simple compounds, Cu-Kα- is tens of microns (μm). Figure 2 shows the spectral dependences of Al2O3 obtained by the powder diffractometer. In addition, the Miller indices are given, as well as the interplanar spacing dhkl for these samples. We used the Rietveld method [7, 9] to refine the structure from powder data obtained using X-rays. The principle of the method is to use independent intensity measurements at each point of the diffraction pattern, describing the line profile using analytical functions, instead of using the integral reflection intensity. Function parameters, including structural, device and other characteristics, are refined using the nonlinear least squares method. Using this refinement method, we determined the interplanar spacing dhkl and the Miller indices (hkl). In addition, using this method, we were able to accurately determine and designate the interplanar spacing dhkl and Miller indices (hkl) as can be seen from Figure 2. As mentioned above, powder X-ray

diffractometry allows for quantitative elemental analysis. The elemental analysis carried out by us using the “Search and Match” software [8] of the samples shows that the Al2O3 samples have the following composition (in weight percent): for Al2O3, the following weight ratios were obtained: Al - 68.56%, O - 31.44% . As is known from the literature data [7,10-11], Miller indices are applicable in all syngonies. As the Miller index increases, the interplanar spacing decreases [12–13]. For the Al2O3 sample measured by X-ray diffraction analysis using the “Search and Match” software [8,13–14], the degree of crystallinity and amorphism was assessed. For alumina, it looks like this: the amorphous phase for alumina is 56.84%, and the crystalline phase, respectively, is 43.16%. Indexing - determination of indices (HKL) for each line of the diffraction pattern and grating type. Indexing was carried out to identify impurities in the sample by isolating reflections that do not belong to the main substance. In this work, we determined the presence of hydrogen impurities for Al2O3. The most characteristic results are shown in Fig.2.

Fig.2.

Spectral dependence of Al2O3 obtained by the method of powder diffractometer. And also processed by the Rietveld refinement using the FullProf software [9]. Miller indices are given.

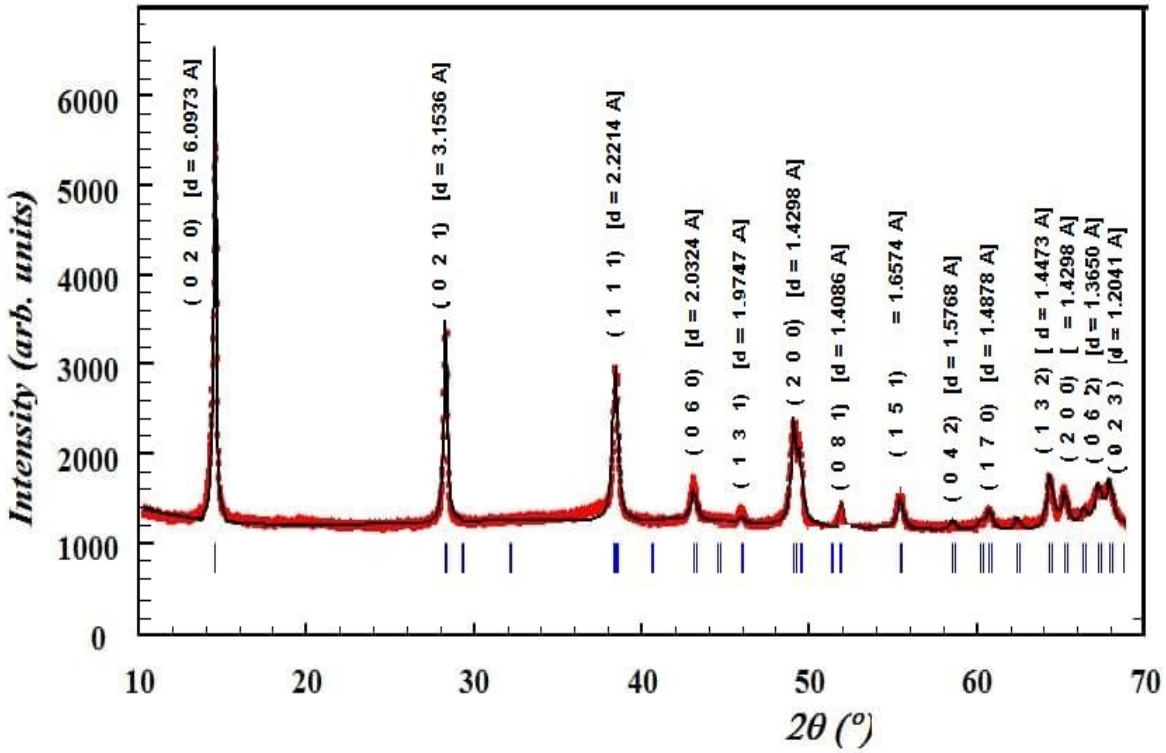


Figure 3 shows the spectral dependence of Al_2O_3, obtained by the method of powder diffractometer (XRD-6100) after gamma irradiation with a dose of D=107 ion/cm2. As can be seen from the spectral dependence, irradiation leads to a decrease in the peaks of the corresponding Al_2HO_2, and to the amorphization of this sample. We can determine this as follows: for an Al_2O_3 sample measured by X-ray diffraction analysis using the “Search and Match” software [8,12-14], the degree of crystallinity and amorphism was assessed. For an irradiated alumina sample, this is as follows: the amorphous phase for alumina is 66.42%, and the crystalline phase, respectively, is 33.58%. In addition, we carried out elemental analysis using the “Search and Match” software [8] of the samples. Samples of Al_2O_3 have the following composition (in weight percent): for Al_2O_3, the following weight ratios were obtained: Al - 45%, O - 53.30%, and hydrogen-H-1.7% was also

found. Indexing was carried out to identify impurities in the sample by isolating reflections that do not belong to the main substance. In this work, we determined the presence of hydrogen impurities for Al_2O_3. This indicates that the hydrogen in the volume after gamma irradiation comes to the surface.

Fig.3.

Spectral dependence of Al_2O_3 obtained by the method of powder diffractometer after gamma irradiation with a dose of D=107 ion/cm2.

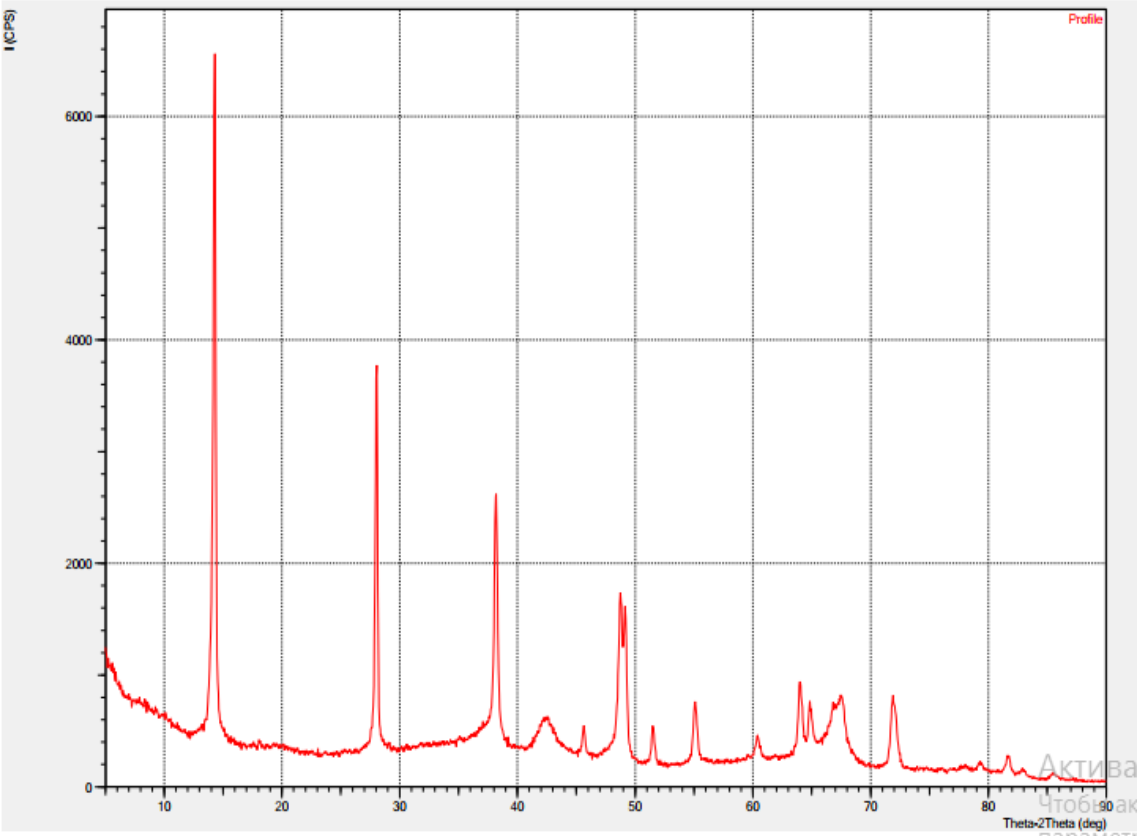
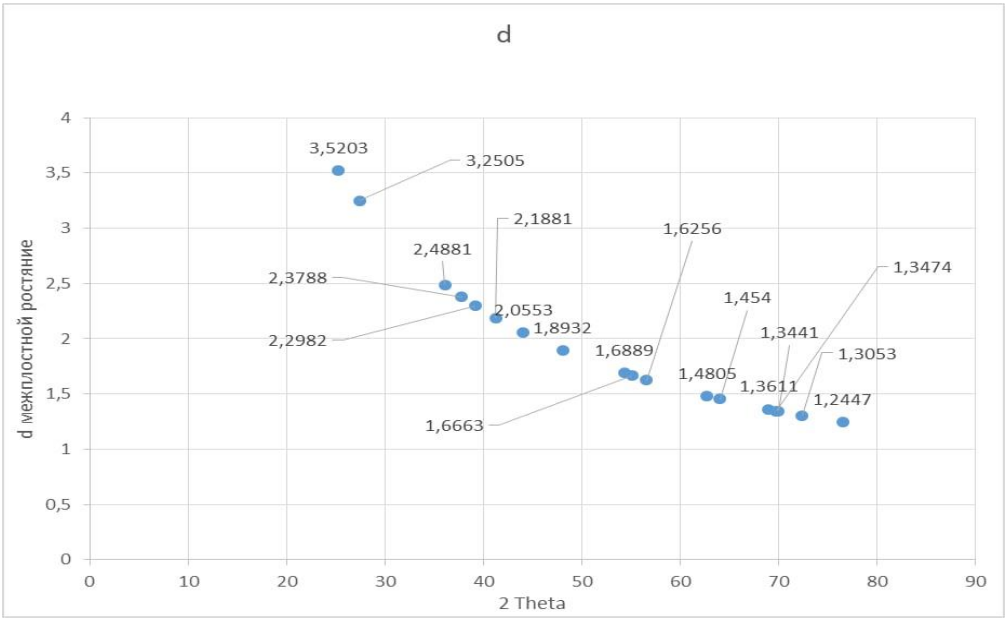


Fig.4.

Dependence of the interplanar distance on the angle of incidence of radiation.



As can be seen from Figure 4, with an increase in the angle of incidence of X-ray radiation on the sample, the interplanar distance decreases [10,12,13-14]. Thus, we can conclude from Figure 4 that the interplanar spacing strongly depends on the Miller index. This shows that using this method, based on analytical work, we can conduct a qualitative and quantitative analysis of samples of various compositions, with different stoichiometry, and determine various crystallographic parameters.

Findings

The Rietveld method [7, 9] was used to refine the structure from powder data obtained using X-rays. A decrease in the interplanar distance with increasing Miller indices is determined. Indexing was used to identify impurities in the sample by isolating reflections that do not belong to the main substance. Elemental analysis was carried out in weight percent for Al_2O_3 Al - 68.56%, O - 31.44%. The degree of crystallinity and amorphism of the Al_2O_3 sample was determined. Also, gamma irradiation of the Al_2O_3 sample was carried out with a dose of D=107 ion/cm2. Surface amorphization after gamma irradiation was determined.

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SAFETY MANAGEMENT IN AIR TRAFFIC SERVICES

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Abstract. *The paper considered the concept of aviation security and factors that lead to accidents. The types of human errors in the maintenance of air traffic are described. A graphical diagram with an explanation of the concept of "safety cycle" is given. The economic aspect of the aviation industry in the event of non-standard situations has been studied.*

Keywords: *experience, error, attention errors, memory errors, perception errors, errors and gross violations, direct consequences, indirect consequences, industrial and social consequences, the price of safety*

INTRODUCTION

Technological maps are developed, in order to improve the skills of specialists, to reduce the time to think about the situation, for the purpose of reflection on the next step and sequence of actions. However, in each individual case, an aircraft accident may develop unpredictably. Every dispatcher and pilot can make a mistake. Our goal is to reduce the time required to parry an aviation accident, to minimize the influence of the human factor in each case.

Human behavior in an aircraft accident can be influenced by many extraneous factors. That is why the behavior in the event of an aviation accident at the landing stage should be as "automated" as possible. And for this it is necessary to investigate and analyze the algorithms of the actions of the dispatcher and the pilot. Analyze the factors that can lead to a special in-flight event during the landing phase. To study the factors influencing the behavior of the controller and the pilot, and ways to reduce the influence of these factors.

It is known that most accidents are committed through the fault of the flight and air traffic controllers. They are the result of suboptimal human actions. Therefore, any improvements in this area can significantly improve the level of Flight Safety.

MATERIALS AND METHODS:

Analytical methods were used in the work. As well as monitoring the work of air traffic controllers in the process. The regulatory and technical rules and methods used by the ATS personnel in non-standard situations were analyzed.

The purpose of the study is to analyze the existing technologies for the work of air traffic controllers regarding the performance of work in non-standard situations, to compare the procedure for performing actions of SUE Center "Uzaeronavigation" controllers and foreign countries.

RESULTS AND DISCUSSION:

The use of inappropriate rules involves the use of a procedure that experience has shown to work in the past but contains unrecognized defects. If such a solution worked in the situation when it was first used, it can become part of an individual approach to solving such problems.

When a person does not have a ready-made solution based on previous experience and / or education, he turns to personal knowledge and experience. Making a decision in this way will take more time than applying a rule-based decision. Because it requires substantiation of knowledge on basic principles. Errors arise due to lack of knowledge or incorrect justification. Applying

knowledge based on personal experience will be particularly difficult. Because, the person at this time will be busy, or his attention will be diverted from the justification process by other circumstances. In such situations, the possibility of making a mistake increases.

The actions of an experienced person are routine and brought to automatism. A person only monitors the progress, mistakes and errors arise as a result of:

- Errors of attention. They arise as a result of the inability to follow the process of performing a routine action. At a certain critical moment, this happens when a planned procedure is similar to, but not identical to, a routine activity performed earlier. If attention is distracted or distracted at a critical moment when the procedure differs from the usual action, the person is more likely to perform the usual action, something that is needed at the moment.

- Memory errors occur when we either forget what we intended to do, or skip an element of the chain of planned actions.

- Errors of perception - errors in recognition. They arise when we are sure that we have heard or seen something before, in fact, different from the given circumstances.

Errors (which are normal human actions) are quite different from violations. Both actions lead to system failure. The difference lies in the intention.

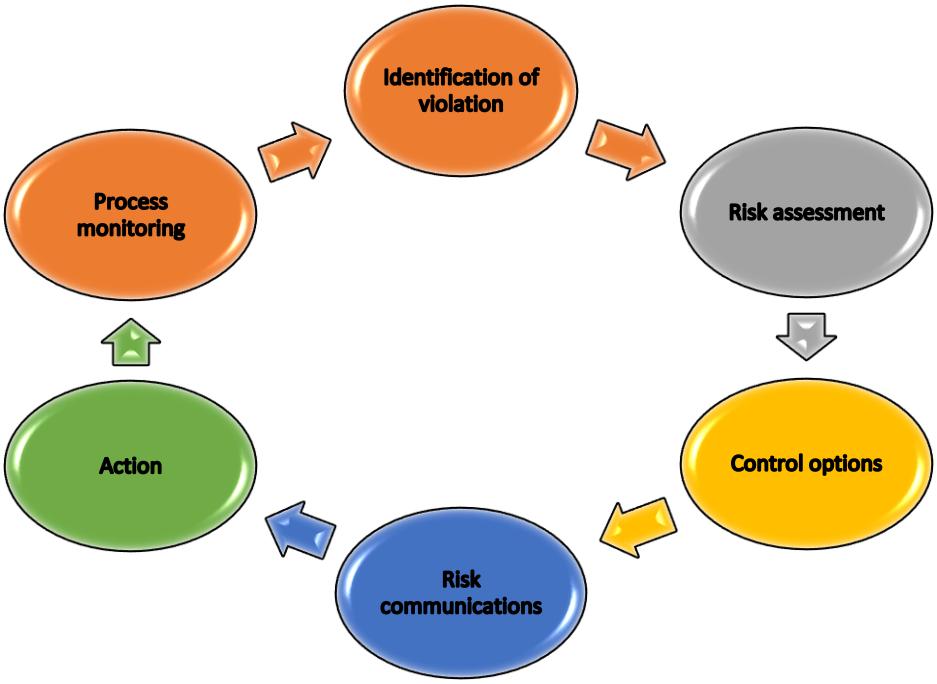
Violation is a deliberate act, while error is unintentional. For example, take the situation where the controller allows the aircraft to descend to the level of an aircraft flying at cruising speed. When the distance of the ranging equipment between them is 18 nautical miles and this happens in circumstances where the required minimum is 20 nautical miles. If the controller made an error in calculating the distance difference of the distance measuring equipment recommended by the pilots, this will be an error. If the controller calculated everything correctly, and allowed the descending aircraft to descend to the level of an aircraft traveling at cruising speed, knowing that the condition of the necessary minimum was not met, this would be a gross violation.

Some violations are the result of insufficient or unrealistic actions. When people have developed habits of "approximate work" while doing a task. In this case, it is very visible to notify of their detection. To correct procedures immediately. In any case, violations will not be tolerated. There have been a number of accidents in which a corporate culture tolerating short cuts instead of following published procedures has been cited as a cause of accidents.

An effective safety management system requires a given number and potential interactions of factors affecting safety. A required example of the type of systematic process is shown in Figure 1, Safety Cycle. It is followed by a short description of the cycle.

Figure 1.

Safety cycle



Each identified violation should be identified and prioritized. This assessment requires finding and analyzing all available information. The information is evaluated to determine the extent of operational disturbances. Are they "one of a kind" or systemic? A database may be required to facilitate the storage and retrieval of information. In this case, appropriate tools are needed.

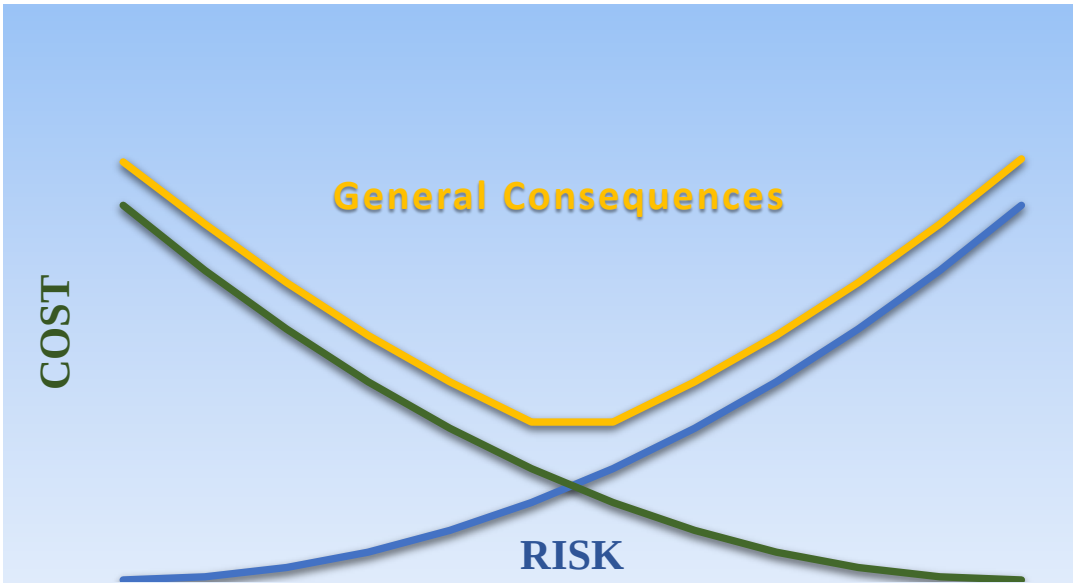
Once defects are found in a security system, decisions must be made on how to avoid or eliminate the breach or mitigate the risk associated with it. The decision must take into account local conditions, as "one size" does not fit all situations. Care must be taken that the decision does not lead to new violations. This is a risk management process.

Running a portable but reliable airline or service provider requires a constant balance between the need to meet production goals (such as departing on time) and security goals (the extra time it takes to check the safety of a closed gate). The aviation workspace is filled with unsafe conditions that cannot be avoided, but operations must continue.

Some operations make a "zero accident" commitment and claim that "safety is their number one goal." The reality is that operators (as well as some commercial aviation organizations) need to generate income in order to survive. Profit or loss is an immediate indicator of success in meeting your productive goals. Be that as it may, safety is a necessary prerequisite for a sustainable airline business, as the temptation to save money will gradually grow. For many companies, the concept of safety can be defined by the absence of losses in disasters. Companies may only realize they have safety issues after an accident or loss, in part because it will result in losses/reduced profits. However, a company can operate for years under unsafe conditions without adverse consequences. In the absence of an effective safety manual to identify and eliminate unsafe conditions, a company may be considered to be meeting its safety objectives. Which is proven by "no loss". It's actually just a happy accident.

Figure 2.

Cost-to-Safety Graph

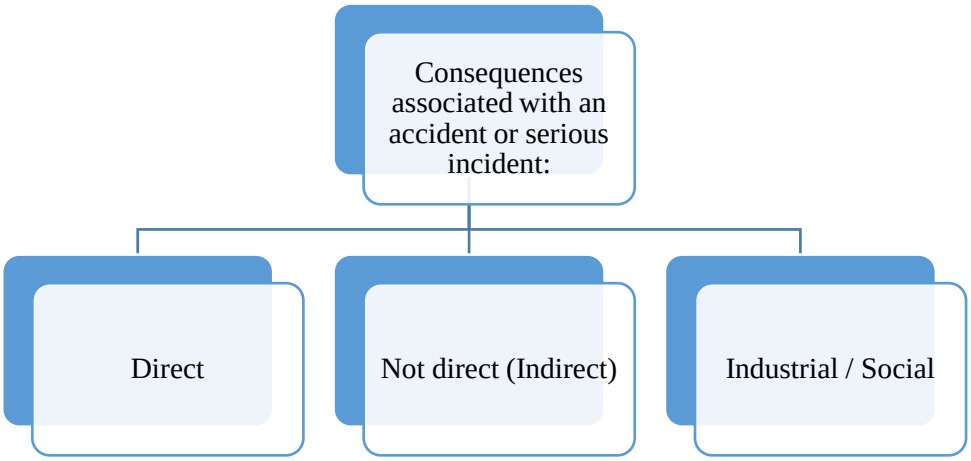


Security and profit are not mutually exclusive. Indeed, quality organizations understand that the cost of correcting unsafe conditions is an investment in further long-term profits. Accidents are expensive. Thus, money spent on ways to reduce risk also reduces losses - as shown in Figure 2. However, spending more and more money on reducing risk may not result in an equivalent profit. Companies must balance the cost of risk with the costs of ways to mitigate it. In other words, some level of loss can be accepted in terms of direct benefit to loss. Be that as it may, only a few companies are able to survive the economic consequences of a major disaster. Thus, there is a strong economic reason for effective security management to manage risk.

Ensuring safe separation intervals should guarantee conflict-free aircraft flights. It is based on technologies and procedures that ensure the required minimum separation of aircraft and maximize the capacity of the ATM system. (Эшмурадов Д. Э., 2015)

Figure 3.

Cost of risk



Direct consequences are obvious consequences that are easily identified. For the most part, they are related to physical injury, repair, replacement or compensation for damage, aircraft equipment and damage to property. The high cost of an accident can be reduced by insurance payments. (Some large organizations try to protect themselves by accumulating funds to cover risk costs).

Indirect effects - since insurance can only cover certain types of expenses, there are expenses that are not covered by insurance funds. Understanding such costs is fundamental to understanding the economics of security. Indirect consequences include all non-insured costs resulting from an accident rather than direct consequences. Such costs are not always clear and are often deferred. Examples of some of the costs that are not included in the insurance and may be accumulated depending on the accident.

Industrial and social consequences. In addition to the monetary consequences described above, a plane crash can cause more damage to the reputation of the aviation industry and the market as a whole than an airline accident. (The events of September 11, 2001 are proof of this). Passengers choosing alternative modes of travel (such as rail) may be at additional risk.

The cost of safety is even more difficult to determine than the overall consequences of an accident, partly because of the difficulty in estimating the consequences of averted accidents. Be that as it may, some operators are trying to determine the costs and benefits of establishing security management systems. They found that the savings are substantial. However, profit analysis is difficult, there is a procedure to follow, and senior management is reluctant to spend money if there is no quantifiable profit. One way to address this issue is to separate the costs of the security management system from the costs of correcting system defects, making the costs of the security management system the responsibility of the security department and the costs of correcting system defects to line management. This procedure involves senior management in assessing the costs and benefits of the safety management system.

CONCLUSIONS:

Depending on the intensity of the flows of arriving and departing aircraft and the applicable flight rules in the area of the aerodrome (air hub), one of the three main methods of organizing air traffic can be established. Firstly, the organization of the movement of the aircraft according to the established patterns without radar control, with the use (without the use) of technical means of navigation. It is used when organizing flights in the area of an aerodrome (air hub) and consists in establishing, as a rule, one typical aircraft movement pattern for each of the take-off and landing directions. Secondly, the organization of traffic according to established patterns, including landing approach and exit patterns from the airfield area at the shortest distance, in the presence of radar control and other technical means of navigation. This technique is used when organizing flights in the area of an aerodrome (air hub) and consists in establishing alternative aircraft movement patterns for each of the take-off and landing directions. Thirdly, the organization of traffic on standard routes of departure and arrival SID / STAR, regardless of the use of radar control. This technique is used when separating the flows of arriving and departing aircraft, in developing and establishing schemes in which for all aircraft following standard routes, the possibility of safe separation is provided in advance in compliance with the established separation standards at intersection points.

ATM in the area of the aerodrome (air hub) consists in the development and implementation of a set of organizational and technical solutions to create a highly efficient and safe ATS system that meets the needs of air traffic.

The created ATM system should be adapted to function both in normal (standard) conditions and in conditions of "peak" air traffic intensity (daily and seasonal), failure of RTS navigation, "failed" situations in air traffic, complex (dangerous) meteorological phenomena etc.

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IMPROVING THE ORGANIZATION OF LANDSCAPING SERVICES – TIME REQUIREMENTS

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Abstract. *This article is devoted to landscape services, which have become one of the most global problems in the world. It is emphasized that the lack of attention to the improvement of this network today is one of the most pressing problems of this type of services. At the same time, the most important aspects of landscaping are illustrated with examples, proposals and recommendations for the development of this type of services are developed.*

Keywords: *landscaping, landscaping services, urban improvement, landscaping, cities, district centers, modern appearance, landscaping facilities, landscaping.*

Introduction

Landscaping services, which is one of the most global problems in the world today, cover all developed and developing countries. Especially in the capitals of countries around the world, environmental cleanliness is in the focus of attention of all levels of government, political parties, social movements, the media, as well as the population.

Literature review

In order to effectively develop landscaping services and pay special attention to this type of service, President of the Republic of Uzbekistan Sh.M. Mirziyoyev's Resolution No. PQ-4351 "On Additional Measures to Improve the Efficiency of Work in the Field of Improvement of Settlements" adopted on June 4, according to which In order to address this issue, it is necessary to take consistent measures to improve landscaping through the establishment of landscaping departments on the basis of existing organizations (divisions) on landscaping in the districts and cities of the country. new tasks for the development and updating of the database, standards, urban planning norms and regulations have been identified.

Research methodology

In the implementation of the study, conclusions and recommendations were formed as a result of the analysis of indicators of effective development of landscaping services through economic methods. In addition, the methods of analysis and synthesis were effectively used in the study of landscaping by zoning in the conduct of scientific research.

Analysis and results

Analyzing the day-to-day operations of cities around the world is a challenge to addressing a number of issues in that city. Most importantly, the development of landscaping services is another important indicator that serves to enhance the status of cities, while ensuring economic and social stability. However, one of the most important problems in the development of landscaping services is the lack of focus on improving this sector today.

Landscaping services, so to speak, are the servants within the enclosure. It’s a process that changes the mood of each of us throughout the day, either in a very beautiful way or vice versa. It is advisable to study this type of service into the following objects.

Areas of landscaping - landscaping, in front of regional, district, multi-storey buildings, neighborhoods and other areas, including playgrounds, courtyards, functional planning structures, administrative buildings of districts and urban districts, as well as in accordance with the principles of a single town-planning regulation isolated areas (security zones) or visual-spatial perception (area with buildings, adjacent territory and street with buildings), other specially defined areas.

Landscaping standards - a normalized set of elements of landscaping of specially designated areas, where the norms and rules of landscaping are determined, controlled by the norms and rules of their placement in this area.

Examples of such areas are:

- technical (safety and operation) of various functional purposes, pedestrian communications, roads, public places, public places and zones, housing development, sanitary and protective zones of industrial development, recreation areas, residential street and road network, engineering communications zones.

Cleaning of areas - this requires the timely completion of tasks related to the collection of industrial and consumer waste, other garbage, snow, transportation to designated areas, as well as other measures aimed at ensuring the ecological and sanitary-epidemiological well-being of the population and environmental protection. In the conditions of our country, the size of courtyard plots is 300-600 m2, depending on the characteristics of the urban situation.

The estimated density of the housing stock in the territory of residential districts and neighborhoods shall be taken in accordance with Tables 1 and 2.

It is not allowed to increase the existing density of residential buildings in the zones of environmental disasters and emergencies identified in accordance with the criteria for assessing the environmental condition of the territories without taking the necessary measures for environmental protection.

Table 1.

Density of housing stock for the total area 1 ha, m2

Floor of residential houses	Residential houses with plots of land		Multi-family apartment buildings								
	1-2 yards	2 blocks	2	3	4	5	6	7	8	9	12
Density of housing stock, at least	1200	1800	2200	3900	4200	4800	5100	5400	5700	6300	6700

Notes: 1. The density of the housing stock may be changed with appropriate justification during construction and reconstruction in the territory of urban settlements.

In the construction of multi-storey buildings, the density of the housing stock should be taken according to the medium harmonic formula:

$$\frac{100}{a_1/n_1 + a_2/n_2 + a_3/n_3 + \ldots},$$

бу ерда *a1, a2, a3* - the total area of multi-storey residential buildings accepted in the project, as a percentage of the total area of all residential buildings in the area;

n1, n2, n3 - density of the housing stock, determined from Table 2, m2 / ha, depending on the number of storeys of the adopted buildings.

In determining the density of the housing stock in settlements with a population less than the specified number for one area, service institutions and enterprises, as well as land plots occupied with greenery for the settlement as a whole are not taken into account.

Table 2.

Density of the housing stock with a total area of 1 for the territory of the residential district, m2

Floor of residential houses	Residential houses with plots of land									
	1-2 yards	2 blocks	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**12**
Density of housing stock, at least	700	1200	2200	2600	2800	3100	3200	3400	3500	3700	3900

Notes: 1. When calculating the density of the housing stock, the area of service establishments and enterprises, car maintenance enterprises and other objects of city significance located in the residential area shall be excluded from the area of the residential area.

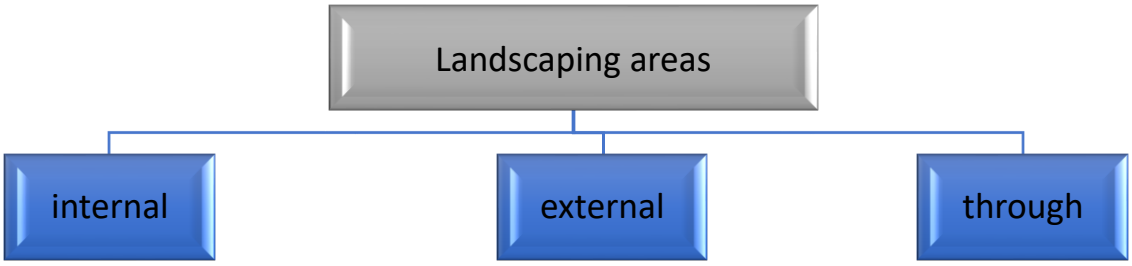
In cases where the residential district is bordered by main streets, the area of the residential district shall include half the width of the main streets bordering it.

The volume of demolition of the base structure in the reconstruction of districts with a predominance of pre-existing capital housing will be determined based on the urban development conditions of the region. Construction of attic floors in the zones of historical installations is allowed in accordance with the general stylistic unity of the historical environment, preservation of historically formed landscape views of historical and cultural monuments. [3]

Landscaping areas can be divided into 3 main parts:

Figure 1.

Landscaping areas



Internal areas - fronts of provinces, districts, high-rise buildings, neighborhoods and other areas, including playgrounds, courtyards, functional planning structures, administrative buildings of districts and urban districts, as well as areas (security zones) or visual -spatial perception (area with buildings, adjacent territory and street with buildings), includes other specially defined areas.

When landscaping the interior, first of all, these areas are beautified with the help of various flower beds, species of flower varieties that look beautiful in hanging pots (fucus, surfinia, pelargonium).

When landscaping outdoor areas, it is advisable to decorate the perimeter of the building or structure with various types of outdoor trees, shrubs, spruces and roses.

Special attention is paid to irrigation and drainage systems in the landscaping of the intermediate part. An important part of this area is usually occupied by lawns, which makes it extremely convenient for people to relax.

The formation of a modern image of existing cities and settlements in the country, the harmonization of road transport and engineering-communication infrastructure with modern urban planning norms and requirements will play an important role in the future economy and development of the country.

Conclusion

As a result, we can say that the existing cities and districts of the country will be beautified, the maintenance and operation of facilities will be carried out in a timely and quality manner.

The issues of landscaping of streets, squares, alleys, monuments and other public green areas of the country, agro-technical measures for the care of trees, the fight against their pests and diseases are gradually being addressed.

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RESOURCES OF THE TOURIST TERRITORY: NATURE, COMPOSITION AND ROLE IN THE DEVELOPMENT OF THE SOCIO-ECONOMIC SYSTEM

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Abstract. *The article provides a scientific and theoretical analysis of the definitions of the concept of "tourist resources" given by foreign and domestic scientists, based on the grouping of different approaches. Based on the results of the analysis, the composition of tourist resources was determined, and an author's definition of this concept was developed.*

Keywords: *tourism, tourist resources, recreational resources, two-factor approach, three-factor approach, natural-climatic conditions, infrastructure.*

Introduction

In recent years, in the context of globalization of international relations, integration processes in the world economy are constantly under the influence of deintegration factors (increasing number of "conflict points" around the world, the introduction and intensification of socio-economic sanctions, the spread of various diseases, etc.). At the end of December 2019, the spread of COVID-2019 in China was recorded, which has forced the whole world to change its attitude to socio-economic policy to this day. The global impact of the coronavirus epidemic has posed a serious threat to all aspects of the world - economic, social development and other areas. This impact has had a significant impact on the economic situation of airlines, especially in the field of tourism and hospitality.

Tourism has been noted as one of the leading sectors of the world economy for the last twenty years, and its growth rates and share in global macroeconomic indicators have led to its recognition as a future industry. These trends have become the basis for comprehensive reforms aimed at developing the tourism sector as a leading sector of the national economy in Uzbekistan, which has a high tourism potential. The Decree of the President of the Republic of Uzbekistan Sh.M.Mirziyoev dated December 2, 2016 No. PF-4861 "On measures to ensure the accelerated development of the tourism sector of the Republic of Uzbekistan" provides for the restructuring and diversification of the national economy. A number of tasks aimed at accelerating the development of tourism as one of the powerful tools to deepen employment, increase incomes and quality of life and make tourism one of the strategic sectors of our economy have been identified, and the main priorities have been identified.

More than 70 normative and legal acts adopted in 2016-2019 have created the primary and necessary conditions for the rapid development of the tourism industry in our country. Reforms aimed at developing the tourism sector as a strategic sector of the national economy have yielded positive results. The number of foreign visitors to Uzbekistan has been growing steadily every year. Thus, in 2019, the Republic of Uzbekistan was visited by 6748 thousand foreign tourists, which is 26.2% more than in 2018.

By the 21st century, tourism has become a way of life for everyone and has the potential to recover quickly after political, economic and social crises. Therefore, one of the most pressing

issues today is the revival of the tourism industry and the rapid economic reforms in the field, based on the current sanitary and epidemiological situation in the world.

From this point of view, scientific research on the content and essence of the concepts inherent in the tourism system, in particular, the concept of "tourist resource" is relevant today.

Literature riview

The economic literature studies theoretical and methodological issues specific to various aspects of tourism development. In particular, the theoretical foundations and practical issues of economic relations inherent in the tourism economy, tourism market economy, as well as specific issues of the use of tourist resources were studied by scientists from the CIS countries VI Azar, IT Balabanov, A.Yu. Alexandrova, V.S. Bogolyubov, M.B.Birjakov, M.N.Dmitriev, A.B.Zdorov, N.B.Zorin, V.A.Kvartalnov.

A.Yu.Aleksandrova, A.M.Gavrilov, N.N.Zubakova, P.I.Karanevsky, A.S.Kuskov, M.A.Morozov, studied the elements of resource potential of regions for the development of recreation and tourism. I.Mukhina, I.I.Pirozhnik, V.S.Prebrajensky, N.S.Mironenko, I.T.Tverdokhlebov and similar scientists made a great contribution.

Specific issues of tourism development in Uzbekistan KH Abdurahmanov, EV Golisheva, NS Ibragimov, MK Pardaev, AF Saidov, B.Sh. Safarov, T. Tashmuratov, N. Tukhliev , IS Tukhliev, BH Turaev, DK Usmanova, OH Khamidov, MT Alimova and a number of other economists.

Research methodology

Since the purpose of the study was based on the coverage of the theoretical and methodological foundations of the topic, theoretical research methods were used to shed light on the theoretical foundations of the tourism area.

Analysis and results.

The use of the concept of "tourist resource" is accepted in the scientific literature on tourism. Tourism resources are the basis for creating a tourism product. Analyzing the views of different authors on the nature and elements of tourist resources, we can conclude that there is no consensus on this issue. In some sources, the concepts of "tourist resource" and "recreational resource" are considered as interrelated concepts, while in some sources, these resources are interpreted as the same concept, which requires clarification of the definition of these concepts.

Recreational resources are interpreted as the sum of natural-climatic, domestic, cultural, health-improving, educational, historical and other similar resources used or intended to be used in the provision of recreational services in the course of recreational activities [1]. Table 1 lists a number of definitions of “tourist resources”. In our view, the concepts cited do not fully disclose the economic content of these resources, which in turn implies certain definitions. We propose to consider tourism resources in terms of their impact on the socio-economic development of the regions.

The tourist resources of the region are a specific type of resource and require special approaches to their classification. The classification of tourist resources has been carried out by scientists at different stages of development of the tourism industry. In particular, the Polish economist M. Trausi (1963) divides tourist resources into three groups: natural (climate, air, landscape, sea, river, mountains, forest, etc.); resources created by human labor (architectural structures, sculptures, works of art, etc.) and additional (resources created by human labor for the purpose of service-infrastructure).

Table 1

Basic concepts of tourist resources

Contents	Name of source	Authors
Although Article 17 of the law recognizes tourist resources as natural, historical, socio-cultural, medical and health facilities, as well as other facilities that can meet the needs of tourists and excursionists, they are not explained as a separate article.	Law of the Republic of Uzbekistan on Tourism	Law of the Republic of Uzbekistan, No. O'RQ-549 of 18.07.2019
A complex of cultural-historical, socio-economic and natural objects that can be used in tourism	Tourism, service and hospitality	L.P. Voronkova
Natural-climatic, socio-cultural, historical and similar resources of the region, which is a factor of the tourist microenvironment and creates a tourist impression, able to meet the interests of tourism	Practical touring	G.A. Avanesova
Objects and events such as natural-climatic, socio-cultural, historical and archeological, scientific and industrial, spectacular, architectural, which are able to meet the goals and needs of man in the field of tourism	The role of tourist resources in the development of tourism	V.I. Maslov
A set of natural-climatic, socio-cultural and infrastructural factors of the region used in the production of tourist products to meet the goals and needs of man in the field of tourism	Development of regional tourism on the basis of tourism resource management strategy	A.I. Frolov

French economist P. Defer (1972) believes that infrastructure facilities are not part of tourist resources. It divides tourist resources into four groups: hydro (water bodies); fitom (er, nature); lithom (man-made architectural buildings and structures); anthropom (intangible human activities - customs, holidays, rituals, values, etc.) [2]. A number of researchers support the views of P. Defer, including M.E. Nemolyaev, L.F. ... while these businesses provide access to tourism resources, they cannot serve as a tourist destination on their own. " We cannot agree with P. Defer's views: In our view, infrastructure facilities are part of the resource element needed to create a tourism product.

SA Bystrov and MG Vorontsova have a different opinion on the composition of the elements of tourist resources. They include in the classification of tourist resources natural and tourist interest, direct tourist resources, infrastructure resources, as well as resources of tourism production factors (financial, information, labor, education, material, etc.). The views of MM Amirkhanova, NS Lukashina, AP Trunev on the composition of the elements of tourist resources are of particular interest. They include complex tourist resources (resources of natural-territorial tourist institutions), natural-continental and natural-aqual, natural-anthropogenic (parks, alleys, forest parks, national parks) and unique and unique (natural parks) consisting of natural areas such as nature reserves, river valleys. natural monuments). LV Gorkanova summarizes the main approaches to the classification of tourist resources [3]. According to him, the classification of tourist resources can be made on the following criteria:

 general (in terms of origin, recovery capacity, unusability or complete loss rate);

 by the composition of resources (description of use, functional suitability (use in its intended direction), the ability to replace one resource with another);

 on the quality of tourist products (level of convenience, aesthetic appeal, importance);

 by prevalence in the region;

 According to the intensity of use.

Analyzing certain approaches to the classification of tourist resources, the author suggests the use of a classification conducted by researcher N.P. Krachilo on the composition of resources and fully covering all elements of the natural and economic potential of the region. In this case, the author proposes to replace the first group of "natural resources" with "natural-climatic resources", and to expand socio-economic resources based on the classification proposed by S.A. Bystrova and M.G. Vorontsova. In addition, it is proposed to divide the group of socio-economic resources into subgroups of "infrastructure", "organizational and managerial resources" (education, personnel, management, material, financial, information, institutional resources).

As noted above, a number of authors do not include infrastructure tourism resources in the group of socio-economic resources, preferring to consider such resources as a separate group. In our opinion, it is expedient to include tourism infrastructure in the group of socio-economic resources, as it is tourism infrastructure that is an important link in the creation of tourism products and the main resource for the development of the tourism industry. It is also necessary to replenish the group of socio-economic resources with elements of the institutional environment.

Systematic scientific research on the flow of tourists and the placement of recreational resources began in the 70s of the last century, such research includes M.A. Ananev, 1975; N.S. Falkovich, 1972; P.T.Lixanov, 1973 such as work done by scientists.

The first description of recreational resources was given by a number of scientists from the Institute of Geography under the direction of V.S. Preobrazhensky. While the resources are interpreted from a natural-geographical point of view, their study relies on an assessment of the natural-landscape environment of recreation and leisure.

It should be noted that in the early stages of the study of this object as a resource there are a number of scientific works that consider only natural constituents (A.A. Mikhailov et al., 1971; U.K.Savelev, T.S. Shchitov, 1977 y.) [4]. The growth of tourist activity of the population, the wider involvement of new natural and other tourist resources in the process of circulation By the 1980s, there was a need for a systematic study of recreational tourism, taking into account the technical and economic indicators. It should be noted that the research in the field of tourism was initially characterized by a strong emphasis on the geographical aspects of the industry, but later these studies have become more in-depth, taking into account the social and economic aspects. In this case, recreational resources are considered in terms of their ability to exhibit positive features in terms of time and space, ie not only in terms of functional convenience (suitability in terms of organizing recreational activities), but also in terms of territorial and temporal convenience. In terms of time, convenience reflects the duration of functionally favorable conditions, while regional convenience refers to the size of the area with favorable opportunities for recreation. This interpretation of recreational resources is described in the scientific monograph of NS Mironenko, M. Bochvarova (1986). explained [4].

According to most authors and researchers, the general aspect of tourist resources is that they reflect objects and events of natural-anthropogenic character, whether directly or indirectly related to the needs (goals and interests) of tourists.

The specifics of the approaches to defining the concept of "tourist resources" are reflected in their composition, integrity and specificity to a particular region. In our study, we divided the definitions of the concept of “tourist resources” into three groups.

1. Approaches to the description of tourist resources in terms of their composition. Some authors refer to these resources as two enlarged groups of internal factors - natural and socio-cultural factors: “natural and cultural landscapes” (I.I. Pirozhnik, E.L. Plisetsky), “natural elements and specific results of human activity” (P .Deffer), "natural and cultural-historical objects" (G.A. Karpova, Glossary of tourist terms). A number of other authors believe that such resources should include historical, architectural, archeological, religious, scientific, exhibition facilities (D.S.Ushakov, V.I.Azar, V.N.Akishin, etc.). , but it should be noted that, in essence, these resources are a practical result of the socio-cultural activities of society. For this reason, these definitions reflect a two-factor approach to the interpretation of tourism resources.

Another approach to determining the composition of tourist resources is based on the separation of three groups of factors - natural, socio-cultural and infrastructural (logistical).

In our opinion, the first approach to defining the concept of tourist resources is a bit narrow and does not fully reveal the essence of this concept. We will try to explain this by the regularity shown in the definitions given. This law is manifested in the form of interrelationships between criteria such as "content" and "conditions of transfer".

2. An approach to defining tourist resources in terms of the interrelationships of tourist elements. In addition to differences in the definition of the composition of tourist resources, there are also some differences in their interpretation. The following differences are related to the interdependence of tourism resource elements.

In particular, I.I. If researchers such as Pirozhnik, P. Deffer, E.L. Plisetsky consider individual objects that serve the needs of tourists as resource-forming factors; Authors such as G.P.Dolzhenko, O.O.Baydik, V.G.Gulyaev, I.N.Gavrilchak interpret the interaction as a tourist resource, rather than individual elements of natural-anthropogenic character that meet the needs of tourism.

Table 2

The structure of tourist resources in the scientific work of foreign researchers

Two-factor approach:	A three-factor approach: Nature + socio-cultural + infrastructure

Nature + socio-cultural *Yu.B. Xramov, V.A. Klyushkin, 1976:* *-natural;* *-cultural.* *Yu.A. Vedenin, V.N. Kozlov, 1995:* *-natural;* *-cultural-enlightenment.* *Yu.S. Putrik, A.V. Gitbut, 1995:* *-natural;* *-cultural-historical.* *A.B. Shtogrin, 2000:* *-natural;* *-socio-cultural.* *V.V. Xrabovchenko, 2003:* *-natural;* *-social;* *-cultural-historical*	*R.Grande, 1993;* *N.I. Kabushkin, 1999;* *A.Yu. Aleksandrova, 2001;* *I.A. Revinskiy, L.S. Romanova, 2001;* *A.G. Nizamiev, 2003:* *-natural;* *-socio-cultural;* *-infrastructure.* *Yu.V. Lisauskayte, 2000 y .:* *-touristic;* *-curortological;* *-health;* *-material.* *T.K. Sergeeva, 2004:* *-natural landscape;* *-cultural landscape;* *-infrastructure.*

In the organization, planning and control of production activities at the level of tourism firms or on a micro scale, resources are considered as separate objects or their various ratios used in the creation of a tourist product. In determining the consumption value of tourist products and creating an image in this regard, the integration of factors used to meet the complex needs of tourists and used in the production of resources is used.

1. Approach to the definition of tourist resources in terms of their dependence on tourist areas. At the same time, most researchers do not use the practice of "linking" tourist resources to a particular area in determining them. It should be noted that it is impossible to organize production activities by moving tourist resources from one place to another. Therefore, we support the approach put forward by researchers such as EL Plisetsky, G.P. Dolzhenko, G. Harris, O.O. Baydik, I.N. Gavrilchik and D.S.Ushakov. The above-mentioned researchers recommend the study of tourist resources "linking" to a particular area the factors that allow to create tourist products and meet the needs of tourists. In addition, from the point of view of regional tourism, it is important to "attach" resources to the region, because regional resources are available in a limited way and reflect the state of a specific area of the region. The ability of a region to meet the needs of tourists is determined by the composition and quality of the resource factors available within the region.

Conclusion and recommendations

Summarizing the results of the analysis, we can highlight the criteria that can be used to determine the regional tourist resources:

1. Complexity description - "generality of factors of natural and anthropogenic characterization";

2. Content - "natural-climatic, historical-cultural and socio-economic factors";

3. Territorial affiliation - “factors that own or exist in a particular territory”;

4. Conditions of carrying out - "Possibilities of use in production of the tourist product on satisfaction of needs in the purpose and process of tourism".

In conclusion, regional tourist resources are a complex set of natural-climatic, historical-cultural and socio-economic factors of the region used in the development of tourist products to meet the needs of the visitor in the implementation of tourist goals.

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ELECTRONIC COMMERCE SYSTEM

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Abstract. *This article " digital of the " economy " category definition and him to develop different approaches given. Digital of the economy one part calculated electron of commerce essence, classification and electron in commerce transactions where in order structure according to the word is brogan. Electronic commerce development according to offer and recommendations work released.*

Keywords: *electronic commerce, e-commerce platform, online stores, blockchain, electronic contract, IT technologies, transaction, electronic message, electronic motor, electronic document.*

INTRODUCTION

Last in years information technologies and global Internet development significant growth a person of life different in the fields new of directions appear to be take came. Electronic commerce current At the time of the Internet society diary to his life high speed with come in came and his indispensable to the part is spinning.

Electronic commercial term too wide concept to him many definitions given Quoted definitions mostly via the internet done increased each how to trade or to the transaction electron it is called commercial.

Electronic commerce when you say computer networks using done to be increased all financial and trade operations and such operations with dependent business processes own into received economy field is understood.

METHODS

Electronic commerce electron praises done increase, customers and delivered givers search, advertising distribution, internet applications through goods buy get and sell such as many business operations to perform possibility gives. Electronic of commerce this type past appeared in the 60s of the century to be despite the last ten year global changes within happened is giving Global information and cheap digital of gadgets appear to be population number increased going electron of commerce fast of possibilities use enable gives. Electronic of commerce advantages about the following to say can: Time and alive work expenses with depends transaction expenses reduction; For purchases, payments fast input, desired from the place and desired comfortable at the time access opportunity; Client to himself comfortable time, place and at speed the product choose and buy get opportunity have Trade activities the work activity with together in parallel, that is work from release not separated without take to go opportunity; A lot numerous of buyers one of time in itself one how many to firms appeal do it get opportunity; Necessary products at speed looking for to find and this products there is has been to businesses appeal in doing technique and from vehicles efficient use opportunity; of the buyer to live place, health and material supply from the level strictly look everyone row equal to entitled product buy get opportunity; Current of the day there is the world standards answer giving products choose and sell opportunity; Electronic in commerce trade organize to do of enterprises competition strengthens, from monopoly emits and of products quality increase opportunity gives.

Electronic this is commercial online buy get and sell process. These funds and data electron network through transmitted business deal So, physical and digital of products all types sell and services of the deal two participant in the middle organize will be done. This to the participants according to, electron commerce one how many kind of deals own into takes:

• Business for business (B2B)
• To the client business (B2C)
• To the client buyer (C2C)

Electronic commerce companies and to individuals this huge to the market to join and each two towards too big for advantages have has been trade from the model used without own businesses to develop possibility gave. This business of the model main benefit is convenience. Electronic commerce each always works 24 hours a day, a week seven day. That's it means that buyers the work hours, to location how reached to go and the like things without thinking, the product when convenient to get can.

RESULTS

Electronic of commerce objects and subjects, their right and obligations clarified, transactions done increase and their performance provide mechanisms marked, electronic trade to the fields and electron to the contract requirements, goods deliver and praises done increase issues, contract conditions refusal to perform order and electron in commerce export done increase features determined given.

Electronic commerce with valid to legislation according to realization of goods (works, services). to do to the right have entrepreneurship subjects to engage in possible being, in this electron commerce with engagement for addition permission reach feature have document is not required.

Electronic in commerce electron documents on paper formalized and own hand with signed to documents is equalized.

Electronic in commerce contract parties in the middle contract conditions electron documents and messages confirmation the way with agreement through electron document in the form of will be formalized.

Electronic in commerce sellers of the following consists of:

Electronic trade on the field goods (works and services) retail or wholesale sell according to activity done increasing legal persons and alone in order entrepreneurs;

Electronic trade on the field retail goods (works, services) sell according to activity done increasing himself booked by himself persons.

In the field payments the following in methods done is increased:

- Cash money funds with
- Money funds from the bank account transfer through;
- Electronic of money used without

Trade of the fields operators, payment services delivered givers and goods delivered to give services showing legal persons own information to systems or "escrow" service to bank accounts current reach can.

Goods for client by payment done increase during the "exrou" service showing paid money funds client goods of receipt confirmation to be taken until storage to the right have. If the goods delivered if not given or to the description suitable if not, "exrou" service showing money funds

to the buyer returns. If the goods audience by acceptance done if so, money funds of the seller to the account will be held.

Information for, escrow service this financial deal is then the third towards in agreement participant two towards for necessary was payment funds, agreement complete done to increase until, in itself storage and to manage own undertake takes This is it in turn money conditional storage account in the number holding stand up through, agreement more safe to be possibility creates. Payment reliable of the company control under only of the contract all conditions when done openable safe account in the number is stored.

The following electron of commerce main principles is:

- electron in commerce entrepreneurship activities done increase freedom;
- electron in commerce transactions to compose optionality;
- electron in commerce participation reach conditions equality;
- electron commerce of subjects rights and legal interests protection to do
- documents, that's it including electron documents (messages) one diversification;
- information safety provide;
- of goods (works and services), relevant quality provide;
- electron commerce in the field openness, transparency and precision
- Electronic in commerce transactions optional basically is made.
- Electronic deal conditions of the parties at will according to is determined.

Electronic trade the pitch is organizational, informational and technical of decisions software -hardware set, that's it including sale of goods (works, services). for information system through vendor and mutual buyer (customer). Cooperation designated as an online store that provides;

Electronic message is this information the sender identification possible giver electron form note done marked as information;

Electronic the tool is electron in the form information again work, save and him to exchange intended computer and (or) other technical tool, as well telecommunications marked as a network;

Electronic contract is this trade of goods (works, services). for information from systems used without vendor and client in the middle to be built defined as a contract;

Electronic the document is in electronic form note electronic digital signature know approved and electronic document him identification enable giving another to the props have has been information.

DISCUSSION

" Electronic commerce about " under Article 9 of the Act electron documents and electron in the form note done data, their electron address (e-mail so-called messages) to identify possibility gives, to paper based on documents with legal in force recognized as equal, also signed and transactions evidence as use can. Current at the time of Uzbekistan valid in UNCITRAL documents on the law that it was as, electron commerce within paper documents and electron messages between equality set placed.

Information technologies on a global scale development economy and in society changes for lever became of these processes main structural from the parts one of the Internet of the economy all networks come in is going. Last sometimes through the Internet commerce connections scope significant level expands, it is the following structural parts own into takes:

- via the internet goods sell and buy get
- electron from networks use through money funds transfer
- electron in the form information trade and others

Electronic commerce modern in economics very with high temp developing from fields is one to him one by one of the company digital technologies and they are giving to benefits based, profit which brings activity as is considered. new commerce environment attraction done buyers known opportunities and to benefits have will be Organizations in front standing tasks information and communication technologies of possibilities used without much fast and the most less cost with solution is being done.

Electronic commerce development opportunities evaluation for not only to the Internet connection and of organizations modern computers with technical equipment, perhaps website and electron mail address availability is also large important have. Organization personal website electron economic relationships participants between mutually contact opportunities significant level extends:

- site organization activity with dependent useful information announcement does: analysis and market news, statistics research, trends, customers with of communication to himself special features of this theoretical and practical basics;
- business, organization news placed;
- portfolio to the site or product image will be placed. Consumer offer being carried out goods looks like this announcement done quality, features confirms the company professionalism shows;
- electron in the form information trade and others;
- site to the consumer company with contact installation opportunity gives On the site present done or present being carried out goods and services on the surface public his opinion determination for they ask to pass possible;
- to advertising, of the company to himself and to the product relationship
- fast order

Highlight that's right, the republic scale online of purchases most of them local from stores done is increased.

CONCLUSION

Digital economy when you say only Blockchain technology and of them international finance in the markets use issues or cryptocurrencies to understand need not. Of course, Blockchain technology, cryptocurrencies are also digital of the economy one piece. But digital economy (Digital Economy) means digital communications, using IT take to go economy is understood. In this case, hidden to the economy I'm done to give tool also viewed as can Because first, all operations electron register to the transition, secondly transparent to be is achieved. In addition, in release new IT technologies application because of product and of services cost decreases. Electronic commerce this each two towards benefit for which brings tired activity type is considered Electronic in commerce deals each two towards have come without contract is made and composed contract paper contract with equalized.

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INCREASING THE PLACE AND ROLE OF PRIVATE ENTREPRENEURSHIP IN THE DEVELOPMENT OF THE SERVICE SECTOR

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Abstract. *In this article, the relationship between the service sector and private entrepreneurship, the analysis of the main economic indicators related to them, and the relevant proposals for increasing the role of private entrepreneurship in the development of the service sector have been developed.*

Keywords: *private business, service industry, self-employment, after-sales service, financial services, trade services, investment projects.*

Introduction

One of the main goals of establishing a socially oriented market economy in Uzbekistan is the priority development of private entrepreneurship. In order to realize this goal, economic reforms are being carried out step by step, and large-scale institutional foundations have been created to increase the role of private entrepreneurship. Legal and regulatory documents guaranteeing the organization of private business activities, free operation, market infrastructure supporting private business have been formed. As a result, to this day, private business entities operate in all aspects of the economy of our country, in the production of machine-building products, in the production of consumer goods, agricultural and food products, and in the provision of services.

In the development strategy of New Uzbekistan for 2022-2026, the goal is to create conditions for the organization of business activities and the formation of permanent sources of income, to increase the share of the private sector in the GDP to 80% and the share of exports to 60%.

The role of private entrepreneurship in the further development of the service sector in our country, especially in the development of information and communication services, repair services for computers, personal items and household goods, services related to intellectual activity, is invaluable. The issue of increasing the role of private entrepreneurship in the service sector is one of the urgent issues.

Literature analysis on the topic

The research conducted by economists L.N.Manitskaya and B.M.Zhukov on the development of the service sector, modernization of service enterprises and organizations is one of the most important scientific achievements in this regard. They developed models of modernization in service enterprises and indicated the external and internal factors affecting it[2].

The issues of achieving economic efficiency in the field of services and finding points of economic growth have been widely studied in the scientific researches of our local scientists Q.J.Mirzaev and M.Q.Pardaev [3]. The issue of development of entrepreneurship in the field of services is reflected in Sh. Kuvondikov's scientific researches [4]. Also, marketing problems in the development of private entrepreneurship [5], organization of sales channels [6], development of

after-sales services [7], issues of customer service in the wholesale trade service [8] were studied in the researches of D.H. Kholmamatov.

Research methodology

The method of analysis and synthesis of statistical data was used to consider the issue of increasing the role of private entrepreneurship in the development of the service sector. Observation methods were also used to study the state of private entrepreneurship in the service sector. In the study, based on monographic observation and logical thinking, personal approaches to the issues of increasing the role of private entrepreneurship in the development of the service sector were put forward.

Analysis and results

Our experience in our country in a short period of time has proven that small business is an important factor of sustainable economic growth. Especially in the conditions of deep structural changes and diversification in the country's economy, private entrepreneurship serves as an important factor in the sustainable development of our national economy, increasing its competitiveness and achieving high macroeconomic indicators.

Reduction of state interference in the economy requires, first of all, continuation of institutional and structural reforms aimed at protecting the right of private property and further strengthening its priority position, encouraging the development of small business and private entrepreneurship.

The accumulated experience in the development of private entrepreneurship in our country shows that increasing the level of competitiveness of enterprises requires that they expand and become larger in the course of their activities. However, in some cases, the quantitative limits of enterprises that allow private business entities to have privileges and reliefs established by the state may hinder these processes. During the past period, many enterprises, whose economic potential has increased as a result of the increase in the level of socio-economic development in our country, favorable conditions created for private business entities, in order to continue using these benefits, try to keep the number of employees within the set quantitative limit. are doing This hinders their growth.

Small business and private entrepreneurship are gaining a strong place in the country's economy. In particular, in 2021, 54.9% of GDP, 27.0% of industry, 72.4% of construction, 74.4% of employment, 22.3% of exports and 48.7% of imports will be accounted for by small businesses.

If we pay attention to the analysis of the volume of services provided by the main types of economic activity, the volume of the main services is made up of trade services, transport services and financial services (Table 1). In 2021, a total of 284,165.4 bln. 25.5% of the services provided are for trade services, 23.6% for transport services, and 21.0% for financial services. These types of services make up about 80% of total services.

Table 1

Volume of services by main type of economic activity (billion soums)

Indicators	2017	2018	2019	2020	2021
Services - total	118 811,0	150 889,8	193 697,8	219 978,5	284 165,4
information and communication	8 196,7	10 332,6	10 891,7	13 852,3	17 755,1
financial activities	15 023,8	21 296,3	34 036,6	45 783,0	59 733,3

transport activities	36 217,2	44 159,4	54 473,5	53 662,9	67 238,6
of which: motor transport	20 232,9	21 786,8	25 527,5	28 474,1	36 249,3
accommodation and food service activities	3 649,6	4 673,3	5 933,6	5 431,7	8 375,4
trade	32 006,9	39 743,4	48 748,2	57 572,7	72 483,3
real estate activities	4 026,5	4 949,2	5 950,7	6 016,9	8 081,1
education	4 402,0	5 416,5	7 164,9	8 539,4	12 021,8
human health activities	1 701,5	2 220,0	3 104,3	3 386,7	5 105,9
renting and leasing	2 589,2	3 297,4	3 733,5	4 149,0	5 351,0
repair of computers and household goods	2 329,2	2 630,7	3 200,1	3 347,8	4 680,5
personal	3 134,4	3 700,6	4 575,6	5 032,2	6 764,1
architectural and engineering activities, technical testing and analysis	1 611,7	2 953,6	4 543,1	4 907,5	6 306,8
other services	3 922,3	5 516,8	7 342,0	8 296,4	10 268,5

Services for repairing computers, personal items and household goods, personal services, services in the field of information and communication are decreasing. It is these services that have the main place in private business, family business, and self-employment. The role of private entrepreneurship is especially important in the development of services in the neighborhoods.

The role and place of small business and private entrepreneurship in the service sector can be seen from the analysis of the main indicators in the economic sectors. 204787.4 billion of trade services in 2021. soums, 144812.7 billion of the remaining services. soums correspond to small business and private entrepreneurship (Table 2).

Table 2

The volume of key indicators of small business and private entrepreneurship in sectors of the economy

Indicators	Unit of measure	Years				
		2017	2018	2019	2020	2021
Industry	billion soums	61367,8	87962,0	83344,2	103020,8	121719,2
Construction	billion soums	22469,4	37451,7	53960,9	63866,6	77762,0
Employment	thousand people	10541,5	10128,8	10318,9	9865,7	10070,7
Export	million US dollars	2759,3	3810,8	4714,8	3100,9	3711,2
Import	million US dollars	7511,9	10916,2	14972,2	10943,3	12389,0
Trade	billion soums	92973,0	114896,4	138920,7	164106,1	204787,4
Agriculture, forestry and fisheries	billion soums	152010,5	191759,2	219466,9	253238,2	307280,2
Services	billion soums	69212,7	84433,4	103106,6	114052,7	144812,7
Freight transportation	million tonns	548,8	611,7	641,0	638,9	678,9
Freight turnover	million ton-km	10444,4	11657,7	12152,3	12304,6	13108,1
Passenger transportation	million people	5037,5	5242,6	5345,0	4904,8	5237,6
Passenger turnover	million people km	111435,0	115335,2	117412,7	107766,7	114681,5

The results of our observations show that some types of services are operating in neighborhoods without registration. For example, some types of services that operate without registration in the territory of the neighborhood include a bakery, a bakery or other small catering services, tailoring, shoe repair, hairdressing, small shops (mainly opened from houses), home repair, carpentry, architecture, etc. .

Conclusion

Based on the conclusions reached as a result of the scientific research, the following proposals were developed:

1. In order to increase the role of private entrepreneurship in the development of the service sector, it is first necessary to develop mechanisms for increasing the weight of specific sources of financing for business entities, including public funds, extra-budgetary funds, loans from entrepreneurs, commercial banks and financial institutions, grants from international organizations and foreign countries.

2. Establishment of partnership mechanisms between individual entrepreneurs providing services at home and large and medium-sized enterprises, including the organization of household work, provision of services based on outsourcing contracts. It is especially desirable to organize after-sales service with production enterprises, to attract specialists to service centers.

3. It is necessary to expand the type of services organized along the road and in neighborhoods, to expand the scope of services such as sales services, warehouse services, after-sales service centers, consulting, evaluation.

4. Formation of investment projects for the placement of service facilities in the regions, taking into account the existing demand for services and the capabilities of the regions.

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APPLICATION OF DIFFERENT POPULAR STYLES IN FURNITURE DESIGN

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Abstract. *This article discusses popular historical and modern styles of furniture, as well as the material used and the description of the appearance of the furniture.*
Keywords: *Style, form, material, wood, pattern, ornaments, carving, interior, object, art.*

When talking about styles of furniture, most often they mean their inextricable connection with styles in furniture. But in the entire history of mankind, there are hardly more than a dozen architectural and furniture styles. Previously, furniture was decorated with decor, which was made from mahogany, ebony, in most cases it was done by hand.

The meaning of style according to Dahl's dictionary is an image, a taste. Style in our understanding is artistic unity. Each era has its own ideas. About the surrounding world, his vision of beauty and harmony, which is defined as style of a given era, but over time, the style changes with a new set and is created modernized style. Furniture style is a reflection of the culture embodied in furniture.

There are such types of antique style:

– antique;
– Romanesque;
– gothic;
– baroque;
– Empire;
– Provence.

There are some more types, but they are less popular and are not used as often, they are less likely to be found on sale, less often the craftsmen who make furniture hear about them. Now let's look at each type in detail.

Antique decoration is carried out based on the motives of Ancient Greece and Ancient Rome – columns, tiled marble floor, a lot of light. In such rooms you can find ornaments in spirals, leaves. Antique-style furniture, as a rule, is not sheathed, has a simple shape, is smooth to the touch and wooden with inlay in the form of a mosaic of expensive wood.

Cabinets in this style were not used – instead of them there were chests. The room should have additional accessories - cabinets, chests, low benches.

Romanesque for European furniture is about the same as Latin for all European languages. This style became the proto-language, which subsequently spoke furniture makers from almost all of Europe and the whole world.

It originated between 800 AD. and the beginning of the second millennium, after the decline of the Roman Empire, in the church architecture of southern France, becoming the result of the development and creative processing of Roman monuments, the heritage of Byzantine culture, as well as the culture of the Franks, Normans, Scandinavians.

As a rule, Romanesque furniture has a simple design and a rough massive shape. Cabinets made of poorly planed boards were held up with forged iron plates. This technique originated in France. Columns, profile cornices, arcades appear in late Romanesque furniture.

1-fig. *Romanesque medieval furniture*

Gothic style (1200-1520), an important stage in the history of the development of furniture styles, the heyday of trade and crafts. In France, a new movement began from the Île de France in the north and continued from 1200 to 1525. It gave birth to a furniture style that existed for more than 300 years and entered the history of culture under the name of the Gothic style (Gothic).

The furniture is made of dark shades of wood, has many different elements. Oak, walnut, pine, cedar are variants of trees that are used for production. Such furniture is famous for its precise forms, extraordinary patterns. This direction originated in the XII century, which is why this style is reminiscent of the Middle Ages, and the furniture creates a sense of personal presence in those times. In such models there is upholstery on all upholstered furniture.

2-fig. *Monumental gothic carved walnut fireplace*

Baroque the Italian word “barocco”, which is the name of the style, means a shell of an elaborate shape. Born at the end of the 16th century, the Baroque, in essence, was a direct, natural continuation of the Renaissance style.

3-fig. *Baroque furniture*

The Baroque style in furniture with its magnificent forms was used to decorate the palaces and houses of the monarchy and the aristocracy. In creating rich furniture interiors, Italian masters knew no equal. Wealth and sophistication - this is how you can characterize this style, the main focus of this decor is on luxurious gilded furniture, which has rounded contours.

On armchairs and chairs with carved backs, wardrobes, beds, there are refined curved patterns. Today, many buyers choose furniture of this style, because its cost is very affordable, and the luxurious and rich look has not disappeared anywhere.

Empire. The essence of the Empire style is already expressed in its very name: Empire – from the French "empire", empire. The first emperor of France sought to surround himself with splendor and splendor, which once surrounded the Roman emperors. Empire soon spread throughout Europe.

4-fig. *Empire style furniture*

This is an imperial furniture style that originated in ancient France, and accessories in appearance resemble antique style. The main material for manufacturing is mahogany. Everywhere there are gold-plated ornaments, bronze decorative overlays. The color scheme is white with gilding.

Provence. This is a light southern French style, which still pleases many connoisseurs of light, it displays the simplicity and at the same time the power of old French manors. As in all other styles, the main material used to make furniture is wood. Furniture in such an interior is characterized by an abundance of light and warm, natural shades.

Contemporary styles of furniture. The fast pace of life and technological progress have left a serious imprint on new styles of furniture. Modernity began to dictate new conditions, accordingly, there was a need to optimize the area of housing and the relevance of using all the free space. There are such main types of modern styles:

– modern;
– minimalism;
– high tech;

– constructivism.

Modern. Wavy, curving lines are the main features of this style, furniture made in exquisite colors, made of wood or forged metal, the characteristic of the style is glass, stained glass, artificial materials.

In Art Nouveau furniture, two lines developed in parallel; decorative - floral ornament of chairs and armchairs, cabinets glazed with curved glass, coasters resembling a cup of a flower in shape and constructive – characteristic of German and English Art Nouveau furniture products, straightforwardness and clarity of construction.

5-fig. *Art Nouveau furniture*

Minimalism. Simplicity and conciseness are the main features of furniture design in this style. The main task of this style is to create a feeling of free space, so all elements are minimally equipped with decor.

High tech. The most technological style of furniture design, sliding, built-in wardrobes, transforming sofas prevail. Products with a glossy surface, in most cases silver, complemented by bright colors and flowers.

Constructivism. The use of functional furniture is the main message of this furniture style, and black, gray, green and red colors predominate in production.

Thus, we can say that the modern abundance of furniture styles will allow anyone to furnish a house or apartment for every taste, you must also always remember that you can dream up, make an experiment, and then you yourself will be proud of your creation. A fresh and original look at the interior plays an important role in creating a special style in the room.

The study of furniture styles gives us an idea of the features of different eras, morals and customs. Getting acquainted with different styles of furniture of certain periods, we get an idea of their development.

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HOSPITALITY SERVICES IN TOURISM AND THEIR CHARACTERISTICS

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Abstract. *This article discusses the development and prospects of the hospitality industry in Uzbekistan, the use of a marketing complex, the expansion of the range of hospitality services and the development of additional tourist services, and the problems related to marketing activities in hotels.*

Keywords:*Tourism, hospitality, service, business, industry, opportunity.*

INTRODUCTION

Tourism and hotel business have a special place in the service sector. Therefore, as the President noted, "It is inevitable that the development of this sector will make a huge contribution to the economic and social development of our country by attracting a lot of foreign tourists to our country, and most importantly, by providing large foreign exchange earnings."

The existence of both the necessity and the opportunities for the tourism and hospitality business, the continuous increase of the requirements for it, imposes the requirements to strengthen the economy and increase the efficiency of the tourist complexes that carry out these types of activities, to organize the management tools that serve this, such as tourism marketing in accordance with today's requirements. This demand, in turn, necessitates deep research of the problems of economic development and efficiency improvement of tourist complexes, as well as theoretical, organizational and methodological issues of marketing in them.

These characteristics of the tourist product have a great influence on the content of tourism marketing. Based on this, tourism marketing is a set of methods and methods of organizing the promotion of tourist services in order to meet the demand for recreation and recreation in the tourist market.

Research methodology

Systematic approach, abstract-logical thinking, grouping, comparison, factor analysis, selective observation methods were used in the research process.

Analysis and results

The hospitality industry provides a complex of services to consumers, among which hotel service occupies the main place. From a business point of view, a hotel is an enterprise that has certain consumer characteristics and is able to satisfy the needs of customers, producing and providing services. The improvement of service marketing in the hospitality industry is included.

To achieve this goal, several tasks were set in the work:

1. Development and prospects of the hospitality industry in Uzbekistan.
2. Application of the marketing complex in the field of hospitality.
3. Expanding the range of hospitality services anddevelopment of additional tourist services.
4. Analysis of the main directions and results of marketing activities in the hotel;
5. Show problems related to marketing activities in the hotel;
6. Show ways to improve marketing activities in tourist enterprises.

The hospitality industry is one of the fastest growing sectors of the industry. "Hospitality industry is a business sector consisting of services that rely on the principles of hospitality, characterized by friendliness and openness to guests." In this regard, the hospitality industry can be defined as the names of various activities related to receiving and serving guests. The word "guest" is as important in the hospitality industry as it is in the service industry. According to the applicable legal norms and the rules existing in the practice of the hospitality industry, the term "guest" is similar to the concepts of "consumer" and "customer".

Marketing in the hospitality industry is formed on the basis of the experiences of industrial and commercial companies, has absorbed the achievements of general marketing theories and its practical application. At the same time, marketing in the hospitality industry has a number of characteristics that allow it to be studied as a specific type of activity.

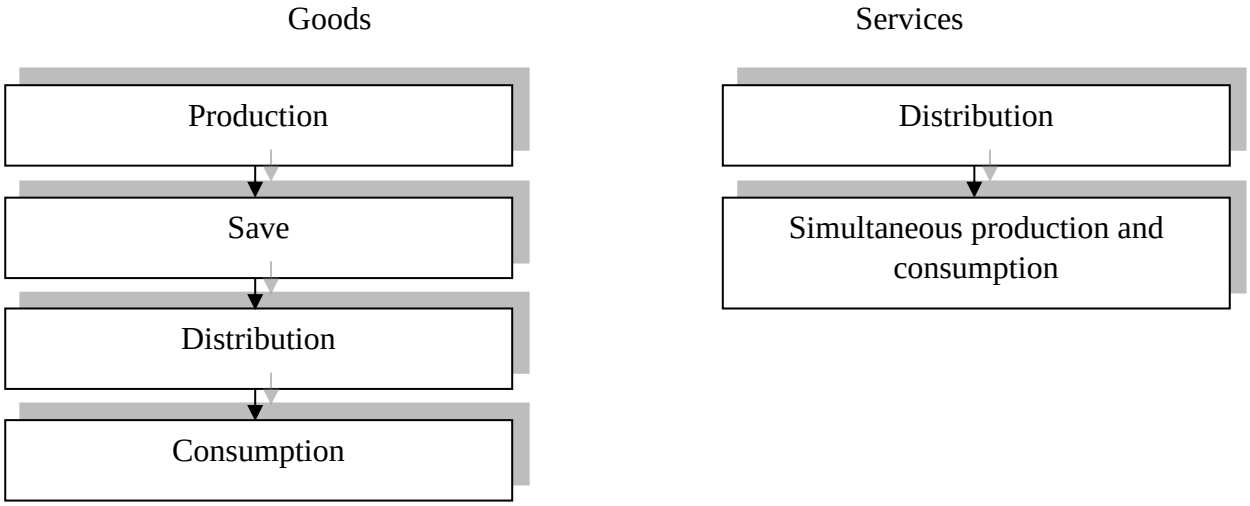
The hotel business consists of several departments offering accommodation, catering, travel arrangements, car rental, dry cleaning, hair salon, massage room, fitness centers. The most important of these are catering, accommodation and delivery services.

The essence of the accommodation service is that, firstly, guests are given a special place for use (hotel rooms) and secondly, services performed directly by the hotel staff are provided.

Food delivery services consist of a complex of various processes: production (food preparation in the kitchen), sales (sale of ready-to-eat products, alcoholic and non-alcoholic beverages), service (service to guests by waiters in restaurants, cafes and hotel rooms).

Figure 1.

Interdependence of development and consumption of goods and services



Tourist services are a set of activities aimed at meeting and providing the needs of tourists and excursionists, and they should meet the goals of tourism, the nature and orientation of the tourist service, and should not be against universal principles. According to the definition of the state standard, tourist services are the products of the activities of tourism organizations engaged in satisfying the needs of tourists.

Services in general are a special type of intangible commodity. Service occurs directly in the consumption process and does not exist separately. This is the main difference between a service and a product. In addition, the goods are brought to the consumer, and in the case of tourist services, the consumer is taken directly to the place where the service occurs. Therefore, the production and sale of tourist services is not governed by the laws related to the sale of material goods, but by a different set of laws.

In the tourism service, the concept of export and the law are different. According to some sources, according to the traditional option, the services of the head of the tourist group in foreign countries and the services of the bus driver sent to work in a foreign country are related to the export of tourist services.

The tourist service includes booking services, transportation, accommodation and all other formalities, all types of transportation, transfers, meals, excursions and attractions, medical examination and insurance, translation services, meetings, etc.. Services may include the services of a group leader and a guide-interpreter.

Each network's range of services is different, determined by the application, and each service has many other elements included.

If we consider tourism, according to general principles, every tourist package will have at least two types of services, which are: transportation and accommodation service package. These are called the main tourist services (two). According to experts, there are more than 400 additional tourist services. Except for the two (main) types of services mentioned above, all other services are additional tourist services. Even catering and excursion services. Services may be extended by the organizer at the request of the tourist, or this may be determined by the organizers at the choice of the tourist. The latter is preferable, because overall prices are reduced to a minimum level according to the principles and values of competition. This leads to the minimization of the package of services.

It was found that successfully organized marketing and expenses spent on bringing the tourist product to the international market will return to the government in the form of economic and political dividends. Comprehensive studies in many European countries show that for every additional dollar spent by each tourist, 50 cents goes to the government coffers in the form of income taxes.

The "Hotel Association" of Uzbekistan should have its own page on the Internet, where video tapes about all tourist products of Uzbekistan and the addresses of tour operators and tourist agents should be displayed. In addition, the Association should have two employees at its headquarters in Tashkent who can speak English fluently and who can provide positive information about Uzbekistan to the international media. The biggest problem in developing a marketing plan for Uzbekistan is the lack of quick and accurate information about the existing market. The Department of Analysis and Economics of the national company "Uzbekturizm" does not yet have such experience. The main focus in this regard is the introduction of a system of timely delivery of information about tourists coming to Uzbekistan together with airports and immigration services. Thanks to the membership of the BTT Executive Committee, Uzbekistan has the opportunity to have information about the situation in the international tourist community. Apart from that, it would be appropriate to involve international diplomatic missions in collecting information about what is happening in major tourist countries. The availability of direct flights to these countries is an important factor when the national company "Uzbekturizm" opens its representative offices abroad. The foreign representative offices of many touristic organizations make it their main task to participate in market activities and work with customers on the spot, providing them with relevant information. "

Repair works of four airports in Tashkent, Samarkand, Bukhara and Khiva are being completed in Uzbekistan.

In world tourism today, the private sector controls 90% of the world's tourism infrastructure.

The main directions of development of investment allocation for hotels are as follows:

• to see medium-class (three-star) hotels that are not large (with an average of 200 beds). This allows for the full use of existing capabilities, easier financing due to its small size, lower operating and management costs, and manageability even for medium-level trained professionals.

• renovating the existing hotels and bringing them up to international standards. According to the results of the research, it is appropriate to spend almost 50% of all capital for this direction.

• Development of the infrastructure of motels, airports, car dealerships, development of motor vehicles along the Tashkent-Samarkand-Khiva route. As a result, the level of efficiency of these directions increases almost twice.

• as a result of allocating investments to sports facilities and the development of more than 250 religious objects, the number of visitors to Uzbekistan from all over the world for religious tourism may increase 10-12 times.

• investments can be made by a number of large banks and companies of the world.

• internal resources should be the main source of hotel investment. First of all, it is necessary to increase the efficiency of using existing hotel facilities: specialized hotels, as well as places for various offices.

• Combining the efforts of all hotel infrastructure owners will help to increase the occupancy of hotels, increase the number of tourists staying in them, and increase the categories of tourists. For this purpose, it will be necessary to organize the Association of national tourist organizations, including hotel organizations. One of the important aspects of effective use of limited foreign exchange funds is the centralized use of all foreign exchange funds for tourism. For this, it will be necessary to establish a unified centralized currency fund of Uzbekistan with the funds received from hotels and tourist organizations and direct the funds in it to solve national problems of international tourism development.

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DEVELOPMENT OPPORTUNITIES OF ISLAMIC FINANCE IN UZBEKISTAN

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Abstract. *Uzbekistan is a country in Central Asia with an emerging economy with great human capital, an openness to micro-investments, and a high encouragement of small and medium businesses. Small and medium enterprises represent 70 percent of the economic landscape and 78 percent of the employment rate in the country. However, small and medium size enterprises are facing many challenges such as the high interest rates and complicated loan requirements. Similarly, many Muslim citizens in Uzbekistan with a capital in hand, are facing difficulties in dealing with banks in terms of investment activities due to the interest rates involved. Therefore, this study attempts to explore the opportunities and to propose the necessary steps and procedures towards implementing an Islamic banking and finance system in the Republic of Uzbekistan. In order to do that, 7200 responses were collected from individuals, business enterprises and banks in the form of survey questionnaire to analyze their willingness to use Islamic Finance products and services. During the survey, which was conducted in the first half of this year with the cooperation and financial support of the UNDP office in Uzbekistan and Republican Training Center for Entrepreneurship Principles under the Chamber of Commerce and Industry of Uzbekistan it was found that the majority of individuals and companies, because of their religious belief, go for Islamic financial products, while bankers claim that the demand for Islamic financial services is strong as the country's population is predominantly Muslims.*

Keywords*: Islamic Finance, Islamic Finance products and services, MSME sector.*

INTRODUCTION

Islamic banking system refers to a banking system in which all financial activities are carried out based on Islamic laws. It has similar purpose and operations as the conventional banks, that is, to facilitate the flow of money within the economy for boosting economic activities. However, unlike conventional banks, the principles of governing Islamic banks are mutual sharing of risk and profit between parties while ensuring justice and fairness in any transaction and business operation. The success of Islamic Financial Institutions drew the attention of many conventional banks. This had led numerous conventional banks to launch their Islamic banking windows in many countries. In 2015, the number of Islamic banking windows of conventional banks has risen to 350, which is almost equal to total number of Islamic banks world-wide (Dr. Azmi, 2015). Pakistan Bangladesh, GCC countries, and many others who had implemented Islamic banking and finance within their jurisdictions, started reaping the fruits from the growth and success that Islamic Financial Institutions (both commercial and social institutions) have achieved.

Last couple of years, the Government of Uzbekistan has initiated ambitious economic reforms. One of the measures taken is to make easier for private companies to gain access to lines of credit for their business expansion (World Bank, 2019). This is mainly to confront the increasing unemployment problem in the country, which stood at 5.5 percent in 2019. According to OECD (2017), small and medium enterprises in Uzbekistan account for 78 percent of employment. Yet,

they are having a hard time meeting their financing needs through conventional banks (ADBI, 2018) due to the following matters:

1. the long list of documents set by banks to consider for the loan issuance;
2. collateral and guarantee requirements;
3. financial illiteracy;
4. high interest rates;
5. Religious reasons, which restrain Muslim entrepreneurs from fulfilling their financing needs with conventional banks.

In case of (v), Uzbekistan is facing a lack of banking and financial institutions operating based on the principles of the Islamic financial system (Imamnazarov, 2019). Due to these reasons, ADB (2019) stated that around 64 percent of SMEs have to rely on self-financing, that is using their savings or borrowing from their families and friends. This certainly indicates the inefficiency of the current banking system of Uzbekistan in meeting the financing need of MSMEs.

Bangladesh, with 89.5 % of Muslim population, was once considered among the less developed and poor nations. However, during the last decade, Bangladesh's economic growth rate accelerated from 5.57 % in 2010 to 7.9 % in 2018. According to the study of Solaiman, Safiullah, and Rana (2012), Islamic banks made a substantial contribution in Bangladesh's economic growth in terms of making loans easily available to various private enterprises including MSMEs. Nowadays, Islamic banks account for 24 % market share of Bangladesh's banking sector (UNDP, 2019). In Uzbekistan, where more than 90 % of population comprises Muslims, there is an immense potential for introducing Islamic financial institutions. The presence of Islamic Finance could play a crucial role in boosting economic activities of MSMEs and reducing the cost of financing.

In lieu of acknowledgment and identification of the country's financing needs as stated above, the paper at hand aims to study the determinants of Islamic Finance opportunities to finance MSMEs in Uzbekistan.

POTENTIAL ISLAMIC FINANCE INSTRUMENTS THAT CAN BE USED FOR OPERATIONALIZING UZBEKISTAN'S BANKING SECTOR.

2.1. Partnership Specific Islamic Contracts:

Musharakah: According to Usmani (1998) the term Musharakah in Arabic means sharing. The basic tenet of Musharakah contract is similar to a partnership contract in English law, wherein two or more partners come together to form an enterprise by pooling in funds, materials, and/or intellectual property. In the case of Uzbekistan, musharakah at the banking level can be used for project financing, particularly in financing mid and long-term projects or financing any joint venture where the arranging bank acts as a partner to the project or joint-venture and earns a profit at the rate determined at the time of concluding the financing contract with a customer. At the capital market level, Musharakah is extensively used in the equity market. The underlying stocks in the equity market must be Sharia- compliant. Apart from the equity market, Musharakah contract is also being used in the bond market in the form of Sukuk.

Mudarabah: Mudarabah is a unique way of partnership facilitated in Islamic finance, wherein one partner provides all the funds required to start a business and the other partner invests those funds in a profitable venture through efficient and effective management. In the case of Uzbekistan, Mudarabah in the banking level can be used in mobilizing deposits from the customers. Based on the Mudarabah arrangement Islamic banks act as Mudaribs whereas

customers as Rab al-mal. The profit will be shared based on the pre-agreed ratio. Mudarabah is mainly used for investment accounts or term deposit accounts for deposit mobilization. Besides, it has also been used in project financing and facilitating a letter of Credit (LCs). Similarly, in Capital Markets, Mudarabah can be used in structuring sukuk. Under this arrangement, investors who buy sukuk certificates would become rabb al-mal whereas the company management would be mudarib.

2.2. Sale-Based Islamic Contracts

Murabaha: Murabaha is a sale-based contract. Under this arrangement, a seller buys a Sharia-compliant asset based on buyer's specifications which the seller would sell by adding some profit to the cost of the asset acquisition. The payment may be done either on spot or it may defer to the future date as per the mutual consent of the seller and buyer. At the banking level, this contract is predominantly used in home financing by banks. The Islamic bank buys the property based on the specifications given by the customer in the application form. Islamic banks would then sell the property to the customer at the mark-up price (cost + profit). The payment will be deferred and usually be paid on a monthly basis for the period as mutually agreed by the consenting parties. Apart from this, Murabaha is also being used for personal loans, credit cards, project financing, letter of credit (LC), auto finance, long-term financing for businesses in terms of buying heavy machinery, working capital, etc. Similarly, in the Capital Markets Murabaha could also be used in structuring sukuk for large companies and government. These entities could use Murabaha sukuk for financing long term projects.

Ijara (Islamic Lease): Ijara means renting a tangible asset. It is similar to conventional lease, however, the underlying asset in Ijara must be Sharia-compliant and be capable of generating usufruct. Ijara is predominantly used by Islamic banks for facilitating auto finance. Apart from this, it is also being used for financing farmers for buying agriculture-related equipment and tools, non- agricultural business entities in financing the purchase of heavy and expensive machinery and equipment. In Capital Markets, Ijara based sukuk is the predominant ones in the sukuk market.

Istisnah: According to Usmani (1998), "Istisna is the second kind of sale where a commodity is transacted before it comes into existence. It means to order a manufacturer to manufacture a specific commodity for the purchaser (pp. 135)." The price will be fixed at the beginning of the contract along with the detailed product specifications. Islamic banks mainly use Istisna for financing construction, manufacturing, project financing and for such contracts that are based on build operate and transfer of underlying asset. In Uzbekistan, Banks may adopt Istisna for financing new housing or office places as such constructions are quite well developed in the country. In Capital Market level, Sukuk structuring also includes Istisna. Istisna based sukuk is predominantly used for undertaking big projects like construction of roads, metro stations, flyovers, dams, etc.

Salam: It is a form of forward agreement where a seller promises to deliver certain goods to a buyer at a future date in exchange for a full price paid in advance. Salam agreements can be widely used in agriculture. For example, farmers would sell future harvest by entering into a Salam agreement.

Wakalah: Wakalah refers to a contractual agreement wherein a person (generally known as an agent) is appointed as a legal representative of another person, who undertakes all permissible activities as stated in the Wakalah contract. In return, the agent will be paid a fee as agreed by the contracting parties. In practice, Wakalah is predominantly used in conjunction with other Islamic financial contracts like Musharakah, Mudarabah, or Ijara. However, it has also started being used

as a standalone Sharia contract for structuring sukuk or deposit-based instruments. Concurrently, Wakalah can also be used as deposit instruments by Islamic banking institutions. Under this agreement an Islamic bank acts as an agent and invest the funds collected from its customers for a period stipulated in the contract. The Islamic bank charges a certain fee while the profit will be shared among the Wakalah deposit holders as per the %age stipulated in the contract. The above discussed Wakalah based Islamic financial products will be well suited to Uzbekistan's contest and can extensively be used in increasing the public participation in the banking sector.

PART III. METHODOLOGY

Studying and analyzing population perception representing various social sections, banks, and businesses was considered important. The primary objective of this study was to evaluate residents' priorities and demand for Islamic financial institutions, along with the challenges they face when addressing their financing needs through established financial institutions (formal and informal). Structural and content-related questionnaires for individuals and companies are identical, whereas banks are different.

The survey questionnaire consists of four sections, covering demographic information, access to finance, opportunities for Islamic finance, where knowledge of Islamic financial system and products was tested by respondents followed by insurance industry. Only key figures are presented. A quantitative methodology was introduced to gather relevant data as survey questionnaires and interviews. In total, 7200 responses were collected with the help of the Republican Training Center for Entrepreneurship Principles. From that, 2,235 responses from corporate bodies, 27 from bank headquarters, and 4938 responses were from public (individuals). Using Google forms and SurveyMonkey sites, survey questionnaires were disseminated.

PART IV. ASSESSMENT OF OPPORTUNITIES AND NEEDS FOR THE IMPLEMENTATION OF ISLAMIC FINANCE INSTRUMENTS IN UZBEKISTAN THROUGH SURVEY

Demography of the respondents

Study findings revealed that 47% of individual respondents were aged 31-45, while 44% were aged 18-30 years. 42% had higher education, 36% had only secondary education. 25 % of the respondents were state employees, while 21% were private employees.

Similarly, most businesses responding to the survey are 18.66 % from Tashkent Area. Their organizational structure consisted primarily of 44% limited liability corporations, 18% private companies and 16.5% individual entrepreneurs. 64% Small Businesses, 25% Micro Businesses, 10% Big Companies. 26% of these businesses were engaged in manufacturing, 17% in services, 22% in commerce and 13% in construction. 41% of these companies ' annual gross profits was less than 100 million UZS, 37% of them made between 100 million and 1 billion UZS, and only 4% made more than 10 billion UZS. Comparably, most of the responded banks (24 banks) were located in Tashkent Area, while 3 other banks are in Fergana Valley. Twenty banks are joint-stock commercial banks, five are private banks and two are international banks. This information can say us that the future customers of Islamic financial services will be mainly individuals with higher education and limited liability corporations.

Access to finance

40 % of companies and 31% of individuals used formal channels for acquiring loans. The main aim of obtaining a business loan was to buy equipment, automobiles or special machinery (50%), working capital and trade (34%), and agricultural ventures (11%).

For those seeking a bank loan, 53% received consumer loans, and 28% received mortgage loans. 60 % of companies and 68 % of citizens reported not using bank loans. A fundamental problem for businesses and individuals was non-compliance with conventional loans with Islamic norms. This led them, despite business need, to discontinue and close credit lines. High interest rates, complex terms and conditions are other factors.

Opportunities for Islamic Finance

Knowledge of Islamic Finance System: 40% of businesses and 37 % of individuals stated that they had basic knowledge of IF principles; while 50 % of individuals and 52 % of businesses defined Islamic Banks as "Islamic Banks have similar services as their conventional peers, only IBs must be asset-based and interest-free in nature".

Overall, among 36 % of businesses, 7.41% of banks and 4% of individuals said Uzbekistan's population had a deep knowledge and understanding of IF institutions while 31% of businesses, 67 % of banks, and 49 % of individuals had mere general understanding and knowledge. 22% Banks could not evaluate population awareness of Islamic Finance.

Unlike companies (14%) and individuals (16%), banks (54%) are aware of government attempts to introduce Islamic Finance in Uzbekistan. Only 32% businesses and 28% individuals heard or knew about the Takaful Islamic insurance scheme, including the latter, 44% businesses, 74% individuals, and 71% banks are willing to use Takaful once introduced in the country.

Knowledge of Islamic Finance Products/ Services: Both individuals and businesses were asked if they were aware of and fully understood Islamic finance products/ financing methods. Ijara (leasing) is the most known Islamic finance products among both group of participants followed by Mudarabah agreement. Salam, Istisna, and Sukuk were the least known financing agreements by respective participants.

When they convene operations in Uzbekistan, 61% of companies and 75% of individuals are prepared to opt for Islamic financial institutions. By comparison, 35% of businesses and 22 % of individuals reported that their choice in selecting a particular institution would depend on the cost and quality of the services provided by Islamic financial institutions, while only 3 % said that they would not be interested in the services provided by Islamic financial institutions due to lack of knowledge and awareness. 47% of companies and 55 % of individuals have argued that they will not be very concerned even though Islamic financial instruments are highly priced as the primary concern is to comply with Islamic values in their financial affairs. On the contrary, just 22% of companies and 19% of individuals hold opposing views as their primary concern will be the high cost of Islamic financial instruments.

Banks are also of the opinion that in the case of IF's implementation in Uzbekistan, due to the high population request for IF goods, there is a high possibility (81% of banks) for the attraction of financial capital from the population to savings or partnership agreements. By comparison, 15 % of banks (4 banks) showing the opposite opinion that opportunities are low as demand is low, while 4 % says there is no opportunity as there is no demand in the market. Upon further investigation on which types of Islamic finance products/ financing instruments will be more effective in promoting entrepreneurship in the country, 81 % bankers stated Musharakah and Mudarabah as they are based on partnership, followed by Murabaha (66 %) and Ijara (66 %) (Refer to table 1)

Table 1.

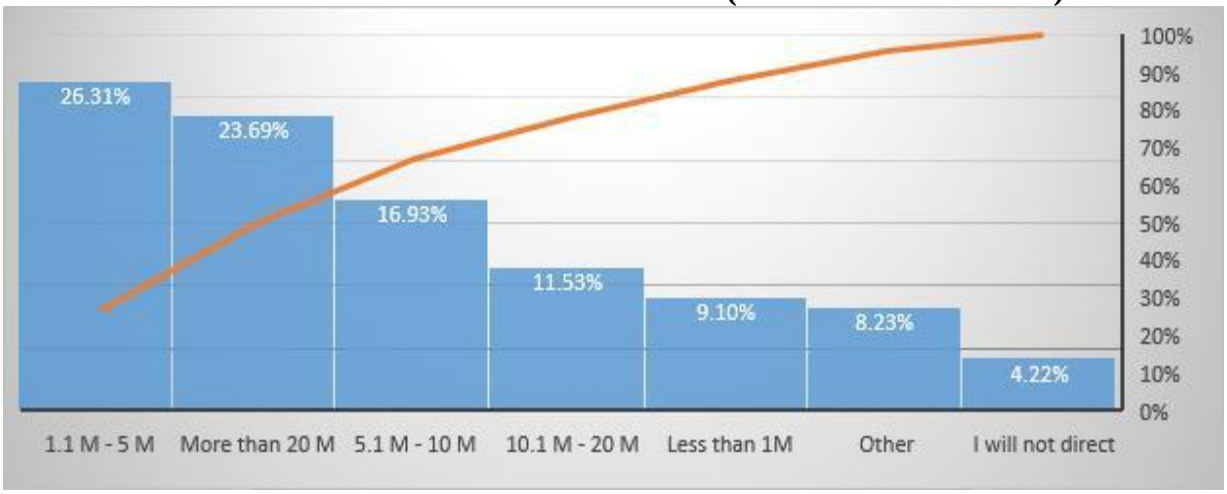
Estimation of effective IF products in the market

What type of Islamic financial products will be the most effective in Uzbekistan and why?	Banks	
	Numbers	%
Musharakah and Mudarabah because they are based on partnership	22	81.48%
Murabaha because it gives opportunity to purchase goods by deferred payment scheme	18	66.67%
Ijara because it is similar to leasing which is already widely use in the country and therefore it will be easy to implement	18	66.67%
Salam, because it allows advance payment in agriculture, which is very helpful to farmers	11	40.74%
Istisna, like Salam gives opportunity for advance payments in project financing and construction, considering fast-growing construction industry and high demand	11	40.74%
Sukuk, because it gives opportunities for capital markets development, which is consistent with the government policy	12	44.44%
I don't know	0	0%
Total	27	100%

Amount of funds to direct to IBs: 44% of businesses and 42% of individuals said they would direct their funds for savings or cooperation with Islamic banks in the implementation of Islamic Finance in Uzbekistan, while 26% of businesses and 36% of individuals would prefer not to. Furthermore, 26.31 % of people are able to pay money for Islamic savings or partner deposits as seen in Figure 1.

Figure 1.

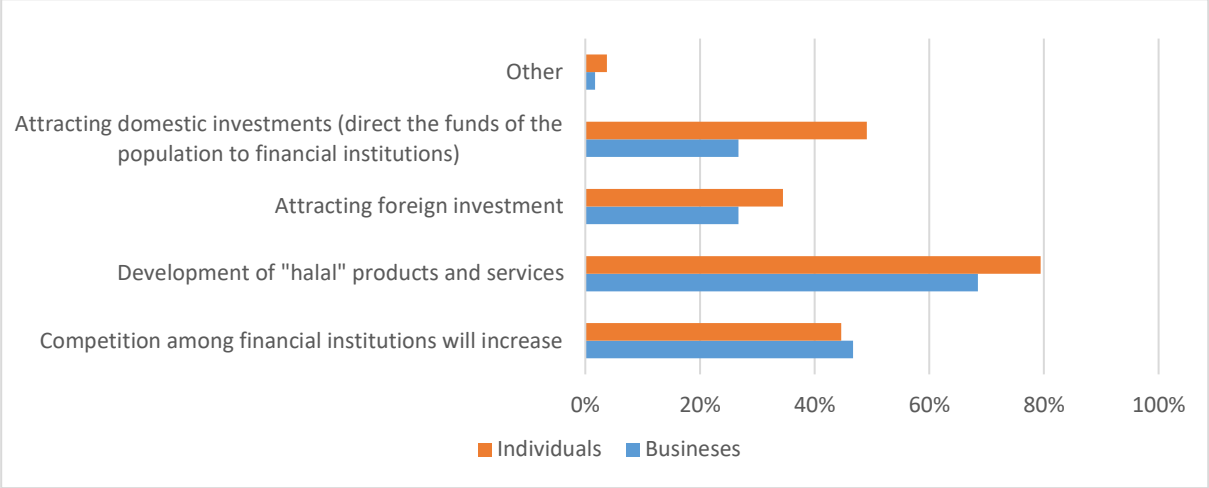
Amount of funds to direct to IBs (all amounts are in UZS).



Furthermore, in case of development of Islamic Finance system in the country, 79 % of individuals and 68 % of businesses believe that it will impact the development of "halal" (permissible) products and services in the market, while 45 % individuals and 47 % businesses are of opinion that IF will increase the competition among financial institutions in the country as described in figure 2. Nevertheless, 47 %of enterprises and 58 %of individuals held to be pessimistic about the possibility of Islamic banking and finance implementation in Uzbekistan, saying that responsible agencies paid little attention to this area. Other factors included competitiveness, lack of experts, lack of knowledge, etc.

Figure 2.

The impact of implementing and developing IF system in Uzbekistan



Capacity to introduce Islamic Finance system in Uzbekistan

In this section, Banks were asked if they would support Islamic finance including the establishment of Islamic banks in the country. All 27 banks stated they would fully support the opening of Islamic banking in Uzbekistan. Some banks commented as “yes, we will support as almost 90 % of the population are Muslims and there is a high demand from businesses”. 67 % of banks considered that implementation was very necessary because it would increase competition among financial institutions, the market for “halal” products and services would develop, and more investments would come from Muslim countries. 26 % of banks considered it as a good option to establish because individuals and entrepreneurs need to be offered a variety of new products and services. In contrast, 2 other banks (7.4 %) think that opening one or two Islamic banks is enough due to a low demand, or even opening an Islamic window will cover the market need. Upon further investigation pertaining to introducing IF system in the short term 44 % of banks are in the opinion that commercial banks have no enough opportunities but they are ready to develop this system, while 44.44 % are in the opinion that they know the main principles of how IF system works but it is not sufficient to launch it. Table 2 summarizes the results.

Table 2.

Capacity to introduce Islamic Finance system in Uzbekistan

Do the banks have enough capacity to implement the Islamic banking in the short term period?	Numbers	%
Yes, we have enough trained professionals to start our business in this field	3	11.11%
Yes, though we have limited knowledge about how IB operates but we welcome to open it	12	44.44%
We know only the basic principles of Islamic banking, but it is not enough to start activity in this area	12	44.44%
We have no specialists who have the necessary knowledge and skills in this sphere	0	0.00%
Total	27	100.0%

RECOMMENDATIONS

Part four (4) of the paper aims to analyze the responses collected from banks, individuals, and businesses. The following recommendations are derived based on the above analysis.

1. It is necessary to introduce an Islamic Banking law and make necessary amendments to relevant legislative and regulatory documents including the Civil code, the Tax code, and the

Banking law. To implement these changes, the Government shall establish a working committee, which will consist of specialized lawyers with international experience and technical assistance team from international organizations like IsDB and IFC.

2. Until appropriate legislative documents and regulation on Islamic Banking is adopted, certain Islamic finance instruments like Ijara, Musharakah, Mudarabah, and Murabaha should be piloted and exercised by non-banking leasing and investment companies. Special amendments are required in relevant laws which would enable non-banking Islamic leasing and investment companies carry out such operations. In addition, these non-banking financing institutions shall also be empowered to accumulate funds from general public.
3. An Islamic Finance Council should be established to assist in developing the Islamic banking and financial system in Uzbekistan. The Council should include representatives from the Banking Association of Uzbekistan, commercial banks, government agencies, the Muslim Board, international financial institutions (including the Islamic Development Bank, the World Bank / IFC, etc.), Capital Markets' Development Agency, other business and finance community representatives.
4. Islamic Banking and Financial System Development Fund should be established under the Council with the following main functions:
5. Conducting research and studies on developing Islamic banking and finance infrastructure in Uzbekistan and proposing recommendations to the Council;
6. Attracting funding from various sources (including the private sector) to develop the Islamic financial system;
7. Coordinating the activities of all types of Islamic financial institutions operating in Uzbekistan (without duplicating the powers and responsibilities of the Central Bank or other government institutions);
8. Promoting Islamic finance and banking to increase financial literacy of the population. Publishing books and manuals of internationally renowned scientists and specialists on Islamic Finance in Uzbek and Russian;
9. Conduct training and collaborating partnership with Islamic Finance institutions (Imamnazarov, 2018), national and international stakeholders for enhancing capacity-building initiatives. Collaborating with institutions and business schools to encourage and facilitate course offerings in Islamic finance, economics, and banking.
10. A Strategic Plan shall be adopted for developing Islamic finance in Uzbekistan which includes the following:
11. Enabling Policy Environment for legal, regulatory, supervisory, liquidity management framework, taxation regime, and financial accounting & reporting framework;
12. Establishing Sharia Governance and Compliance which will focus on standardization and harmonization of Islamic finance law practices, and products/services. Moreover, it is vital to establish proper dispute resolution mechanism to address conflicts that could arise between Islamic financial institutions and customers. For this purpose, the Government shall make necessary provisions in its judiciary system to refer Islamic financial law pertaining to dispute resolution in all the matters of Islamic financial institutions operations;
13. Awareness and Capacity Building which will be made through coordination and collaboration amongst internal and external stakeholders, enhancing awareness about Islamic finance, and building capacity of the stakeholders;

14. Based on the Strategic Plan, an action plan shall be structured by stating the list of activities, the timeline, and respective responsible bodies.
15. Ease of licensing requirements for establishing Islamic Finance institutions or any such company that intends to offer Islamic finance services.

CONCLUSION

This study recommends incorporating Islamic financial system (formal and informal institutions) to the current financial system and fill in the financing gap existing in Uzbekistan. MSME sector faces many challenges in funding their business while traditional and formal financial institutions fail to meet their financing needs. Combination of formal and informal financial institutions, which is part and parcel of Islamic financial system, has high potential in funding the balanced growth in Uzbekistan. The success of Islamic financial institutions in peer countries like Indonesia and Bangladesh is commendable and worth adopting and incorporating its best practices.

LIMITATION AND FUTURE DIRECTION

The study has number of limitations which also open the door for future research avenues. Firstly, due to the lack of literature related to the area of current study pertaining to implementation of Islamic finance in Uzbek financial system, the present paper can be considered as a potential area for the new line of future research. The current paper is hoped to assist the academicians, practitioners, and researchers with its findings for their future studies in the same area. Another limitation is that the present study has strictly focused on the quantitative method, it is recommended that in order to obtain a deeper understanding regarding the opportunities for implementing Islamic finance in Uzbekistan, a mix method research can be considered. It is hoped the new study will be developed to obtain a deeper understanding of the current topic with the help of current study. Thirdly, instead of collecting data from banks' headquarters only, new research can focus on the perception of bank managers including branch managers to understand their openness for implementing Islamic financial services in the country.

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POINT ESTIMATION OF THE TRUE VALUE AND MEAN SQUARE DEVIATION OF THE MEASUREMENT

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Abstract. *This article covers in detail the issues of ensuring metrological dimensions at the required level in the process of production and repair of mechanical engineering parts, information about the types of measurements, means and rules for their use.*

Keywords: *Measurement, device, machine, deviation, deviation, metrology, object, function, distribution, interval.*

It is known in metrological practice that when estimating the true (searched) value of a measured quantity or finding a measurement result and finding its error according to a group of results of a series of measurements, the point (point) estimation method of the values of the distribution function of a random quantity is used. This method is based on solving a statistical problem, that is, a series of values from the results of n independent experiments based on a selection.

If the value is represented by a single number, it is called a point estimate. Any point estimate calculated on the basis of the data obtained from the experiment is a function of it, and therefore it depends on the distribution of the initial value of the random variable and the results of the experiment.

It must satisfy the three requirements of point evaluation: perfect, stable and efficient (effective)**.**

Perfect estimation means that the estimable values correspond to the characteristics of the estimator in terms of probability.

The measurement process and, of course, the measurement results are affected by many factors, which in some cases are difficult to take into account.Бу омилларни кўриб чиқишни It is necessary to start by understanding the concept of "measurement process" itself. "Measurement process" means the total amount of measurement data, devices and operations. In this case, the "element of the measurement process" should be understood as any individual factor affecting the measurement result (Fig. 1). Such factors include:

measuring object;
- measurement subject (operator);
- measurement method;
- measuring tool;
- measurement conditions.

The object of measurement has been sufficiently studied, and the formation of its model, its level of detail (in-depth study of the object of measurement) should be adequate for the intended purpose of measurement.

Figure 1.

Measurement of groove dimensions

For example, if "thread size should be measured". First, the object model is created and the shaft diameter is measured once so that the cross section of the shaft can be circular.

The operator also affects the measurement process, causing subjective error. Subjectivity of the operator depends on his qualification, psychophysiological condition, sanitary and hygienic conditions of work (measurement) and others.

Among the factors affecting the measurement result, the measurement method and measurement tools are also of great importance. It is necessary to choose both the measurement method and the measurement tool in accordance with the purpose of the measurement process and the conditions of its implementation.

It should be remembered that measuring instruments have only a specific error (instrumental component of measurement error) and can change the value of the object of measurement, that is, it can affect the measured quantity itself.

The measurement conditions affect all other elements of the measurement process - the measurement object, the measurement tool, and the operator himself.

Often, measurements of a quantity in different ways and using different measuring instruments give completely different results. Each of these options has its advantages and disadvantages, and the choice of the most optimal option (for a particular measurement problem) depends on the skill of the experimenter. Of course, in this case, there cannot be a specific ready-made solution and recommendation. However, there are some error reduction methods that can significantly reduce the individual components of the regular error.

Correlation function of random process and their properties.

The following laws are used to study the distribution of random quantities in metrology: normal (Gauss), uniform distribution law, Student, triangular (Simpson), xi-square (□2) (Pearson), Fisher's law, exponential law, etc.

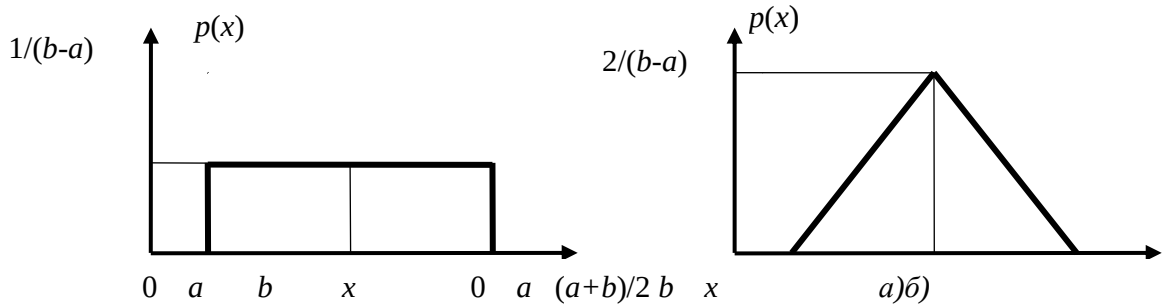
The normal distribution of random variables is often used in measurement techniques. The law of normal distribution of random errors, based on the theory of probability, is used when the results of measurements are affected by random factors. Random effects cause measurement results and errors to be distributed according to (almost) normal law.

The distribution curves according to the normal law for different values of the mean square changes are presented in Figure 2.

Triangular and uniform even distribution of random quantities are also found in metrological practice.

Figure 2.

Uniform (flat) (a) and triangular (b) distribution of random variable



If the random variable X assumes values in the interval from a to b with a constant probability density, such a distribution is called a uniform (flat) distribution, and this is characteristic of the display of most digital instruments (Fig. 2a).

The integral function F(t) of the normalized normal distribution is related to the Laplace function (probability integral) by the following expression.

$$L(t_p) = \frac{1}{\sqrt{2\pi}} \int_0^{t_p} e^{-\frac{1}{2}v^2} \cdot dV$$

$$F(t) = 0{,}5 + L(t_p)$$

.

This function does not differ from 1 for large values of t1 in the range outside the limit of values of t from -3.5 to +3.5.

XI is the squared X2 distribution - the sum of squares of the standard normal distribution of a random variable.

$$X_k^2 = \sum_{i=1}^{n} \left(\frac{x_i - m_x}{\sigma_x} \right)^2 = \frac{(n-1)S_x^2}{\sigma_x^2},$$

in this *K=н-1* - number of degrees of freedom; *н* - number of random variables. If *x* and *Y* are independent quantities, in this *x* - standard normally distributed quantity,

Y while - *K* - with degrees of freedom x^2 - is a normally distributed random variable, then the random variable

$$T = x / \sqrt{\frac{Y}{K}}$$

For different values, the Student's distribution is defined as the Student's fraction and is given in Table 1 (True value of K-size)

$$t_p = \frac{\bar{x} - m_x}{S_{\bar{x}}} = \frac{\bar{x} - Q}{S_{\bar{x}}} = \frac{\bar{x} - Q}{S_x} \sqrt{n}$$

of the magnitude measured using the Student's distribution or from Table B.1

$$\delta_p = t_p S_x$$

true value can be determined if its deviation (deviation) from the average arithmetic value does not exceed.

Fisher distribution. If X and Y – independent (unrelated) random variables κ_1 and κ_2 – with degrees of freedom X^2 if distributed according to, then a random variable $F = \frac{x/k_1}{y/k_2}$,

ie F Fisher distribution κ_1 and κ_2 distributed by degrees of freedom.

The main characteristics of the laws of distribution of random numbers (variables), integral and differential functions of distribution are given in Table 1.

Table 1.

Characteristics of distribution laws of random variables

Distribution law	Distribution function	
	Differential	Integral
Normal (Gaussian)	$F(t_p) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{t_p} e^{-\frac{1}{2}t^2} dt$	$F(x) = \frac{1}{\sigma_x\sqrt{2\pi}} \int_{-\infty}^{x_0} e^{-\frac{(x-m_x)^2}{2\sigma_x^2}} dx$
Equally distributed (Uniform)	$p(x) = \begin{cases} 0; & -\infty < x < a \\ \frac{1}{b-a}; & a \le x \le b \\ 0; & b < x < +\infty \end{cases}$	$F(x) = \begin{cases} 0; & -\infty < x < a \\ \frac{x-a}{b-a}; & a \le x \le b \\ 1; & b < x < +\infty \end{cases}$
Triangle (The Simpsons)	$p(x) = \begin{cases} 0; & -\infty < x < a \\ \frac{4(x-a)}{(b-a)^2}; & a < x < \frac{a+b}{2} \\ \frac{4(b-x)}{(b-a)^2}; & \frac{a+b}{2} < x < b \\ 0; & b < x < +\infty \end{cases}$	$F(x) = \begin{cases} 0; & -\infty < x < a \\ \frac{2(x-a)^2}{(b-a)^2}; & a < x < \frac{a+b}{2} \\ \frac{2(b-x)^2}{(b-a)^2}; & \frac{a+b}{2} < x < b \\ 1; & b < x < +\infty \end{cases}$
Standardized (normal)	$p(t) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}t^2}$ *бунда* $m = (x - м_x)/\sigma$	$F(t) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{t_p} e^{-\frac{1}{2}t^2} dt$
Exponential one-way (exponential)	$P(x) = \beta e^{-\beta x}$	$F(x) = 1 - e^{-\beta x}$

Example: The distribution of measured sizes of tractor wheel tires can be represented graphically (Figure 3). On the abscissa axis, the size intervals are plotted according to Table 2, and on the ordinate axis, the corresponding frequencies m or m/n are plotted. As a result of graphing, a step line 1 is obtained, which is called a distribution histogram. If we successively connect the points corresponding to the middle of each interval, a broken curve is formed, which is called the curve of the empirical distribution or the polygon of the distribution. With a large number of measured tire treads and a large number of size intervals, the broken empirical curve approximates a smooth curve in the form of a so-called distribution curve. It is recommended to divide the

measured sizes into at least six intervals with a total number of measured tires of at least 50 units to construct a histogram distribution.

Under different conditions, the tire tread, the distribution of its actual dimensions, obeys different mathematical laws. Taking into account that the following laws are of great practical importance in the work of MTA, normal distribution (Gauss's law), equilateral triangle (Simpson's law), eccentricity (Rayleigh's law), probability laws and distribution functions that are part of these laws were taken as a basis.

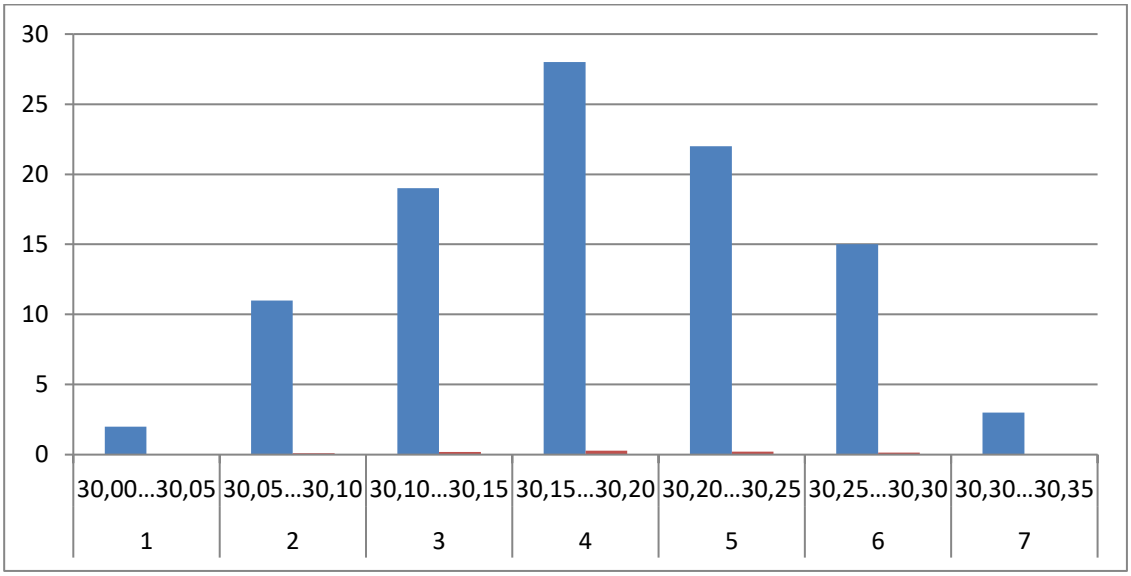
Table 2.

Distribution of deflection dimensions of tire tread pattern (9.5-42 Ya-183). MMTP "Kokumboy" and "Hudayberdiyev" in Kosonsoy district

T/r	Interval, mm	Frequency m	Frequency m/n
1	30,00…30,05	2	0,02
2	30,05…30,10	11	0,11
3	30,10…30,15	19	0,19
4	30,15…30,20	28	0,28
5	30,20…30,25	22	0,22
6	30,25…30,30	15	0,15
7	30,30…30,35	3	0,03
	Itogo	n = Σ m=100	Σ m/n = 1

Figure 3.

Distribution of deflection dimensions of tire tread pattern (9.5-42 Ya-183) "Kokumboy" and "Hudayberdiyev" MMTP of Kosonsoy district



Conclusion

Using the laws of probability allows you to find optimal options for the size of research results.

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THE ROLE OF FOREIGN BUSINESSMEN IN THE DEVELOPMENT OF ENTREPRENEURSHIP IN THE FERGHANA VALLEY AT THE END OF THE 19TH CENTURY AND THE BEGINNING OF THE 20TH CENTURY

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Abstract. *In this article, based on historical sources, the activities of foreign businessmen and entrepreneurs in the history of business activity in the Fergana Valley at the end of the XIX century and the beginning of the XX century have been studied.*

Keywords: *economy, shareholding, entrepreneurship, cotton farming, staff training, foreign business, capital, manufacturing, trading house.*

Introduction

The nature of the progress of the economic reforms implemented in Uzbekistan certainly increases our interest and need for a deeper study of knowledge in the history of entrepreneurship. Based on this goal, in this article, we tried to cover issues such as the origin, development and impact of the activities of foreign businessmen and entrepreneurs in our country on the socio-economic life of the country at the end of the 19th century and the beginning of the 20th century.

The degree of study of literature on the topic. On the subject among researchers Аминов А.М. Экономическое развитие Средней Азии (Колониальный период). Т., 1959., Аминов А., Бобоходжаев А. Экономические и политические последствия присоединения Средней Азии к России. Т.:«Узбекистан», 1966., Вексельман М.И. Российский монополистический и иностранный капитал в Средней Азии (конец XIX - начало XX века). Т.:«Фан», 1987 , Круковская С.М. Встречи с Кокандом. - Т., 1977, Суворов В. Историко-экономический очерк развития Туркистана. - Т. 1962., Эгамназаров А. И. Фарғона водийсида тадбиркорлик ва банк ишлари тарихига доир. *https://doi.org/10.5281/zenodo.7064063* and in the scientific works of others activities of foreign entrepreneurs and businessmen in the organization and development of business activities in the country are given in depth analysis.[1].

Also, in the scientific literature, we find that the general situation of the history of foreign capital in Turkestan regarding entrepreneurship, its origin and development in Uzbekistan is studied. [2]. But about the entry of these issues (investments) into the Fergana Valley are little studied, almost not studied in archival documents, specific data, figures and by a number of authors.

The purpose of the study is the clarification of issues such as the ways of developing of entrepreneurship by foreign businessmen and entrepreneurs in our country in the late 19th and early 20th centuries, and the origin and development of entrepreneurship in Central Asia, particularly in the Ferghana Valley, and its impact on the socio-economic and cultural life of the country.

Research methodology. In the article, we examined business relations using historical, economic, logical principles, deterministic approach and discourse analysis method.

Research results. As we deepen our understanding of the importance of entrepreneurship in the process of transition to market relations, of course, we involuntarily feel the need to know how this issue was implemented in our country at the end of the 19th and the beginning of the 20th centuries. This corresponds to the period of colonialism carried out by Russian imperialism in our country.

At that time, based on the policy of colonialism, entrepreneurship was more prominent in the fields of cotton, cocoon and industry.

The importance of the railway in the development of trade relations between Turkestan and Central European countries has increased. In particular, the purchase of carpet products by many sales agents and company representatives from Paris, Berlin, Vienna and other Western European cities brought the carpet trade to the world market. The best quality carpets were woven in Bukhara, Ashgabat, Marv, and Ferghana regions.[3]

Foreign investments entered the economy of Central Asia in the 70-80s of the 19th century. Due to the conquest of Turkestan, they were interested in all areas of the economy. Before bringing their capital to the country, foreign investors tried to study it well, to know its demand and needs. That's why they started working in the cotton sector. Because cotton was very necessary not only for tsarist Russia, but also for other European countries. As a result of the expansion of cotton fields, by increasing the volume of cotton cultivation, it was necessary to reduce the purchase of cotton from abroad, especially from America. Therefore, the development of cotton cultivation in Turkestan was primarily of interest to the Russian administration. Therefore, the Tsar's administration made use of all possibilities for the rapid development of this industry. In 1883, the American cotton variety was tested for the first time in the lands near Tashkent by the German naturalist A.I. Wilkins.[4]

By 1899, almost all of Turkestan began to grow American cotton seeds. In five years, planting of this seed has increased almost 10 times. It should also be noted that from the 80s of the XIX century to 1913, cotton growing became such an important industry that 90-95% of the lands of the Fergana Valley were converted into cotton fields.

From the table below, we can observe the intensive growth of cotton cultivation areas in Turkestan in 1890-1915:

Years	Regions				
	Fergana	Syrdarya	Samarkand	By country	Caucasian
1890	51141	23500	17348	92889	900
1895	109701	14104	15223	142527	3500
1900	186326	15123	22825	234274	10 000
1905	166789	13312	18737	191111	11 000
1910	235891	35675	25224	324790	28 000
1915	336525	74050	55573	523614	57466

So, in comparison to other regions, the area under cotton cultivation in Fergana region increased rapidly during 25 years and reached 65.8%. Area of cotton cultivation from 1880 to 1913 was reached:

in Fergana region from 34668 to 278897 desyatins or 700%;

in Samarkand region from 7980– to 31858 desyatins –298 %;

in Syrdarya region from 25841 to 62691 desyatins - 139%. [5]

It can be seen that in a short period of time, almost all cultivated areas of the country were converted into cotton fields. With this, the Russian government focused all its resources on

growing cotton and ensuring the non-stop operation of metropolitan factories. The increase in customs fees also clearly proves this. For example, in the years 1864-1878, no duty was charged on cotton exported to Russia, and from 1879 to 1886, a duty of 40-45 tiyins was charged for one pood of cotton, and since 1887, the duty was set at 1 ruble and 15 kopeycks, and it gradually increased, in 1903 a pood of cotton was paid a duty of 4 rubles for export to Russia. [6]

Because entrepreneurship was unconventional in areas where the local population was not involved, it was mainly engaged in by Russian and foreign businessmen and entrepreneurs.

Branches of firms and trading houses Belyakov Plantation (“Плантация Белякова”), Big Yaroslavl Manufactory (“Большая Ярославская Мануфактура”), Meyerkort Company (“Товарищество Мейеркорта”), Kraft Brothers, Knop Trade House, Shlosberg Firm, Osser Firm, Andreev Trade joint-stock company, Ludwig Rabenek association, Zavertse, which were especially famous at that time, could be found in all the cities of the valley [7].

If we consider that the criterion that determines the size of entrepreneurship is measured by the purchase or sale of products, we observe that foreign trade between foreign countries and Russia has greatly expanded due to the direct efforts of entrepreneurs and businessmen (mainly at the expense of Russians and foreigners). For example, the total trade of Russia with foreign countries in 1886-1899 was 3.6 mln. poods, and 16.3 million in gold account, in 1912-1914 amounted to 9.3 million poods, and 44.9 million roubles in gold account.

Thus, in 15 years, cargo transportation has increased almost 2.6 times, and the amount of trade has increased by 2.8 times. Russia's trade with the countries of Turkestan region from 1898 to 1914 amounted to more than 32.7 million rubles, amounting to 170.7 million rubles in gold account.[8]

Based on the above information, it should be noted that such a large-scale exchange of goods required labor and a large amount of money from all responsible companies, firms, trading houses, associations, and companies.

At the beginning of the 20th century, the railway, which entered the Fergana valley, accelerated business activities even more. According to the archive information of the Central Asian Railway Administration, in 1913, cottonseed oil exported from Turkestan was 2 million 115 thousand 119 poods, 252 thousand poods in local routes, a total of 2 million 267 thousand 119 poods.

Cotton cultivation and production of cottonseed oil in Central Asia was organized mainly in the Fergana Valley. In 1913, 1 million 912 thousand 899 poods of cottonseed oil was exported from Fergana. [9]

At the end of the 19th century and the beginning of the 20th century, the Ferghana Valley was considered the main industrial center of Turkestan, while Kokand was the industrial and production center of the Ferghana Valley. In her research, S.M. Krukovskaya described this situation as "merchants in the markets, whether Russian, Uzbek, German, Polish, English, Turkish, Iranian, regardless of their nationality, traded easily." In 1900, there were 58 production enterprises in Kokand, where about 2500 people worked.

In Kokand, silk production was also developed as a third industry, all of which were connected with Russian and foreign capital.[10]

If we look at the press of that time, a commodity exchange was formed for the first time in the history of Turkestan throughout Turkestan, including in Kokand, and special attention was paid to the advertising of trading firms' products. There were 19 manufacturing trade firms in

Kokand only, and their branches also operated in the cities of the Fergana Valley. Although most of them were run by Russian names, they operated with the funds of foreign businessmen.

At that time, Kokan was considered not only a production and industrial center, but also a trade center. In particular, foreign trade, associations, companies - Emil Tsindel, Gardner and Kuznetsov's Porcelain Factory, Schliserburg Manufactory, German Julius Pinti Joint Stock Company, Nobel Company, Zinger Sewing Machine Company, etc. were not limited to opening a representative office in Kokand, but also had trade halls, warehouses, and branches, and were engaged in free entrepreneurship.

For example, the "Brothers Kraft" trading house, established in Kokand in 1897, engaged in the sale of cotton and cotton fiber, first opened branches of enterprise first in Kokand, and later in Andijan, Margilon, and Namangan districts of the valley. The first head of the enterprise, the German Nikolay Yulevich Kraft, built a hygroscopic cotton factory in Besharik, the only one in Turkestan.

Louis Zalm was the only one at that time to buy raw hides and furs in Kokand. The firm was first established in Russia and Kazan in 1884, and from 1894 it was opened in all cities of Turkestan. The head of the company was the German Lui Aleksandovich Zalm, a merchant of the first guild.

In 1914-15, the firm had tanneries, gut processing plants and large warehouses in Central Asian cities. The price of enterprises around Tashkent, Kokand, Margilan was 44 thousand 450 rubles. The annual production capacity of the main clothing factory in 1915 was 2 million 134 thousand 405 rubles. [11]

If we pay attention to historical data, we will find many repeated foreign, especially German names in it - Knabe, Koch, Kraft, Schmidt, Schultz, Behr, Brun, Tsindel, Gardner, Ziegel, Stefani, Guy, Gerhard, Boom and others. This shows that German specialists had a special place in the socio-economic and cultural life in Kokand.

While thinking about entrepreneurship and commerce, it is necessary to briefly touch on the Stock Exchange Committee established in 1906 in Kokand. Heads of the committee of the Kokand Stock Exchange Committee were A.I. Zigel, Ya.Kh. Vadyaev, S.A. Knabe, V.E. Koch, and representatives of large banks, manufactures, trade firms and individual large capitalists were also members.

The activities of the Kokan Exchange Committee were extensive. Although its main field was cotton farming, it was also involved in agricultural pest control, irrigation, organization of meteorological stations and solving other issues.

Also, the Committee was involved, along with controlling the cotton trade throughout Turkestan, in issuing small loans, customs work, building storage areas for products and other tasks.

At the beginning of the 20th century, German experts showed enthusiasm for organizing trade and entrepreneurship outside of Turkestan in Kokand, they created the ground for the emergence of great entrepreneurs and merchants from the local cadres.

For this purpose, in 1908, in order to improve the training of entrepreneurs and merchants in Kokand, the period of study at the Kokand Commercial Educational Institution was extended from 6 to 8 years. These works were sponsored by the Committee.[12] About 80% of the members of the Kokand Exchange Committee belonged to the German nationality.

In conclusion, the rapid implementation of these processes led to the rapid development of other sectors of the national economy in the country through cotton farming. The fact that the Fergana Valley was the most developed area of cotton farming also attracted related industries such as cocooning and oil industry. As a result, a new layer of the working class was formed in the country.

The comprehensive development of entrepreneurship led to an increase in the demand for national personnel.

It should also be noted that the issue of training local personnel by foreign entrepreneurs is one of the most pressing issues today.

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LOCALIZATION CONDITIONS AND BASIC GEOCHEMICAL CHARACTERISTICS OF APOGRANITOID TUNGSTEN MINING IN THE LOWER TIER OF THE YACHTON DEPOSIT

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Abstract. *The article describes new types of tungsten mineralization for the Chakylkalyan-Karatube mining region, the main features of which are: aluminosilicate (granitoid) substrate, along which silicon-alkaline ore-bearing metasomatites are formed; significant addition of Ca, Si, Mg and Fe to the near-ore space; poly-stage and discrete nature of the ore process; a complexly constructed halo of ore-bearing elements.*

Of particular importance for understanding the geological structure and metallogeny of the central part of the Chakylkalyan megablock are products of alkaline-basalt magmatism, which make up the Early Mesozoic formation of trachydolerites and camptomonchits, which form single dikes on the Yakhton ore field, and in neighboring territories of southern Uzbekistan and diatrums and diatrums.

Keywords: *tungsten mineralization, deposits, Zarafshan-Alai, Karatyube-Chakylkalyan ore region, Yakhton, aluminosilicate rocks, metasomatites, geological-industrial types of ores, quartz diorites, ore control structures, crushing, cataclasis, dikes, Apogranitoid, megablock, primary halo, ore-bearing element, scheelite.*

The Yakhton deposit is located in the watershed part of the ridge. Chakylkalyan within the eponymous megablock, which is the western fragment of the Zarafshan-Alai structural-formational zone. Administratively, it belongs to the Urgut district of Samarkand region. The deposit was discovered by S.N. Popenko and A.A. Konyuk in 1946. [5].

Tungsten mineralization at the deposit is confined to the exo-, endo-contact zone of a stock-like intrusive body. For many years, the Yakhton deposit was considered a classic single-stage representative of the skarn-scheelite formation with the formation of tungsten mineralization in the contours of calcareous skarns of contact, interstratal, stockwork and secant morphotypes, formed on various volcanogenic-terrigenous-carbonate rocks of the frame of the Yakhton intrusion [1].

In recent years, employees of the State Unitary Enterprise "Gissargeologia" have identified tungsten mineralization in the lower tier of the deposit, represented by rocks of the Yachthon quartz-diorite-granodiorite collision complex C_3. Its formation occurred in the following chronological sequence: fine-grained weakly porphyritic pyroxene-amphibole-biotite and biotite-amphibole quartz diorites and quartz syenite-diorites; fine-medium-grained porphyritic biotite-amphibole (mesocratic) granodiorites (main intrusive phase); fine- and medium-grained

porphyritic amphibole-biotite (leucocratic) granodiorites; vein rocks of the first stage: granites, aplite-granites, aplites, pegmatites; vein rocks of the second stage: diorite porphyrites; granodiorite porphyry; granite porphyries [2].

Quartz diorites and syenite-diorites occur as xenoliths, less often as small independent bodies. Mesocratic and leucocratic granodiorites have a relatively similar mineral composition.

The petrochemical features of the complex are low acidity of the main types of rocks, moderate iron content (usually not higher than 60%); sodium-potassium subtype - alkalinity in most massifs.

Characteristically, the melano- and mesocratic rocks of the Yachthonsky complex, on the basis of quantitative mineral ratios, are defined as essentially plagioclase granitoids, but they have an increased content of potassium, which is recorded in abundant biotite.

Complexes of regional distribution include the complex Almalysai gabbro-monzonite-syenite and South Tien Shan complex of dikes of subalkaline gabbroids and lamprophyres [7].

Dikes of the Almalysai complex (Permian–Triassic) occur both within the Yakhton ore field and in adjacent areas. The strike of the dikes is predominantly northeastern, rarely northwestern, with single latitudinal dikes. The fall is steep (65° – 80°). The thickness varies from 0.2 m to 3 m, the length is up to 3 km. The dykes of the Almalysai Complex cut through the entire pre-Mesozoic section, all granitoid complexes, and in many cases intersect sharyag structures.

Peculiarities of the petrochemical complex are: undersaturation of rocks with SiO_2 and Al_2O_3; increased alkalinity with the leading role of potassium. The total glandularity increases from 48% in the early divisions to 76% in the later ones. The rocks of the complex are characterized by elevated contents of rubidium, fluorine, boron, vanadium, and chromium. The type of accessory mineralization is apatite-magnetite (with fluorite).

The South Tien Shan dike complex of subalkaline gabbroids and lamprophyres (T_{2-3} *jut*) was identified by I.V. Mushkin (1977) as a complex of dikes and explosion pipes of regional distribution. In the study area, the complex is represented by rare dikes described as essexite-diabases, camptonites, campto-dolerites, and monchikites. Monchikites and camptonites have a similar composition, differing mainly in structural features (t/g in camptonites and glassy in monchikites, ophitic in essexite-diabases). Monchikite phenocrysts contain olivine (chrysolite), often replaced by chlorite-serpentine, basaltic hornblende, and titanium-augite. The camptonites contain olivine and titanium-augite phenocrysts, the groundmass is composed of labradorite, titanium-augite, and barkeveckite. The structure of the rock is microporphyritic, glomeroporphyritic, the groundmass is intersertal. The rocks of the complex are characterized by SiO_2 undersaturation and low total iron content, combined with high alkalinity. The rocks of the complex have elevated (relative to clarks) contents of *Pb, Sn, Cr, Ni*, and sometimes *Hg*. The complex is the latest igneous taxon of the region, breaking through all its Paleozoic subdivisions. Data on measuring the absolute age in Southern Gissar characterize the time interval of 223-245 million years, which does not contradict the idea of the Middle and Upper Triassic age, geologically substantiated in the territory of Tajikistan.

In terms of chemistry, the rocks of the complex are characterized by a reduced content of silica, alumina, alkalis (with a predominance of sodium over potassium) and an increased content of titanium, magnesium and iron. Based on the presence of analcime and normative nepheline, the rocks of dikes (and diatremes in adjacent areas) can be assigned to the formation of alkaline basaltoids of the potash series.

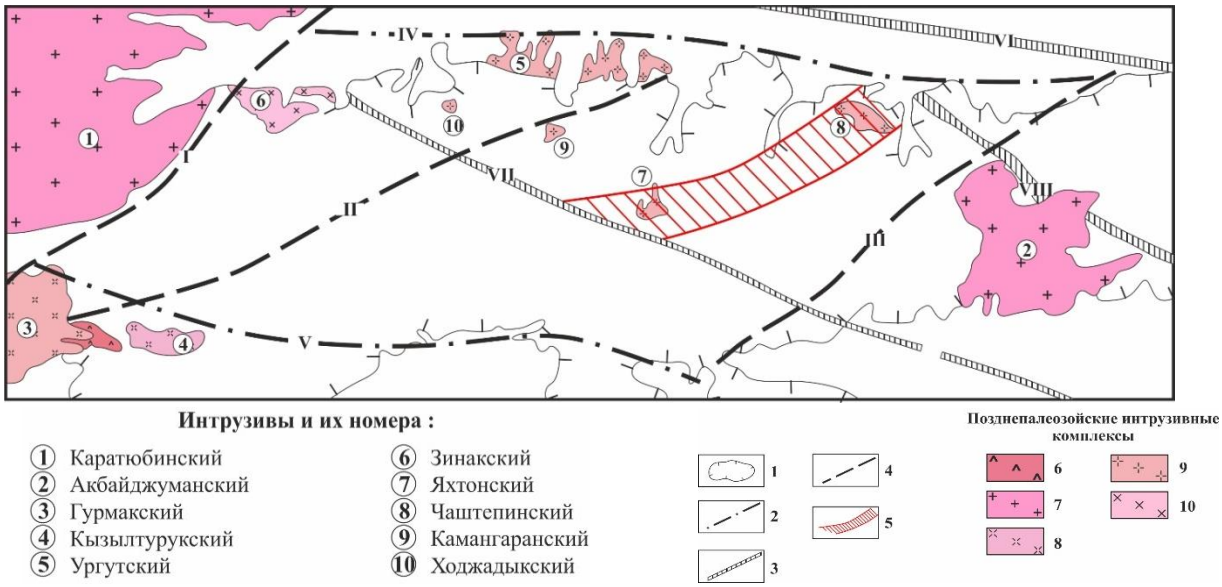
The rocks of the complex have elevated (relative to the clarks) contents of *Se, Re, As, Ag, W, Mo, Ni, Au* and, like the rocks of the early stages of magmatism, are accessoryly specialized in tungsten (scheelite contents in unaltered camptonites are frequent signs).

Of particular importance for the geochemical characteristics of the described ore process can be *Se*, which is considered as a geochemical indicator of processes of deep magmatism [6] and is a characteristic element of deep basalt and peridotite magmas. The data presented may indirectly indicate the unity of the magma-generating chamber during the formation of dikes of lamprophyres and alkaline basaltoids.

Apogranitoid tungsten mineralization in the northern part of the Chakylkalyan megablock (Fig. 1) is controlled by a late (in relation to the Yachthon intrusive complex productive for skarns) tectonic zone of northeast strike. The structure is expressed by linear zones of brecciation and cataclase, subparallel zones of fine fracturing, dikes of granodiorite-porphyry, diorite porphyrites and lamprophyres, linear dike-like apophyses of granodiorites, quartz and pegmatite veins, chains of polarizability anomalies and geochemical halos of typomorphic elements of tungsten mineralization.

Figure 1.

The main elements of the tectonic structure of the Chakylkalyan megablock



1 – Contour of exposed Paleozoic; 2 - Sublatitudinal deep faults activated in Pz-Mz: VI - North Chakylkalyan, V - Kashkadarya; 3 - Paleozoic consedimentary faults: the first order VI - Zarafshan, the second order VII - Central Chakylkalyan, VIII - Chashtepa-Tangisai; 4 - Northeastern faults: First order I - Guzaro-Jizzakh, second order II - Kyrktau, III - Turpaklin; 5 - Chashtepa-Yakhtonskaya tectonically weakened zone. Late Paleozoic intrusive complexes: 6 - gabbro-diorite; 7 – adamellite-granite; 8 - Potassium granites; 9 – Quartz-diorite-granodiorite; 10 - Two-mica granites.

The post-collision ore-feeding deformation structure (Chashtepa-Yakhtonskaya tectonically weakened zone) of northeastern strike crosses the entire pre-Mesozoic section, all Upper Paleozoic granitoid complexes, in many cases crosses thrust structures and controls the position of two ore fields: Yakhtonskoe and Chashtepa located 10 km to the north-east of it (Fig. 1).

In the Yakhtonskoe ore field, zones of submeridional faults form two ore-controlling structures, the Ore and West faults (Fig. 2), which are represented by systems of cleavage cracks with separate crushing and cataclase seams.

Tungsten ore bodies of the lower stage of the Yakhton deposit are located in zones of polycomponent metasomatites formed after granodiorites. The ore bodies are mainly ribbon-shaped with an average thickness of 4-5 m. They are traced along the strike for hundreds of meters. The main industrial component of ores is tungsten (average content in ordinary ores is 0.3–0.5%, in rich ores 1.5–2.0%). Of potential interest (in g/t): *Au* up to 3–4 (in separate samples), *Mo* up to 500–800, *Ag* up to 115.

The main tungsten mineral, scheelite, is represented by two generations - early, associated with molybdenite and gold, forming disseminated impregnation (with individual grains 2–3 mm in size) and nests (up to 0.5–1.0 cm in diameter), and late, which is characterized by sulfosalts (probably formed in the process of telescoping various mineral associations), as well as the veinlet form of segregations (with the thickness of the veinlets from filiform to 2–3 mm.). Scheelite of the first generation is characterized by bright blue luminescence, the second - bluish and yellowish-white.

Within the ore-bearing zones, scheelite mineralization is accompanied by widespread pyrite-arsenopyrite mineralization; confined to narrow linear zones of sulfosalt mineral (with a combination of antimony-silver and lead-antimony sulfosalts in it) and scattered molybdenite and locally manifested lead-zinc mineral associations. An important feature of ore-bearing zones is the presence in them of thin veinlets of brownish-black resinous carbonaceous matter (anthraxolite type), filling microcracks and intergranular space and, apparently, fixing the introduction of juvenile carbon in the near-ore space.

Selenium and tellurium act as indicators of the mineral-forming process, forming an isomorphic admixture in a wide range of ore minerals.

The main rocks hosting tungsten mineralization in the lower stage of the Yakhton deposit are uneven-medium-grained porphyritic biotite-amphibole granodiorites of the main intrusive phase.

The process of formation of the near-ore space consisted of two successive stages. At the first stage, granodiorites hosting mineralization were subject to acid leaching, which was replaced by alkaline metasomatism - the main rock-forming minerals of granodiorites underwent changes, which led to the removal of a number of petrogenic elements from the near-ore space [4].

Hornblende in ore-bearing granodiorites forms mainly tabular, rhomboid, and small-cluster intergrowths, preserved only in some places. Basically, it is completely replaced by chlorite with leucoxene, and in some nests its epidotization is clearly manifested, accompanied by microgranular accumulations of leucoxene and zoisite.

Plagioclase in the original rock forms tabular and isometric sections of prismatic (sometimes polyzonal) crystals 0.5–1.5 mm long along the long axis. During acid leaching, the plagioclase is intensely pelitized and spotty sericitized. However, the leaching process is developed extremely unevenly. In individual grains, sericite makes up to 40–45% in their areas. At the same time, many of its other grains remained completely pure [3]. Biotite of the original rocks is intensively replaced by chlorite with muscovite and leucoxene.

The final stage of acid leaching in the formed silicic metasomatites was the deposition of magnetite and sulfides (arsenopyrite, pyrite, and pyrrhotite). In the process of alkaline

metasomatism, most plagioclase grains are replaced by cloudy-spotty accumulations of non-twinned fine-grained albite, among which microrelicts of intensely sericitized primary plagioclase are common; less often, albite rim is observed in some plagioclase crystal grains. Porphyritic grains of plagioclase are almost completely replaced by microgranular calcite with small spotted albite segregations. Sometimes plagioclase and hornblende crystals are completely pseudomorphically replaced by calcite.

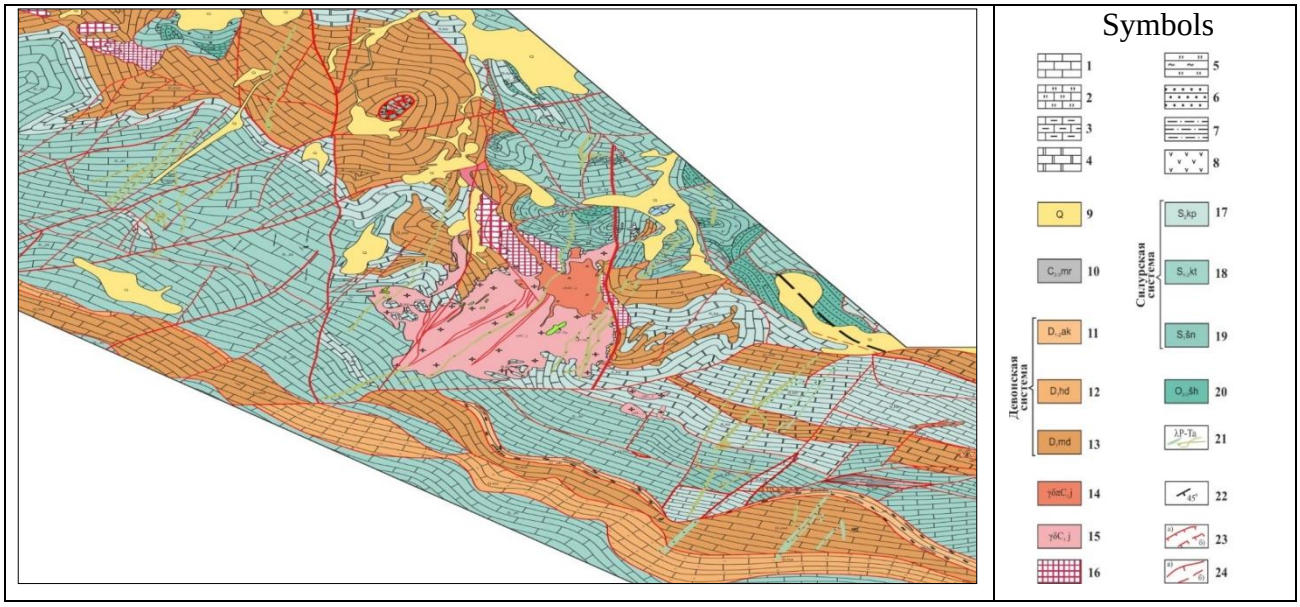
Metasomatic quartz usually forms isometric grains no larger than 0.5 mm, often grouped into small nests, and, together with potassium feldspar and rare grains of chlorite, fills interstitium between plagioclase and hornblende grains along biotite. Other areas are dominated by quartz with tremolite, chlorite, and sphene. Separate areas of metasomatites are composed of almost pure fine-grained calcite.

The result of integral silicicolic metasomatism was rocks represented by a residual matrix of original granodiorites, consisting of primary quartz, albitized (sometimes completely saussuritized) plagioclase and hornblende relics, completely replaced by chlorite with leucoxene and newly formed minerals, forming various combinations, which are based on metasomatic quartz and calcite, with a wide participation of potassium feldspar and albite and locally manifested epidote, tremolite, monoclinic pyroxene, sphene and apatite.

The described model of the formation of the near-ore space clearly fits into the nature and dynamics of the behavior of the main petrogenic elements in it. In the process of pre-ore metasomatism, a stable trend is formed for the removal of *Na, Al, P* and the addition of *K, Ca, Si* with variable dynamics of the behavior of *Mg* and *Fe*. [nine]. In mineralized zones containing tungsten ore bodies, the trend of Na and P removal increases while maintaining the level of Al removal, and a significant input of *Ca, Si, Mg*, and *Fe* is observed. Attention should be paid to the removal of *K* from the mineralized zones in relation to the host wall metasomatites (Table 1).

Fig. 2.

Schematic geological map of the Yakhton ore field



1 - Limestones; 2 - Limestone-siliceous; 3 - Marl-calcareous; 4 - Dolomites; 5 – silicified schist; 6 - Sandstones; 7 – micaceous-quartz-feldspar hornfelses; 8 - Andesites; 9 - Quaternary deposits undivided; 10 - Carboniferous system. Middle-upper sections undivided, Marguzar Formation; 11 - Devonian system. Lower-middle sections, Akbai Formation; 12 - Devonian

system. Lower section, Khodzhakurgan Formation; 13 - Devonian system. Lower section, Madmon Formation; 14 – Yakhton quartz-diorite-granodiorite complex; 15 – biotite-amphibole porphyritic granodiorites, fine-, medium-grained; 16 – Mineralized breccias intensely skarned; 17 - Silurian system. Upper section, Kupruk Formation; 18 - Silurian system. Lower-upper sections, Kuturak Formation; 19 - Silurian system. Lower section, Shing Formation; 20 - Ordovician system. Middle-upper sections, Shakhriomon Formation; 21 – Almalisai gabbro-monzonite-syenite complex; 22 - Elements of rock occurrence; 23 - Thrusts, reverse-thrusts: a) traced, b) inferred; 24 - Reverse faults, discharges: a) traced, b) expected.

The multi-stage and discrete nature of the ore process with telescoping of scheelite, pyrite-arsenopyrite, sulfosalt, lead-zinc and molybdenite mineralization in the near-ore space forms a complex-structured common aureole field of ore-forming elements, which has an internal linear heterogeneity.

At the first stage of studying the tungsten mineralization of the lower stage of the Yakhton deposit, the near-ore space can be conditionally divided into 5 zones, characterized by different clarke concentrations (CC) of tungsten and different behavior of the main ore-forming elements.

The ore bodies are mainly ribbon-shaped with an average thickness of 4-5 m. They are traced along the strike for hundreds of meters.

In general, the entire zone is characterized by above-background contents of *W, Au, Bi, Mo, Ag, Sb, As, Se, Te, Ba* (introduced into the near-ore space at the pre-ore stage): near-background - *Pb, Sn, Cu, Zn, Cd, Mn , U, V*, low background - *Li, Be, Zr, Nb, V, Co, Ni, Ti* and Σ REE.

The mineralized zone containing industrial tungsten ore bodies (with CC *W*>50) is characterized by a significant input of *W, Bi, Ag, Sb, As, Cu*, moderate input of *Mo, Pb, Se, Te, Mn, Co*, neutral behavior of *Sn, Zn, Be, Zr, Cd, Ni, Mn, U, B, Cr* and removal of *Li, Ba, Nb, V*.

Table 1

Model of the formation of the near-ore space and the dynamics of the behavior of the main petrogenic elements in it

Zones in the near-ore space	Elements, g/t						
	Na	Mg	Al	P	K	Ca	Fe
1. Conditionally background granodiorites	22 799	8860	64 827	968	33 904	32 531	28 899
2. External	20 804	9284	62 917	932	33 637	38 910	28 745
3. Remote near-ore	18 775	9633	57 827	668	31 635	42 617	27 593
4. Close near-ore	18 735	11 862	64 675	694	30 201	54 713	33 697
5. Ore-mineralized	15 420	15 740	57 187	627	22 071	82 182	43 705
Clark elements in granodiorites	27 800	11 000	86 000	1100	25 200	24 000	33 000

For tungsten mineralization of the lower tier of the Yakhton deposit, the generalized series of relative intensity has the form *Bi-Te-W-Au-Sb-As-Ag-Se-Mo-Sn-Cu-Be-U-Cd-Cr-B-Ba-Co-Mn*. The first 9 elements are considered as a typomorphic geochemical complex of the object.

To delineate the zones of ore localization in the near-ore space of the lower stage of the Yakhton deposit, a number of intensity factors were calculated (the ratio of the main ore-forming elements to the elements of local removal, normalized to the background). $Ku=W\times Bi\times Te/V\times Nb\times Ni$ has the highest resolution for identifying productive levels of tungsten mineralization, increasing by 5-7 orders of magnitude from conditionally unaltered granodiorites to mineralized zones

hosting tungsten ore bodies (Table 2). Quite accurately, the indicated Ki also outlines the near-ore zones with a range of values of 3-5 orders of magnitude.

Normalized through the background: Ki-1 - *W/V;* Ki -2 - *Bi/Nb;* Ki -3 - *Te/Ni;* Ki -4 - *W×Bi×Te/V×Nb×Ni.*

Table 2

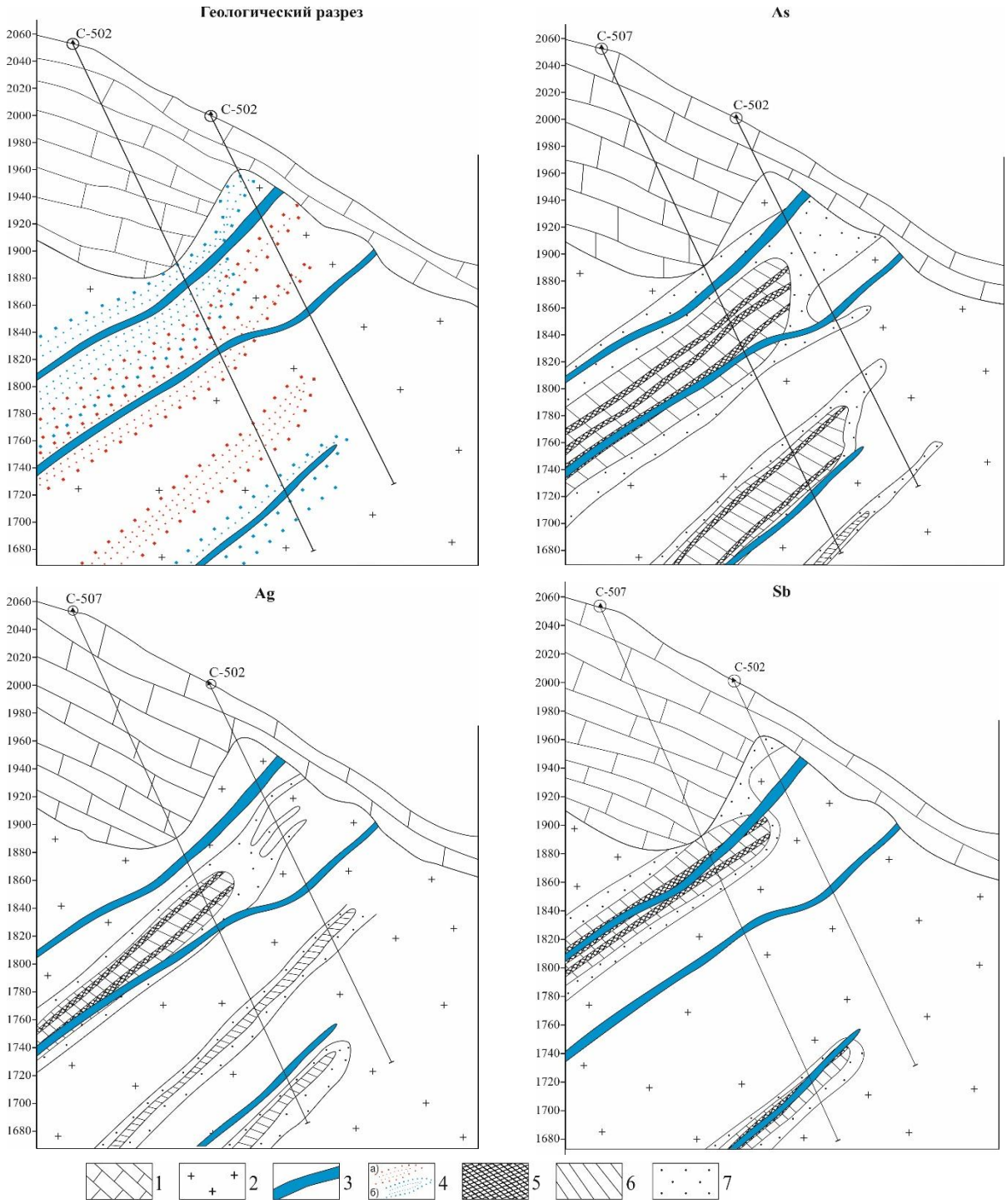
Values of different intensity coefficients in separate zones of the near-ore space of the lower tier of the Yakhton deposit

Zones	Ki-1	Ki -2	Ki -3	Ki -4
Ore-mineralized zone (with CC W > 50)	145– 20 323/7278	450– 122 877/13 989	314– 33 714/5150	$5,87 \cdot 10^{7}$– $2,6 \cdot 10^{13}$/ $139\,966 \cdot 10^{6}$
Close near-ore zone (with CC W 26–50)	94–250/162	378– 237 778/12 085	320– 10 936/2873	$3,2 \cdot 10^{6}$– $5,13 \cdot 10^{11}$/ $20\,489 \cdot 10^{6}$
Remote near-ore zone (with CC W 11–25)	25–222/71	162– 57 522/65 919	211– 4919/6222	$1,99 \cdot 10^{6}$– $8,3 \cdot 10^{11}$/ $15\,537 \cdot 10^{6}$
Conditionally background granodiorites (with CC W 1–5)	7–57/31	356–4271/1567	164– 2840/964	$2,44 \cdot 10^{6}$– $5,33 \cdot 10^{8}$/ $96,9 \cdot 10^{6}$
Zones of polysulfide mineralization (with telescoping of pyrite-arsenopyrite and sulfosalt mineralization)	15–85/35	124– 19 226/2754	400– 32 759/4942	$1,12 \cdot 10^{6}$– $9,56 \cdot 10^{9}$/ $608 \cdot 10^{6}$

Additionally, multiplicative coefficients were calculated that fix the spatial position of gold-bearing and sulfosalt mineral associations. *Au×Bi* is a geochemical indicator of gold-bearing mineral associations, the values of which $0,5 – 5 \cdot 10^{4}$ fix sub-background areas of the near-ore space; $1,4 \cdot 10^{5}–6,7 \cdot 10^{6}$ – local redistribution fields; $1,2 – 6,8 \cdot 10^{7}$ - mineralization zones with high gold content (0.1 - 4.0 g/t).

Fig. 3.

Distribution of primary halos of the main ore-forming elements



1 – Carbonate rocks of the frame of the Yakhton intrusion; 2 – Granodiorites of the main phase of the Yakhton Complex; 3 – Tungsten ore bodies; 4 - Zones of mineralization: a) pyrite-arsenopyrite, b) sulfosalt. Content of elements, g/t: 5 - W - 100-1000, As - 150-500, Ag - 50-250, Sb - 30-100; 6 - W - 50-100, As - 50-150, Ag - 15-30, Sb - 10-30; 7 - W - 20-50, As - 10-50, Ag - 1-5, Sb - 3-10;

Ag×Sb×Pb is a geochemical indicator of sulfosalt mineral associations, the range of values of which $2{,}2\cdot10^{6}$ – $1{,}4\cdot10^{8}$ has an increased frequency of occurrence in zones of mineralized metasomatites with various sulfosalts; $2 – 6{,}2\cdot10^{5}$ - in zones with scattered sulfosalt mineralization; $2 – 9\cdot10^{2} – 1{,}1 – 2{,}5\cdot10^{4}$ - in practically unmineralized metasomatites with relic structures of parent granodiorites.

The distribution of primary halos of the main ore-forming elements is illustrated by the example of a section representing the central typical section of the lower stage of the North area of the Yakhton deposit (Fig. 3). The most intense halos in the near-ore space of the lower stage of the Yakhton deposit form elements that are part of the typomorphic association of tungsten mineralization.

The morphology of aureoles as a whole reflects the structure of mineralized zones and their significant internal heterogeneity, emphasizing the metasomatic nature of mineralization.

Stable connections (significant at the level of 5%) in the correlation graphs form blocks: *V-Pb-W-Li; Bi-Au-Te; Ag-Sb-Cu; Pb-Sb-As-Te; Cu-Ni-V-Cr-Zn.*

Analysis of the correlations between the elements made it possible to identify the following patterns [8]:

the presence of *W* in a single block with elements of the "mafic" group (*V*, which, in turn, exhibits close relationships with *Cr* and *Ni*) and the "granitoid" group (*Li*, *Pb*) may indicate different sources of ore matter and the polygenicity of the object;

the absence of correlations between *Mo* and ore-forming elements proves the scattered nature of early molybdenite mineralization in the zone of ore-bearing metasomatites;

various associative chains with the central position of *Sb* in them confirm the presence of two types of sulfosalts in the mineralized zones - antimony-silver with copper and antimony-lead with arsenic and tellurium, which are indicators of the final stages of mineral formation;

the different position in the correlation graphs of *W* and *Au* confirms their autonomy in the formation of the ore space and the possibility of identifying isolated rare-metal and gold-bearing ore bodies.

Based on the article, the following **conclusions** can be drawn:

1. Integral metasomatism of the lower stage of the Yakhton deposit has a silicic-alkaline orientation with the introduction of *Ca, Si, Mg*, and *Fe* into the near-ore space.

2. A typomorphic complex of elements of apogranitoid tungsten mineralization was revealed, represented by the series *W-Bi-Te-Au-Sb-As-Ag-Se-Mo*.

3. On the basis of the analysis performed, a number of geochemical coefficients were created and tested, fixing the contrast values of various parts of the near-ore space.

4. The studied geochemical field clearly shows the echelon structure of mineralized zones in the general ore-bearing structure.

5. The supra-ore-upper-ore level of primary aureoles makes it possible, on the basis of geochemical constructions, to predict new ore bodies to a depth.

6. Correlations of the main ore-generating elements reflect the multi-stage nature of the ore process in the lower tier of the Yakhton deposit and additionally emphasize the telescoping of mineral associations in the near-ore space of tungsten-bearing mineralized zones.

7. The presence of such elements as *Cr, Ni, Mg, Fe*, and *C* in the ore process indicates a subcrustal (mantle) source of ore matter, the derivatives of which are also dykes of subalkaline gabbroids and lamprophyres (alkaline-basaltoid formation of activated orogenic regions).

8. Polygenicity and polychronism of ore concentrations of the lower tier of the Yakhton deposit is probably the key to the significant scale of this object.

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WAYS TO DEVELOP THE SERVICE SECTOR AND INCREASE ITS ROLE IN PROVIDING EMPLOYMENT OF THE POPULATION

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Abstract: *In this article, based on the rapid development of the service sector in the economy, the increase of population employment, the development of the national economy of the service sector, the solution of social problems, the research of the interrelationship between macroeconomic indicators, material and non-material production areas are considered.*
Keywords: *economy, service, population employment, production, development.*

INTRODUCTION

The service sector in Uzbekistan is developing at a rapid pace, and its role in improving the national economy, creating new jobs, providing employment to the country's population, improving the well-being of the population, and as a driving factor in solving other social problems is increasingly increasing. The share of people employed in the service sector in the economy in the number of people employed in the economy is growing. But it is still far less than the level reached by developed countries. Based on the above, rapid development of this industry is planned in Uzbekistan. In the adopted Action Strategy for the further development of the Republic of Uzbekistan, important tasks for the development of the service sector and ensuring the employment of the population are defined.

In the world economy, the role of the service sector in providing employment is increasing. 70% of the population employed in the economy in highly developed Western countries work in the service sector. As a result of the rapid growth of labor productivity in the conditions of the innovative economy, the urgency of the problems of ensuring employment of the population in the service sector increases even more. From this point of view, issues of rapid development of the service sector based on foreign experiences and increasing its role in creating new jobs are among the urgent issues of today.

Analysis of literature on the topic XA number of scientific and practical works have been conducted by economists about the field of izmat, its essence, its role in socio-economic development, and the issues of development of this field. A. Smith, J. B. Say, A. Marshall, Y. Schumpeter, J. M. Keynes and others' researches are among them. S.S. Gulomov, N.T.Tukhliev, Yo.A.Abdullaev, M.M.Mukhammedov, M.Q.Pardaev, G'.H.Qudratov, I.S.Gulomov, N.T.Tukhliev, Yo.A.Abdullaev, M.Q.Pardaev, G.H.Qudratov, I. S. Tukhliev, K. J. Mirzaev, B. A. Abdukarimov, E. S. Fayziev, T. T. Tashmuratov can be mentioned. In their scientific research, they studied the theoretical and methodological problems of the development of the service sector in our country.

Research methodology

Systematic approach, abstract-logical thinking, grouping, comparison, factor analysis, selective observation methods were used in the research process.

Analysis and results

It consists in the development of scientific and methodological recommendations and practical suggestions for increasing the employment of the population based on the rapid development of the service sector in the national economy of Uzbekistan.

- justifying the role and importance of the service sector in the development of the national economy and solving social problems;

-research of interrelation between the service sector and macroeconomic indicators, tangible and intangible production spheres;

- aggravation of employment problems due to the increase of labor productivity in material production and to justify the role and tasks of the service sector in solving these problems;

- researching the state and development trends of the service sector;

-scientific analysis and assessment of external and internal factors affecting the state and development of the service sector;

- development of priorities for the development of specific sectors of the service sector from the point of view of meeting the needs of the population;

- proposals and recommendations on comprehensive development of the service sector and increasing its role in ensuring employment of the population

It was theoretically and practically justified that one of the important factors of increasing the employment of the population, improving its living standards and quality is the rapid development of the service sector. Therefore, further development of the service sector, setting priority directions for achieving this, is one of the promising directions for solving the important socio-economic problem of providing employment to the working population in the country. In our opinion, the service sector has its influence on the national economy through the following directions.

Determining the impact of the service sector on the economy is important in developing the priority directions of the sector's development.

In the current period, a number of state programs have been developed in order to ensure the development of service sector networks in our country. In particular,"Service industry development program in 2016-2026"include these. According to the program, the following are the priority directions and tasks for the development of the service sector in our country in 2016-2026:

- increasing the gross domestic product due to the development of the services sector, increasing its share in the republic's economy to 48.7%;
- Increase services in rural areas by 2.8 times by 2029;
- development of engineering-communication, road transport infrastructure, creation of conditions for the rapid development of the service sector, structural changes due to the introduction of modern information and communication technologies in networks;
- formation of competition and business environment, and at the same time support for the development of small business and private business entities;
- expansion of various innovative services, new means of communication;
- the use of public telecommunication networks is technical–provide opportunities, provide quality services based on them, complete transition to digital systems of telephone communication and television, increase the share of communication and information in the republic's economy to 2.8% by 2026;

- finance with the introduction of the latest electronic payment technologies–development of services;
- more high-tech services in the health sector–development.

The idea of rapid development of the service sector is also reflected in the directions of the Action Strategy for the further development of Uzbekistan in 2017-2021. At the moment, the issues of ensuring employment of the population of the Strategy of Actions are given a lot of attention. The conducted studies have shown that there are many problems related to the development of the service sector that have not yet been resolved. In our opinion, the problems that negatively affect the development of the service industry include:

- lack of working capital in the service sector;
- a decrease in the share of investments in the service sector;
- that entrepreneurs engaged in service activities are not fully focused on a specific goal;
- the impact of the globalization process on the service sector;
- high risk of economic risk in the implementation of innovative activities;
- the presence of shortcomings in the implementation of the policy of state support of the service sector and its branches;
- lack of highly qualified workers in the field.

Based on the analysis of the above problems, we believe that the following should be defined as the priority directions for the development of the service sector:

1. Formation of a competitive environment in industries on the basis of diversification of the service sector, deep structural changes and modernization;
2. Increasing labor productivity in the service sector;
3. Development of an effective mechanism for managing the service sector, updating its material and technical base and increasing working capital;
5. To strengthen the state's attention in science and education, culture, healthcare, banking and finance and credit sectors of the service sector;
6. Development of neglected types of services based on customs, values and traditions of our people in some regions of our country;
7. Maintaining a preferential tax policy in the field of services and services;
8. Providing the service sector with qualified and young personnel;
9. Development of services and services in rural areas.

Diversification and modernization of industry sectors is of great importance in the development of the service sector and its efficiency improvement. For this, it is appropriate to create a healthy competitive environment in the service sector. Sthe issue of creating a competitive and entrepreneurial environment, and at the same time supporting the development of small business and private entrepreneurship entities is also put in parallel. After all, the service sector is developing mainly thanks to small business and private entrepreneurship. With the growth of these services, a number of problems can be solved. In particular, along with the creation of new jobs in our country, the problem of employment will be solved, the need for services of the production process will be satisfied, and finally, the standard and quality of life of the population will be increased.As a result of diversification, economic sectors and industries, service infrastructure will develop widely. A solid foundation will be created for the organization and development of export of products and services. It also enables the creation of new jobs based on the balanced and systematic development of economic sectors. The lack of modern networks in the economy is

considered the main obstacle to development. The issue of expansion of various innovative services and new means of communication also requires the development of the service sector in our country based on global requirements. We can ensure the stable development of the economy only if we export services in our country on a large scale, as well as goods. From this point of view, it is important to bring the service sector to the level of international standards.

Another priority for the development of the service sector is the creation of a favorable investment environment in this sector. Stimulation of investment processes allows updating the material and technical base of the industry. The renewal of the material and technical base in the service sector is closely related to the progress of science and technology. It is possible to increase its working capital on the basis of meeting the needs of this industry for a modern technical base.

The next priority direction of the development of the service sector is to further strengthen state cooperation in the field of education, culture, art, science and scientific services, healthcare and social security, as well as banking, finance and credit sectors. "At the same time, taking into account that the financial and economic stability of our country largely depends on the efficient operation of banks, deepening and expanding the work in this regard, further development of the multifaceted financial services market in order to support the real sector of the economy is considered a priority task." During the transition to the market economy, the state, as the main reformer, must take responsibility for the implementation of reforms in the financial and monetary credit system and its further development.

Changing the appearance of the village, raising the standard of living of the population and providing employment is largely related to the service sector. For this reason, we found it appropriate to set the development of the service sector in rural areas as a priority. Rapid development of services and services in the regions of the country, especially in rural areas, in particular, services provided to rural residents: first of all, utilities, home repair and construction, water use, veterinary services, preparation, packaging and sale of agricultural products, and other services Increasing the size, types and quality is one of the urgent tasks of today.

In order to further strengthen business activity in the service sector, preferential tax policy should be considered as a priority for the development of this sector.

At the heart of any economic reforms lies the human factor. The creator of these economic reforms is also a human being. Therefore, human potential is the force that embodies the laws of nature and society that govern economic processes. The role of skilled, educated personnel in the development of any economic sector is very high. For this reason, the issue of personnel and their qualifications, knowledge and experience is always in focus. In particular, the personnel who will develop the service sector and bring it to a modern level should have modern knowledge and experience in this regard. Currently, the types of services have increased and new ones are appearing. But the issue of training the personnel who will organize and manage this sector is also in an unsatisfactory state, as the President noted. In this regard, the President of the Republic of Uzbekistan Sh.M. ". For this reason, it is necessary to consider providing the service sector with qualified and young personnel as a priority.

Researches on setting priorities for the development of the service industry have shown that setting priorities in this area is more complicated than setting priorities for the development of material production industries. Because it requires paying special attention to the social, economic and demographic aspects of regional factors. In this regard, Ya.J. Isakov's candidate's thesis on "Econometric modeling of service sector efficiency and its development" also shows:

- functional-economic description of the region;
- the socio-economic description of the region (the level of urbanization, the structure of the population in the field of professional skills, the development prospects of the population's residences);
- the social demographic structure of the region (gender, age and educational structure of the population);
- a description of the material and technical base of service sector institutions.

Therefore, when determining the priority tasks of the development of the service sector, we found it appropriate to develop it according to the regions in the following order based on the above-mentioned factors:

First, appropriate placement of service enterprises and organizations;

Secondly, bringing them closer to the places of work, study and living, recreation and cultural entertainment of the population;

Thirdly, to ensure the operation of these enterprises and organizations at times convenient for the population.

Conclusions and suggestions

As a result of the research on increasing the employment of the population in the service sector, the following conclusions were reached and scientifically based recommendations were developed.

1. The service sector plays an important role in all stages of the historical development of humanity, especially in the transition from one form of economic management to another (from natural economy to commodity production) or from one stage of social development to another (from industrial society to post-industrial society). At a certain stage of development, the deepening of the division of labor between communities, the specialization of social production, the emergence and development of private property cannot be realized without mutual exchange between the members of the natural economy, i.e. without trade and services.

2. In the economic literature, there are controversial opinions about the field of services, the essence of services, their evaluation methodology, the status and the quantitative and qualitative indicators that represent the dynamics of development. In the process of research, their systematization and critical study made it possible to clarify some theoretical issues. In explaining the essence of the concepts of "service" and "service provision", it was argued that, in addition to views from the point of view of the labor process, from the point of view of GDP production, from the state's point of view, from the owner's point of view, first of all, it is highly effective to look at it from the consumer's point of view.

3. In the post-industrial society, the service sector plays an important role in the country's socio-economic development, employment, real income, standard of living and quality of the country's gross domestic product andplays an important role in the formation of other macroeconomic indicators. In the existing literature, the role and importance of the service sector in the socio-economic development of the country is recognized mainly through its participation in the formation of the size of the GDP and in ensuring the employment of the population. However, in our opinion, the service sector also plays an important role in the fulfillment of the requirements of the "Population" law.

4.In order to determine the role and opportunities of the service sector in providing employment to the population, it is necessary to develop improved methods of determining the

state of development and prospects of its individual sectors, which have good practical results. For this purpose, a system of indicators representing the provision of services to the population was developed. It was scientifically justified that the following should be included in such indicators: aavailability of services; that the population is provided with services in a specific branch of the service sector; provision of quality services to the population.

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IMPROVEMENT OF SOLVENT RECOVERY TECHNOLOGY IN OIL EXTRACTION PRODUCTION

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Abstract. *This article discusses the causes of irretrievable losses in the oil extraction industry and the conditions for the proper organization of the technological process. In particular, a solvent regeneration technology has been developed, according to which the condensate formed in the reflux condenser is used to purify the steam-gasoline mixture coming from the evaporator to the meal traps, and which are stable water-gasoline emulsions with meal particles . Thus, the system reduces the consumption of hot water, solvent, the duration of the solvent regeneration process, due to this, the cost of the finished product is reduced.*

Keywords: *extraction, organic solvent, gasoline, regeneration, condenser, distillation, air-steam mixture, dephlegmator, meal trap.*

Introduction

At oil and fat enterprises of our republic, vegetable oils are obtained by pressing-extraction of various raw materials: cotton seeds, sunflower seeds, soybeans, safflower. The extraction solvent evaporated from the miscella and meal is reused after condensation to extract the oil.

The efficiency of solvent use depends on its complete regeneration. However, in practice this cannot be achieved, some of it is lost irretrievably. These losses depend on the type of raw materials being processed, the purity of the solvent, the technology for extracting the oil by extraction, the equipment used in the extraction process and the recovery of the solvent. Irreversible loss of the solvent is up to 1.0% by weight of the extracted material [1, p.319].

The solvent vapors formed in the distillers are sent for condensation. Part of the vapors that have not turned into a liquid state in the condensers evaporates in various containers and reservoirs, auxiliary apparatus, forming air-vapour mixtures. Usually such mixtures consist of a large amount of air and a small amount of solvent.

Cooling condensers are used in extraction shops to condense solvent vapors in mixtures. Subsequently, the condensate is separated into its constituent components - gasoline and water by settling in special devices - water separators. In addition, during the production process, part of the solvent is mixed with water, fats, proteins, phosphatides, carbohydrates, and other substances contained in the processed raw materials, forming stable emulsions (sludges). The isolation of the solvent from them is a rather laborious and difficult process.

As a result of the correct organization of the technological process in the production of vegetable oil by the extraction method, it is possible to reduce the solvent consumption, which not only affects the cost of the finished product, but also improves the environmental, fire and explosive situation at the enterprise.

Sources of irretrievable solvent losses at oil extraction plants can be different. These are water discharged into the sewer from water separators, meal leaving various types of evaporators after steaming, air leaving dephlegmators, gasoline vapors penetrating into the room ¬through leaks in the apparatus and communications of the extraction shop, and then emitted by the exhaust

system into the air and etc. Solvent losses ¬with the meal are especially high in case of violation of the equipment operation mode [2, p.228].

To trap gasoline vapors from the air-vapor mixture, a surface cooling dephlegmator is used, which is a vertical shell-and-tube heat exchanger. The air-steam mixture is fed from above into the annular space . The resulting condensate, consisting of solvent, water, solid particles and emulsions, is discharged to the water separator, air to the atmosphere.

The separation of the condensed solvent and water vapors is carried out by settling and is based on the difference in their densities. To do this, the mixture enters the preliminary water separator , which is filled with fresh water before start-up, then the final water separator. To maintain a constant water level, circulating water is supplied to them. The level of the water-gasoline mixture is controlled using a gauge glass [3, C .153, 4, C .420] .

From the water separator , the upper layer - the solvent is sent to the solvent tank. The emulsion layer is discharged to the sludge evaporator, and the lower layer is formed by water with an admixture of the solvent. Sludge settles at the very bottom.

The formation of emulsions, sludge , as well as mixtures of water with a solvent leads to irretrievable losses of the solvent, which increases the cost of the finished product and worsens working conditions. Losses of gasoline with sludge water in water separators are due to some solubility of gasoline in water. It is known that the solubility of gasoline in water is low, but it increases with increasing temperature, which also contributes to an increase in solvent losses. The water leaving the water separator contains up to 0.3% of dissolved and emulsified gasoline.

Offer and results

During the processing of the meal in order to distill the solvent, along with the vapors of gasoline and water, a large number of particles of the meal are carried away , which are deposited on the cooling surface of the condensers, reducing the heat transfer coefficient. This leads to a deterioration in the operation of capacitors, the formation of stable emulsions of water and gasoline.

For thorough cleaning of water and gasoline vapors from meal particles, wet meal traps or scrubbers are installed between the meal evaporator and condensers (Fig. 1). In them, washing of the gas-vapor mixture is carried out by spraying hot water at a temperature of 85 -9 0 0 C or a hot solvent. The purified juice vapors are sent for condensation. As a result of the improvement of the technological line, these vapors are sent to the distillers of the I and II stages. Wet screening with hot water is part of the sludge and emulsion water treatment system.

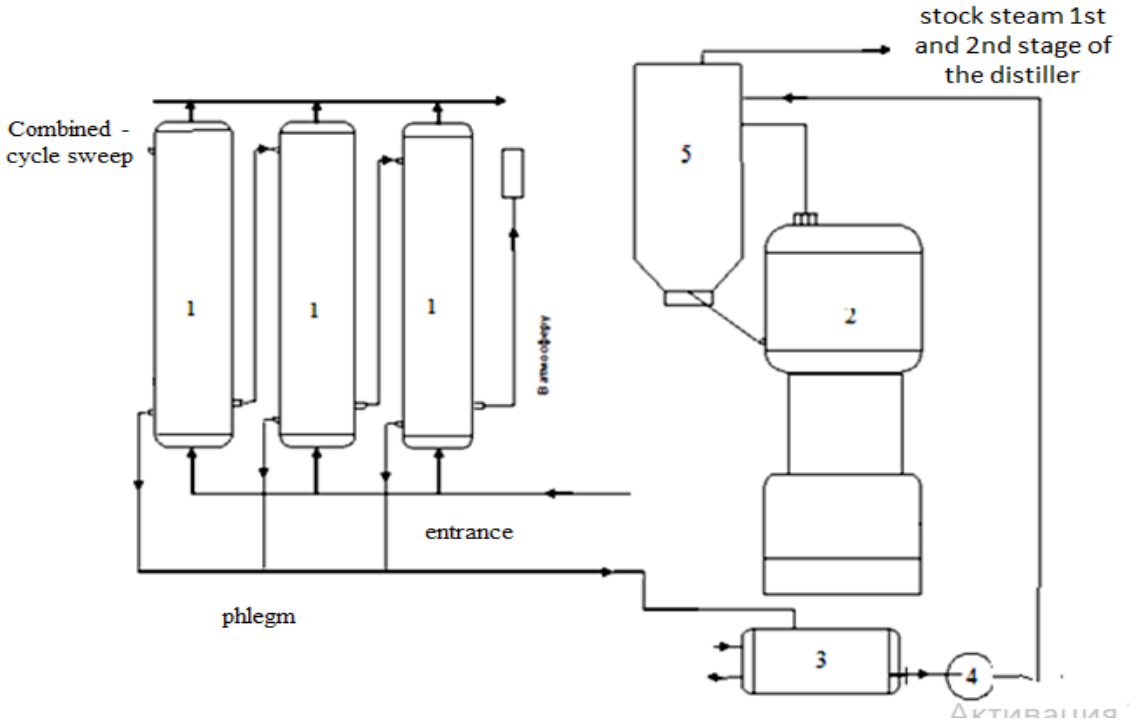
In order to minimize situations that lead to solvent losses, it is advisable to use the condensate formed in the reflux condenser (phlegm) in wet screen traps. This will require one pump and a tank with a volume of V = 3 m 3 , heated by deaf steam, for the continuous supply of the apparatus with hot condensate.

After the recuperation process in reflux plants, the released condensate containing the solvent and emulsions is collected in a container, heated with deaf steam to 85 -9 0 ° C in a heater and sent to a wet sieve trap to clean gasoline and water vapors coming out of the tank evaporator from particles of meal . The washed off sludge is collected in the lower part of the apparatus and sent to the first tank of the meal evaporator.

Thus, an increase in the efficiency of solvent recovery is a chieved.

Fig. 1.

Technological scheme of using reflux to clean the vapor-gas mixture formed in the meal evaporator:



1- dephlegmator; 2 – toaster (meal evaporator); 3-heat exchanger; 4-pump; 5-s to rubber (wet trap).

Conclusion

According to existing technology the condensate formed in the dephlegmator and consisting of water, solvent, emulsion and sludge passes through the preliminary and control water separators, where it is separated into several fractions by settling. In order to maintain a constant water level, wash water is supplied to them.

As aresult of the use of condensate coming out of the dephlegmator. wet screen traps reduced water consumption, solvent losses decreased by 4...5 %, the degree of solvent purification was 97%.

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STUDYING THE MAIN ELEMENTS OF THE CELESTIAL SPHERE IN THE LABORATORY LESSONS OF THE ASTRONOMY COURSE

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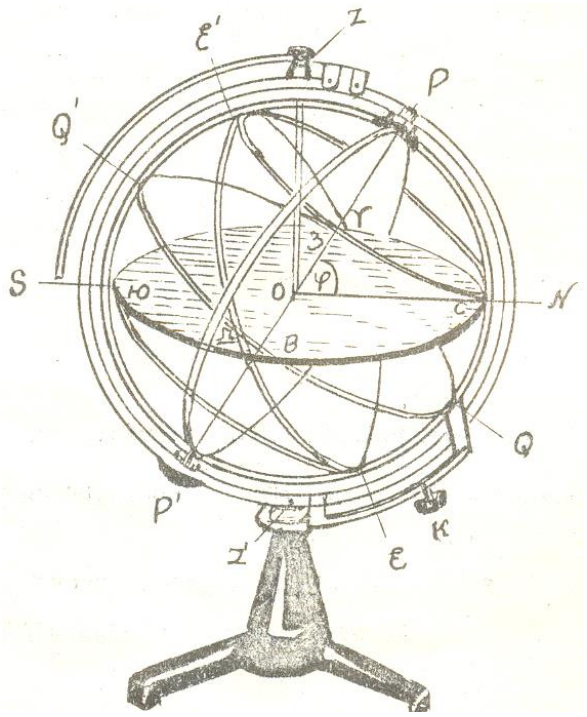
Abstract. *By studying the main elements of the celestial sphere in the laboratory classes of the astronomy course, students strengthen their theoretical knowledge of astronomy and learn to apply it in practice.*

Keywords: *celestial, equator, divides, celestial, convenient to study.*

It is very convenient to study the main elements of the celestial sphere with the help of a model of the celestial sphere and a moving map.

The observer is assumed to be at the point O = at the center of the celestial sphere model, OZ – a plane perpendicular to a vertical line is called a dream line, PP′ = a circle in the plane perpendicular to the axis of the universe (around which the celestial sphere apparently rotates) QQ′ = represents the celestial equator. The celestial equator divides the celestial sphere into the northern and southern hemispheres.

The points N, E, S, W on the mathematical horizon represent the north, east, south, and west points, respectively. Great circles passing through zenith Z and nadir - Z′ are called vertical circles. Vertical semicircles whose plane is perpendicular to the plane of the celestial meridian and passing through the east and west points are called the first verticals. Circles whose planes are parallel to the mathematical-horizon plane are called circles. $\varepsilon\varepsilon'$ the large circle represents the ecliptic, which is located at an angle of ε = 23°27′ relative to the equator. The ecliptic intersects the celestial equator at the vernal and autumnal equinoxes. Large semicircles passing through PP′ represent deviation circles. In astronomy, the declination circle is not a complete circle, but a semicircle passing from the P pole to the P′ pole. With the help of deviation circles, it is very convenient to demonstrate that the deviations of illuminants do not change during the day. At point Z, which represents the zenith in the model, there is a wire strip (equal to a great circle) attached to a movable ruler, which has an iron star stud. It is convenient for displaying the astronomical coordinates of iron bars and starlights. Circular metal wires, whose planes are parallel to the equator and are placed far from it $\pm 23^0 27'$, represent two diurnal parallels. They are very convenient in showing the daily path of the Sun at the points of solstice and the conditions for the luminaries not to rise or set. They are indicated by circles ε′



N and S ε. Here, ε represents the points of the summer solstice, and ε′ represents the points of the winter solstice. In the model, the yellow sphere attached to the deviation circle marks the Sun. It facilitates the study of the daily and annual movement of the Sun and the time systems related to the Sun.

The circle passing through the pole and the zenith represents the celestial meridian. Due to the apparent movement of the celestial sphere, each luminary crosses the celestial meridian twice a day. When the moving part of the model is rotated around the axis of the universe, when the star marking the illuminant crosses the meridian (R) south of the pole, the state where the lamp is at its peak, When it crosses (R) on the north side, it can be shown its position at the lower culmination. The distance of the illuminant from the zenith at the top culmination: $Z = \pm(\varphi - \delta)$ while at the lower culmination, $Z = 180^0 - (\delta + \varphi)$ is found with the expression.

By turning the K-screw at the bottom of the model, it is possible to change the angle of the universe axis with the mathematical horizon plane $(h_p = \varphi_{ни})$, that is, the model can be adapted to different geographical areas. After setting the model to the given geographic latitude, the K-screw is tightened. It is possible to adjust the model to different geographical latitudes and show how the appearance of the starry sky changes during the day.

TASKS

1. Find the universal axis, vertical line, meridian, mathematical horizon and equator circles, ecliptic, north, south, east and west points on the celestial sphere model. Adjust the model to the geographical latitude where you live, and determine the angles formed by the elements of the celestial sphere: the axis of the universe, the vertical line, the dream line, the mathematical horizon and the plane of the celestial equator.
2. At 21:00 on the date of performing this laboratory work, the main elements of the celestial sphere: the north pole of the universe, the vertical line, the axis of the universe, the celestial meridian, the mathematical horizon, the celestial equator, the approximate positions of the north, south, east, and west points in the sky. specify. Using the scroll map, determine the constellations located near the celestial meridian, the mathematical horizon, the equator of the universe.
3. In the model of the celestial sphere, roughly determine the equatorial coordinates of the poles of the universe - P, P′, the main points of the ecliptic E, E′.
4. Unscrew the K-screw of the model $\varphi = 90^0$, $\varphi = 66^0 33'$, $\varphi = 0^0$ adjust for extensions and geographic extension (φ)notice that the appearance of the celestial sphere and the mutual situations of the main directions and planes also change with the change. Find on the scrolling map which constellations do not set in the area where you live, and observe them in the evening sky.
5. Estimate the Z = zenith distances of the stars Shedar, Algol and Arcturus at the high culmination from the displacement map and, using the necessary formulas, calculate the exact values of Z - and estimate the position of these stars in the sky sphere model.

WORKSHOP REPORT

Expansion φ=

	The angle formed by the elements of the celestial sphere

Elements of the celestial sphere	With the mathematical horizon plane	With the plane of the celestial equator
The axis of the universe		
Vertical line		
Dream line		

constellations near the elements in the celestial sphere at 21 hours of the day when the laboratory worked:

Near the pole of the universe ...

Close to Zenith...

Near the mathematical horizon ...

Close to the celestial equator...

Outgoing...

Sinking ...

High climax ...

№	Points of the celestial sphere	α	δ
1	P		
2	P′		
3	γ		
4	Ω		
5	E		
6	E′		

№	The occupied position of the element	$\varphi = 90^0$	$\varphi = 66^0 33'$	$\varphi = 0^0$
1	Axis of the universe (relative to the vertical line)			
2	Equator (relative to the horizon)			

$\varphi = 90^0$, $\varphi = 66^0 33'$, $\varphi = 0^0$ the view of the stars in the sky ...

Where you live. . . constellations do not set.

Stars at the top	δ	φ	Z	The position of the star in relation to the zenith		
				δ>φ	δ<φ	δ=φ
Shedar						

Algol						
Arktur						

$\delta\rangle\varphi$ and $\delta\langle\varphi$ formulas used to find the star's distance from the zenith.

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EXPERIMENTAL DETERMINATION OF THE DIELECTRIC PROPERTIES OF FRUITS (USING ULTRA-HIGH FREQUENCY (UHF) ELECTROMAGNETIC FIELD (EMM) ENERGY)

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Abstract. *The article presents the researches conducted through the dielectric properties of pomegranate. In heating with the help of ultra-high frequency electromagnetic field energy, the design of the chamber, the determination of their moving speed, as well as the results of the experiment and the results related to this research are given. Dielectric properties of products are important when calculating food processing modes.*

Keywords: *ultra high frequency, electromagnetic field, frequency range, temperature, resonant, wave, transmitter, conduction complex, currents, generator, valve, detector.*

Dielectric properties of products are important in dielectric heating, that is, in heating with the help of ultra-high-frequency (UHF) electromagnetic field (EMF) energy, in the design of the working chamber of devices, in determining their moving speed, as well as in calculating food processing modes.

Such information can be determined experimentally in the extremely high frequency range by various methods. The choice of these methods depends on the composition of the product, temperature and in which frequency range to measure.

Due to the variety of tasks, there is no universal measurement method of dielectric properties. Dielectric properties measurement methods differ in the following main indicators. These include frequency range, dielectric constant measurement limit, and absorption tangent angle; the accuracy of measuring these quantities; amount of sample material used; temperature range of the experiment; including solid, liquid, and gas state of the products, the measurement suitability of the method, the complexity of sample preparation, the cost of the equipment, the convenience of the experiment, and the complexity of the calculation.

Commonly accepted methods in the field of UHF include: resonant, wave, transmitter, free wave, and slow wave methods.

Modernization of waveguide methods is common nowadays. Such diversity is due to the cross-section of its various waveguides: distinguished by the fact that it is filled with a rectangular or completely or partially checked product. A particular modification of this method depends on the nature of propagation of electromagnetic waves in the waveguide, as well as on the principle of the search for waves reflected from the dielectric or passed through the dielectric, and on the other hand, where the waveguide line and the sample are placed: on a line connected by experiment, (“experiment”) and released (“hollow rod” method) or their combination with approved loading or absolute absorption; with the product under investigation, by varying the thickness of the layer forming an infinite layer in the waveguide, such as by partially filling the cross section of the waveguide.

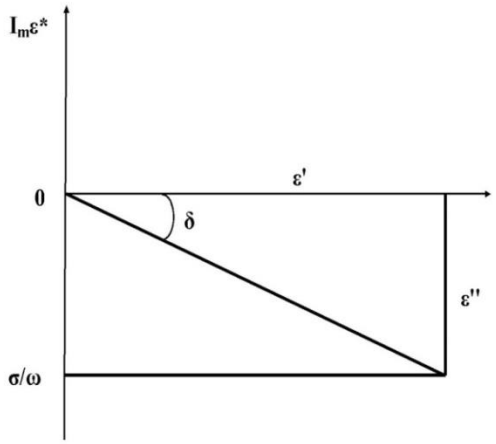
In the process of processing food products with the help of UHF EMF energy, their dielectric properties must be known. The conductivity of the product is characterized by the

complex ε^*dielectric conductivity, and the dielectric property of the dielectric (products) is determined by its current conductivity.

In the complex matrix in the dielectric, the complex dielectric property ε^* is characterized by the real vector ε' and is characterized by the polarization processes, which are characterized by the "mixed" currents and its "minimum" part, the conduction current. (Figure-1)

Figure-1.

Complex dielectric constant



In this, the minimum heating of the dielectric under the influence of the electric part of the EMF is understood and is defined by $\varepsilon'' = \frac{\sigma}{\vartheta}$. They can also be described by a tangent angle:

$$tg\delta = \frac{\varepsilon''}{\varepsilon'} = \frac{\sigma}{\vartheta} \cdot \frac{1}{\varepsilon'}. \quad (1)$$

The larger the angle $tg\delta$, the more energy is spent on heating the dielectric.

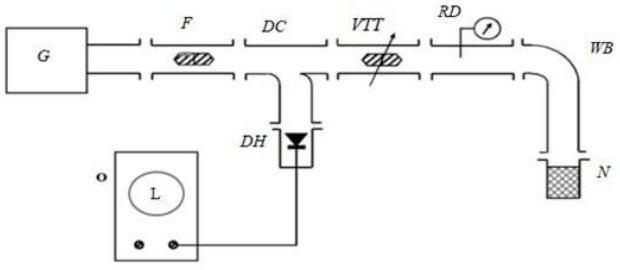
The complex dielectric permittivity and its components ε' and ε'' depend to a great extent on the frequency of the affected field, temperature and other physical and mechanical properties.

We measured the dielectric conductivity of pomegranate fruit by the method of "conducting an experiment" in the device whose block diagram is shown in Fig.2.

Figure-2 shows the block diagram of the device for measuring the dielectric conductivity of food products.

Figure-2.

Block diagram of the installation for measuring the dielectric conductivity of food products.



G - is a microwave measuring generator
F - ferrite gate (separation)
DC - directional connector
DH - detector head

O - is an oscilloscope

N - is the cross-section of the waveguide short-circuited with the studied dielectric (load).

VTT - is a variable attenuator

ML - measurement line

RD - recording device (microammeter M-95 or measuring amplifier U2-4)

WB - wave bending.

Dielectric conductivity measuring device is composed as follows. The device has a generator G, which is a source of measurement of the signal of UHF. For the stable operation of the generator, a ferrite valve is installed to eliminate the electromagnetic waves from the load. The directional valve serves to return part of the NO UHF energy. The energy from it is sent to the oscilloscope O through the detector head DC. The oscilloscope serves as an indicator of the uniform level of power supplied from the generator. A controlled attenuator VTT provides the ability to vary the power regardless of the generator power. The measuring line ML is considered the main element of the device and is used to measure the wavelength, the standing wave coefficient P, and the minimum electric field D_R in the waveguide.

The recording equipment RD captures the application of the standing wave field and the propagation of the field to obtain quantitative information.

Bending WB of the waveguide is used in the search for liquid dielectrics to obtain the waveguide N vertical standing wave experiment.

Based on the experimental research methodology, we tested the dielectric property (conductivity) of pomegranate fruit using the following experimental methodology:

This includes the following sequence.

1. After turning on the external shunt and preparing the device (Fig.2), the GZ-10A generator is added to the experimental stand;

2. We connect the experimental waveguide of the waveguide to the bend of the waveguide, only it should not be filled with the product (dielectric);

3. By changing the position of the wave line detector after heating the generator, the position of the standing wave minimum relative to the free base plane is found;

4. By measuring the minimum distance between the standing waves, the wavelength λ_e of the waveguide is calculated. The wavelength is twice the measured distance.

5. The section of the experimental waveguide was filled with the product under investigation. When filling, it is necessary to pay attention to the tight closing of the dielectric (product) to the edges of the waveguide.

6. The position of the D-standing wave minimum relative to the base plane is measured.

7. Measurement of standing wave coefficient:

$$D_{'} = \left(\frac{I_{max}}{I_{min}}\right)^{\frac{1}{2}} \qquad (2)$$

In this: I_{max}-microammeter reading at maximum standing wave;

I_{min}-minimum standing wave microammeter reading.

8. A similar measurement is made at a different dielectric thickness at l_2 and at D_2

9. $\beta = \frac{2\pi}{\lambda_b}$ is considered. (3)

10. For the measured D:

$$\varphi_{'} = 2\beta(D_{'} - D_R - \ell_{'}) \text{ and } |\Gamma_{'}| = \frac{P_2 - 1}{P_1 - 1} \qquad (4)$$

is considered.

11. A complex number is determined:

$$C_1 < -\psi_1 = \frac{1}{j\rho\ell}\left(\frac{1-|\Gamma_2|\cdot\ell^{j\cdot\varphi_3}}{1+|\Gamma_1|\cdot\ell^{j\cdot\varphi_2}}\right) \quad (5)$$

12. $C_1 < -\psi_1 = \frac{th(T_1<\tau_1)}{T_1<\tau_1}$ equation is solved with respect to T_1 and τ_1;

13. We calculate the corresponding complex numbers:

$$Y_1 = \left(\frac{T}{\beta\ell_1}\right)^2 [\cos 2(\tau_1 - 90^0) + j\sin 2(\tau_1 - 90^0)] \quad (6)$$

14. We calculate the same for dielectric thickness l_2:

$$\varphi_2 = 2\beta(D_2 - \ell_2) \text{ and } |\Gamma_1| = \frac{P_1 1}{P_2} \quad (7)$$

15. Determination of the complex number;

$$C_2 < -\psi_2 = \frac{1}{j\rho\ell}\left(\frac{1-|\Gamma_2|\cdot\ell^{j\cdot\varphi_2}}{1+|\Gamma_2|\cdot\ell^{j\cdot\varphi_2}}\right) \quad (8)$$

and the following equation is solved;

$$C_2 < -\varphi_2 = \frac{th(T_2<\tau_2)}{T_2<\tau_2} \quad (9)$$

16. We calculate the corresponding complex number:

$$Y_2 = \left(\frac{T}{\beta\ell_2}\right)^2 [\cos 2(\tau_2 - 90^0) + j\sin 2(\tau_2 - 90^0)] \quad (10)$$

17. ε', ε'' and $tg\delta$ are calculated by choosing the appropriate Y quantity:

$$Y = g + j\beta \quad (11)$$

$$\varepsilon' = \frac{g+\left(\frac{\lambda\beta}{2d}\right)^2}{1+\left(\frac{\lambda\beta}{2d}\right)^2} \quad (12)$$

$$\varepsilon'' = \frac{B}{1+\left(\frac{\lambda\beta}{2d}\right)^2} \quad (13)$$

$$tg\delta = \frac{\varepsilon''}{\varepsilon'} \quad (14)$$

where: δ - is the length of the wide part of the waveguide.

Experimental study of the dielectric properties (conductivity) of pomegranate juice, the results obtained and calculated according to the above methodology were included in the table:

Table

Dielectric conductivity of pomegranate fruit

№	Pomegranate varieties	Amount of juice, %	Dielectric conductivity $f = 2300\ МГц\ \ t = 20^0C$		
			ε'	ε''	$tg\delta$
1.	Kazakh pomegranate	40-45	60,2	16,1	0,27
2	Red pomegranate	45-50	61,3	17,2	0,28
3	Spicy pomegranate	25-30	56,7	15,4	0,27
4	Black pomegranate	30-35	59,6	15,8	0,26
5	The real pomegranate	25-30	57,1	14,9	0,26
6	Pink goulash (white pod sweet)	20-25	53,8	14,3	0,28

The information given in the table shows that juices obtained from local varieties of pomegranates grown in Mirzaabad district of Sirdarya region were used.

In conclusion, it can be said that the dielectric conductivity of pomegranate juice depends on the pomegranate varieties. Their amount mainly depends on the amount of juice in the pomegranate - the amount of liquid. Similarly, they depend on the frequency and temperature of the UHF EMF.

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ANALYTICAL AND THEORETICAL STUDIES OF THE ASPIRATION AND FRACTIONATION PROCESS OF LOCAL SOYBEAN SEEDS

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Abstract. *The most important condition for obtaining high-quality soybeans is strict compliance with the technological requirements for each individual operation. Compliance with these requirements is possible only with the organization of on-farm quality control of soybeans during post-harvest processing. One of the ways to intensify the soybean aspiration process is the use of a grate with inclined holes in the aspiration zone and a selected fan to carry out the purification process from light and heavy impurities.*

Keywords: *technological process of aspiration, power, reliability, gas dynamics, hydrodynamics, aspiration, compressible liquids, mathematical models, physical models.*

The most important condition for obtaining high-quality soybeans is strict compliance with the technological requirements for each individual operation. Compliance with these requirements is possible only with the organization of on-farm quality control of soybeans during post-harvest processing.

One of the ways to intensify the soybean aspiration process is the use of a sieve with inclined holes in the aspiration zone and a selected fan for the purification process from light and heavy impurities.

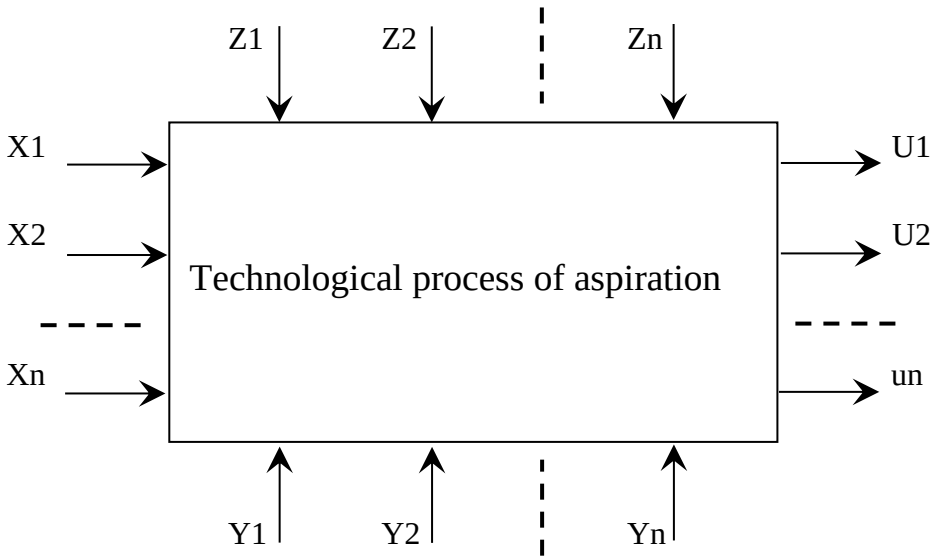
The theoretical study of the ongoing phenomena, namely the technological process, is presented as an object of research, which is characterized by input and output parameters [1; 27-38c, 2; 5-14c.].

The technological process of aspiration and separation of soy mixture on shelves as an object of research can be presented in the form of a block diagram [1; 27-38c, 2; 5-14c, etc.] (Fig.1).

The group of parameters Y, Z are input and X, U are output indicators characterizing the aspiration process. In relation to the combined separator, these will be productivity, purification from light and heavy impurities, completeness of separation, power consumption, reliability, etc.

Fig. 1.

Flowchart of the technological process.



The group of parameters Z characterizes the properties of the soy mixture entering the shaking shelves: the composition of the soy mixture, size, configuration, humidity, particle mass, feed, etc.

The group of parameters Y characterizes the design parameters of the aspiration part of the separator. These include: the dimensions and material of the shaking shelves, the shapes and sizes of the holes, the shape and dimensions of the jumpers, the suction speed of the fan, the angles of installation of the shaking shelves, etc.

Parameter group X, U corresponding incoming and outgoing parameters: (weight, weediness, fan suction rate, etc.).

The task of theoretical research is to establish patterns of relationships between the input and output parameters of the object.

If the input effects on the object do not change in time and space and the output parameters are also unchanged, then the process is called stationary. If at least one input effect changes in time or space, then the process of corresponding change in the output parameters of the object is called dynamic, at the end of the transition time it becomes stationary [1; 27-38c.].

For the theoretical study of static and dynamic characteristics of the object, a mathematical model of the technological process is compiled.

In general, a variety of models of hydrodynamics and gas dynamics are used to simulate the movement of a gas medium in aerosol mechanics. Aspiration problems are relevant for particles of sufficiently large sizes, which are characterized by small values of the Knudsen number, therefore, the gas around them can be described in the framework of continuum mechanics. The models of potential and viscous incompressible fluid flow are used below: for velocities typical for most sampling tasks, without a noticeable loss of accuracy, where the compressibility of the gas medium can be neglected.

Within the framework of the axisymmetric potential flow model of the carrier medium, a boundary value problem is posed for the current function satisfying the Laplace equation in cylindrical coordinates. The solution of the corresponding boundary value problem is found by the boundary element method. As is known, the essence of this method consists in converting a partial differential equation describing the behavior of an unknown function inside and on the boundary of the domain into an integral equation that determines only the boundary values. In the usual formulation, the unknown function is represented as an integral along the boundary on which

sources and sinks are distributed. In this paper, the method of discrete vortices is used when concentrated vortices are distributed at the boundary. The value of the current function at the inner points of the region is determined through a known solution at the boundary obtained from the integral equation. Since all approximations due to numerical calculations are related only to the boundary, the dimension of the problem is reduced by one.

In the framework of the viscous laminar gas flow model, the carrier medium is described by the Navier-Stokes equations

$$\frac{\partial p}{\partial t} + \nabla \cdot (p\bar{u}) = 0,$$

$$\frac{\partial}{\partial t}(p\bar{u}) + \nabla \cdot (p\overline{uu}) = -\nabla p + \nabla \cdot (\bar{\bar{\tau}}) + p\bar{g} + \bar{F} \qquad (1)$$

The first equation in (1) is a mass conservation equation and is suitable for both incompressible and compressible liquids. The second equation is the equation of conservation of the amount of motion, p - is the static pressure, $(\bar{\bar{\tau}})$ - is the stress tensor, $p\bar{g}$ and $\bar{F}$ - are the gravitational and external mass (arising, for example, due to interaction with the dispersed phase) forces, respectively. The stress tensor $(\bar{\bar{\tau}})$ is given by the formula

$$(\bar{\bar{\tau}}) = \mu[\,(\nabla\bar{u} + \nabla\bar{u}^T) - \frac{2}{3}\nabla \cdot \bar{u}I\,], \qquad (2)$$

where μ - is the coefficient of dynamic viscosity, I - is the unit tensor. The second term in the right part characterizes the effects of volumetric expansion.

The equations of conservation of the amount of motion have a similar structure and can be written as a general transfer equation of an arbitrary characteristic ϕ:

$$\frac{\partial p\phi}{\partial t} + \nabla \cdot (p\phi\bar{u}) = \nabla \cdot (I\nabla\phi), \qquad (3)$$

where Γ - is the diffusion coefficient of the characteristic ϕ.

To transform equation (4) into a system of linear algebraic equations, we use the finite volume method. This method is based on the integration of equation (4) over a certain control volume *V*:

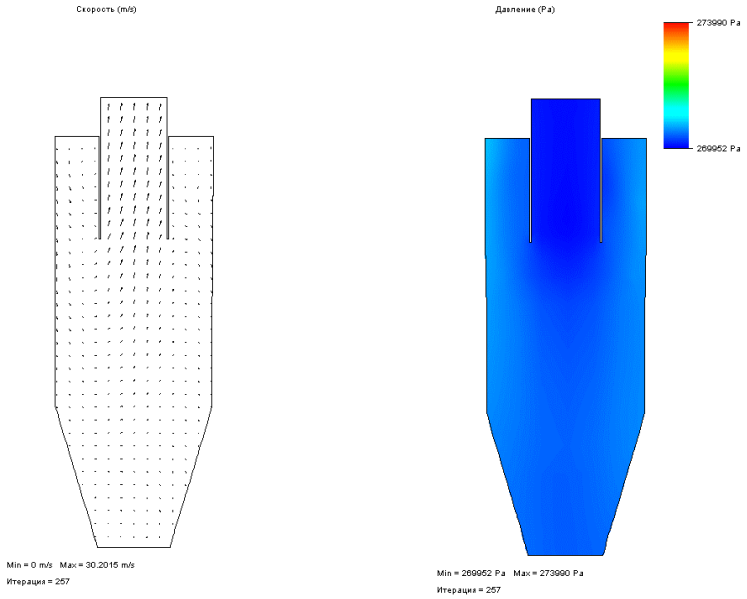
$$\int_V \frac{\partial(p\phi)}{\partial t}\,dV + \oint p\phi\bar{u} \cdot d\bar{A} = \oint I\nabla\phi \cdot d\bar{A}, \qquad (4)$$

where A is a vector directed along the normal to the surface of volume *V*. During integration, volume integrals are transformed into surface integrals, according to the Ostrogradsky-Gauss theorem. Equation (4) expresses the law of conservation of characteristic φ for the control volume *V*. This equation is compiled for each cell of the computational domain. Then a discretization is performed, leading to a system of linear algebraic equations. The resulting system is solved numerically by the Gauss-Seidel method.

Currently, physical and mathematical models and numerical methods of modern computational fluid dynamics have found their embodiment in a number of software packages united by the common name SolidWorks. The convenience of work and the capabilities of SolidWorks significantly expand the range of tasks to be solved in the field of fluid mechanics. One of the widely used SolidWorks is the Flow Simulation package. In Fig.2. the developed computer model of the soybean purification process from impurities by the Flow Simulation package is shown.

Fig. 2.

Computer model of soybean purification process from impurities



As noted, the main task of the theory of sampling of aerosol particles is to calculate the aspiration coefficient - the integral characteristic of the sampler.

At the same time, for a better understanding of the aspiration process, it is important to know the spatial distribution of the particle concentration in the vicinity and inside the sampler. The need to calculate the particle concentration also arises when determining the aspiration coefficient in the case of heterogeneity in the distribution of concentration or velocity of aerosol particles in a medium not disturbed by the sampler, as well as in non-stationary problems.

The main factors affecting the efficiency of the aspiration process are: the specific mass load of soy on the suction channel of the aspiration unit q, the air flow velocity ϑ_B and the width of the pneumatic separation channel B.

When modeling the operation parameters of a diametral fan in the SolidWorks system, the purpose of the calculation is to determine its aerodynamic properties for a given geometric parameters.

At the initial stage of modeling, a volumetric model of a diametral fan with real dimensions is created in the SolidWorks three-dimensional modeling system. Then the resulting model is transferred to the Flow Simulation system for aerodynamic analysis.

The study of the aerodynamic parameters of the diametral fan was carried out with the following parameters: the width of the fan impeller was assumed to be B = 0.1 m; the speed of the fan impeller n = 1000 rpm; fan performance in operating mode Q_v = 0.3 m^3/s.

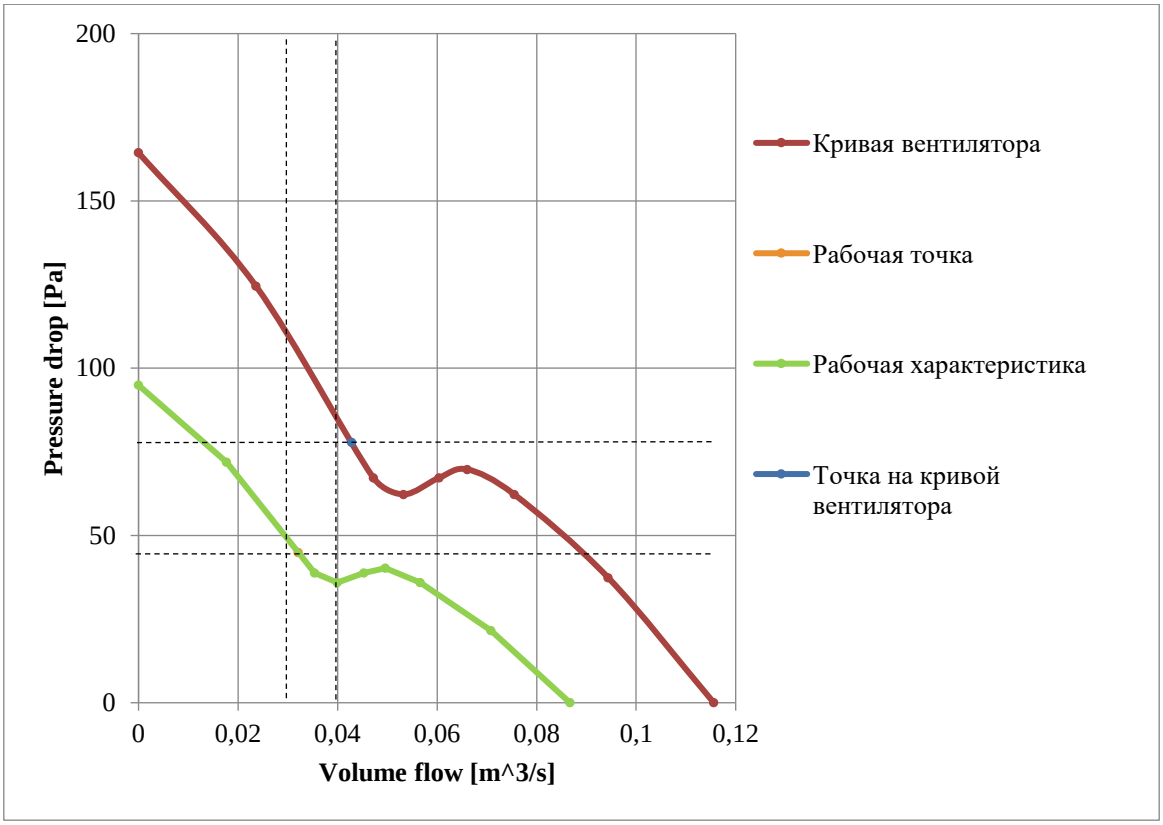
Using the Flow Simulation SAE system, the dependences of the pressure drop on the volumetric flow rate are obtained (Fig. 3.) of the fan. To do this, a series of calculations of the fan model was performed, changing its performance in the range Q_v = 0.3 m^3/s.

As can be seen from the graph (Fig. 3.), the simulated fan provides stable aerodynamic parameters over the entire operating range.

To study the parameters of the operation of the air system of the combined aspiration unit, a volumetric model was created in the SolidWorks three-dimensional modeling system with real dimensions in one projection, the width of the model was taken at B = 0.1 m. The aerodynamic analysis of this model was further carried out in the Flow Simulation system.

Fig. 3.

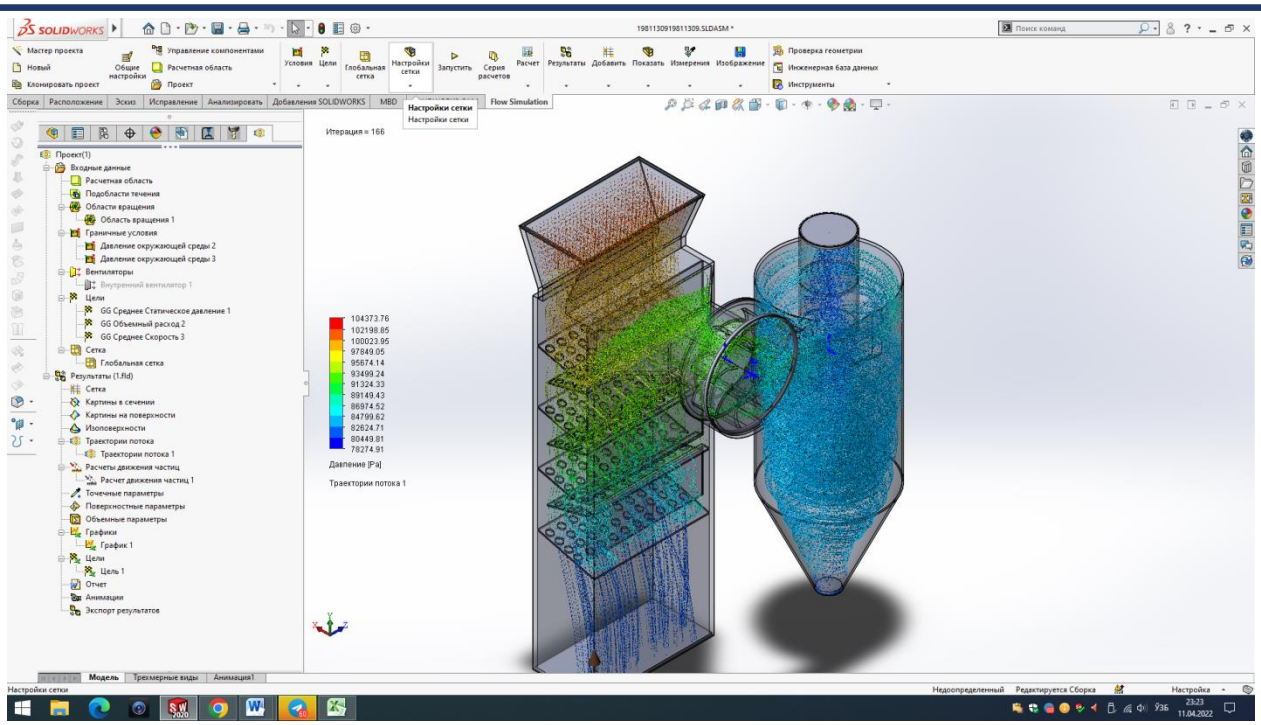
Curves of the pressure drop dependence on the volume flow of the fan.



To study and compare the parameters of the airflow flow inside the air system with experimental data, a sketch was created in the frontal plane of the model, on which a route is laid in the fairway of the airflow from the inlet section to the outlet section (Fig.4.). On the three-dimensional model of the air system of the aspiration installation, it is indicated: P - is the absolute pressure at the reference point, adjusted for the results of the experimental study; Q - is the amount of air circulating inside the closed system in operating mode; Q_A - is the air taken into the aspiration nozzle; q - is the specific grain load, shown at the point of product entry into the suction channel of the aspiration unit, and the route along the the fairway of the air flow.

Fig. 4.

Three-dimensional model of the aspiration and fractionation process of local soybean seeds.



During the simulation, the following initial parameters were set: P=101370 Pa, Q=0.1 m^3/s. During the calculations, the influence of gravity was also taken into account.

The advantage of computer modeling should be considered that the model allows you to quickly introduce constructive or technological changes into it and track changes in the physical parameters of the machine. Fig. 5. shows the field of distribution of the total pressure, and Fig. 8. shows the air flow lines. In this case, the color of the lines characterizes the change of the parameter in magnitude. The pressure difference between the input and output sections was ΔP = 180 Pa.

Fig. 5.
Total pressure distribution field in a closed air system.

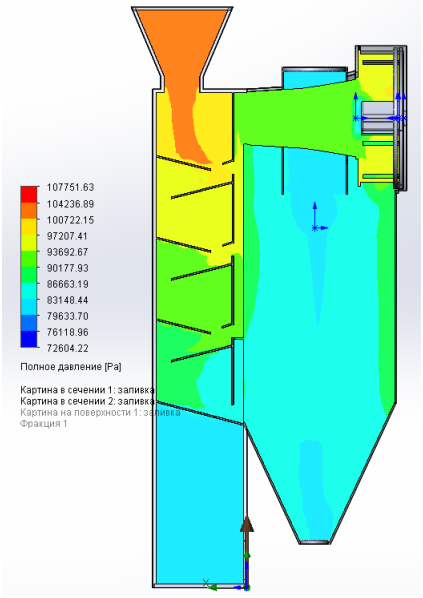


Fig. 7.
Static pressure distribution field in a closed air system.

Fig. 6.
Air velocity distribution field in a closed air system.

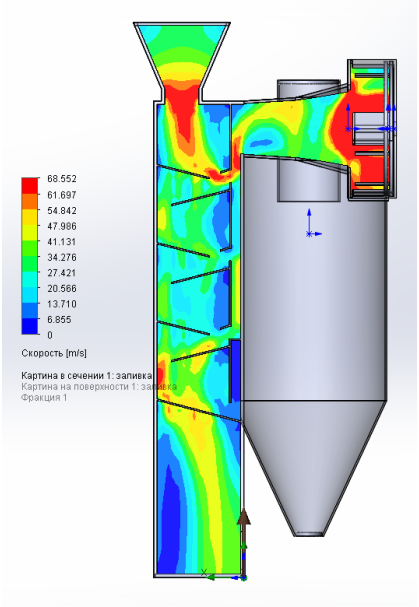
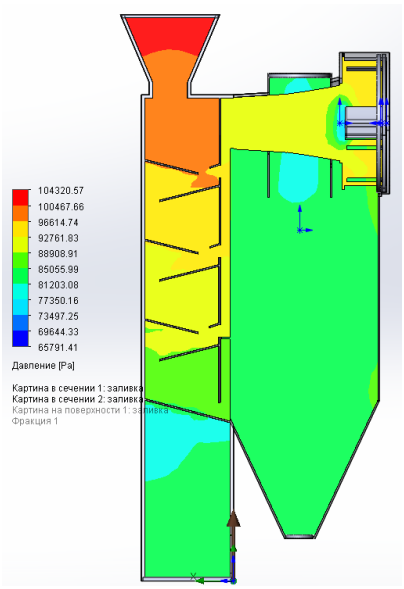
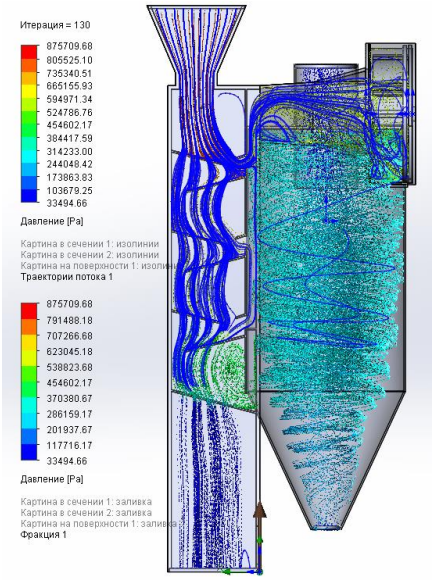


Fig. 8.
Air flow lines in a closed air system

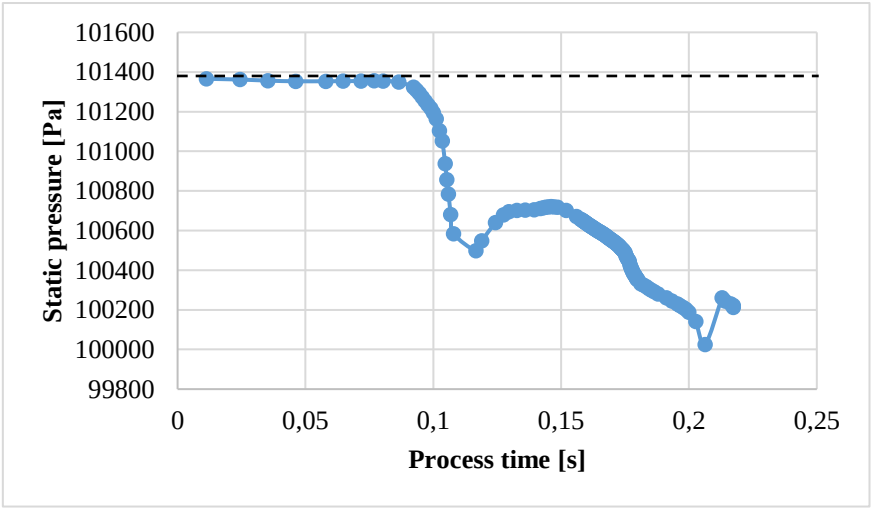




The operability of the grain cleaning machine being developed can be judged by the obtained graph of the distribution of static pressures along the fairway of the air flow, shown in Fig. 9.

Fig. 9.

A graph of the distribution of static pressures Ps over the time of the air flow.



On the ordinate axis, the values of static pressure P_s are indicated on the graph, and on the abscissa axis, the length of the air flow path.

As can be seen from the graph (Fig. 9.), the static pressure line in the area of the aspiration zone is below the atmospheric pressure line, which makes it possible to exclude the possibility of dusty air being released into the working chamber, but it is necessary to reduce the static pressure to completely eliminate this possibility.

Thus, the next stage of the study was the calculation of a model in which 10% of the air is taken from the recirculation channel. Based on the law of conservation of mass, in order not to disrupt the balance of aerodynamic parameters inside the air system, we will take a 10% gap in the aspiration channel as the place of air intake into the system.

It is also advisable to conduct a simulation, allowing leaks in the pipes for the output of soybeans and ratios, taking the size of suction and leaks, respectively, for 5% of the air circulating

inside the system. Taking into account the above assumptions, the research will be carried out with the following parameters: P=101370 Pa, Q=0.1 m/s, Q_A = 0.01 m/s, air suction through the feed slot 0.01 m/s, as well as suction in the outlet for the output of 0.005 m^3/s and leakage through the outlet for the output of soybeans 0.005 m^3/s.

Fig. 10. shows the field of distribution of total pressure, Fig. 11. the field of distribution of air velocities in the frontal plane of an open air system, Fig. 12. the static pressure distribution field is shown, and Fig. 13. the air flow lines are shown. In this case, the color of the lines characterizes the change of the parameter in magnitude.

The pressure difference between the inlet and outlet sections was ΔP=149 Pa. A graph of the distribution of static pressures along the fairway of the air flow with an open air system is shown in Fig. 14.

Fig. 10.
The field of distribution of total pressure in a closed air system.

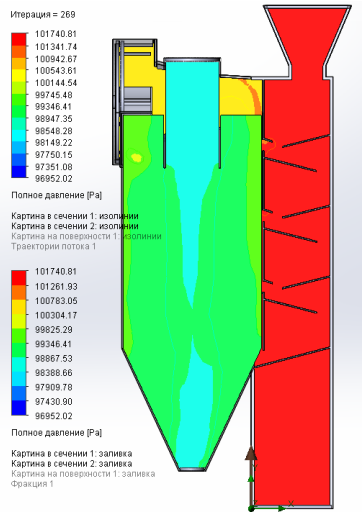


Fig. 11.
The field of distribution of air velocities in a closed air system.

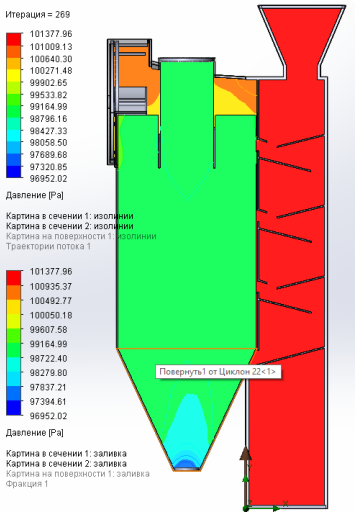
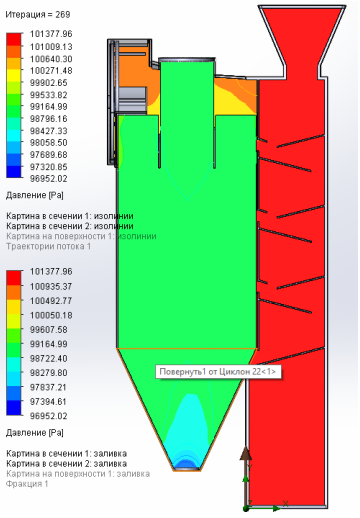
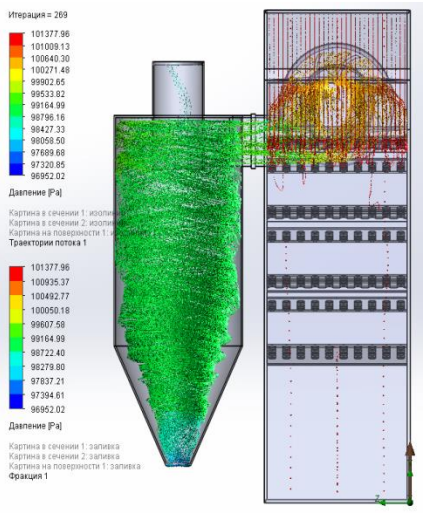


Fig. 12.
Static pressure distribution field in a closed air system.

Fig. 13.
Air flow lines in a closed air system



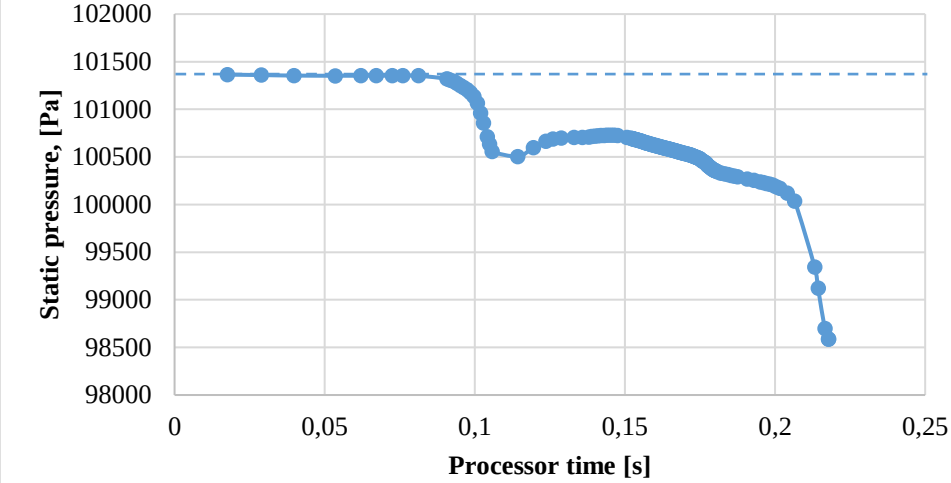


The presented model particles are shown in the velocity field of the air flow (Fig. 11.), while the color of the lines corresponds to the velocity of the particles in this section of the

trajectory. The trajectories of various fractions of model particles are shown (Fig. 13.), while the trajectories of blue color correspond to the main product - soybean grain, green - medium-natural relative, and red - light-natural relative.

Fig. 14.

A graph of the distribution of static pressures P_s over the time of the air flow.



The values of static pressure P_s are indicated on the ordinate axis on the graph, and the length of the air flow path is indicated on the abscissa axis. As can be seen from the graph (Fig. 14.), the static pressure line is below the atmospheric pressure line, which makes it possible to completely exclude the possibility of the release of dusty air into the working chamber. It should be noted that this result was obtained with the initial parameters of the conditional fan operation the same as in conditions with full aerodynamic tightness of the model. The paper shows that the practical characteristics of the fan depend on the conditions, the tightness of the nozzles, and, consequently, on the tightness conditions of the recirculation channel.

Based on the conducted analytical and theoretical studies, the following conclusions can be drawn:

On the basis of which a computer model of the aspiration and fractionation process of local soybean seeds was obtained. Graphical images were obtained showing the characteristics of the installation, curves of the pressure drop dependence on the volume flow of the fan, curves of the distribution of static pressures P_s over the time of the air flow. The concept of the relative velocity of hovering ϑ is also introduced, as the difference between the absolute velocity ϑ of a particle and the average velocity of the air flow U.

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THE ROLE OF ENGINEERING AND COMPUTER GRAPHICS IN THE EDUCATIONAL PROCESS

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Abstract. *This article discusses the issues and approaches of teaching the subject of engineering graphics in technical higher educational institutions. Increasing the motivation of students to obtain the necessary competencies that allow them to read and execute drawings competently. And also provides the main methods of conducting classes using computer graphics programs.*

Keywords: *Engineering graphics, technical education, projection methods, three-dimensional modeling, graphic modeling, geometric modeling, logical thinking, visual image, orthogonal projections, project activity, computer technology, electronic textbook, interactive whiteboard.*

Introduction. Any project of mechanical engineering production cannot be imagined without a drawing. Drawing is a way of communicating technical ideas that is understandable to undergraduates in technical education. In order for students to study in the educational programs of higher technical educational institutions, after engineering and computer graphics, they should study such subjects as machine details and the theory of machine mechanisms. But "engineering graphics" has a special place among the subjects that form the basis of technical education. Without engineering graphics, it is impossible to become a competent specialist in the field of design and construction. Any person, even if they are far from technology, can encounter drawings in life. These are the drawings of the house or cottage under consideration, the repair plan or the placement of precious furniture in the room, not only technologists and designers in the enterprise, but also turners, welders, supervisors, managers from the sales and supply department, and even sales consultants of technical equipment stores in order to provide qualified advice to the customer.

Materials and methods. Since the main task of engineering graphics has traditionally been the study of projection methods and assembly drawing design rules, the demonstration focuses on the method of manual execution of time-consuming drawing and graphic work. The introduction of computers into the educational process greatly simplifies this problem. In modern conditions, when the idea of design changes, first three-dimensional modeling of technical objects is used more and more, and then it is necessary to form methods of automated design of types of views and cuts.

This led to the emergence of a new component in the teaching of engineering graphics - computer graphics. The essence of studying computer graphics is to create an integrated model based on geometric modeling. Its tasks include the formation of skills for working with specific packages of drawing programs; includes learning and practical development of methods of drawing on a computer, methods of automated production of graphic design documents, methods of computer-aided design of drawings using graphic databases.

Currently, there are two different approaches to the problem of teaching computer and engineering graphics and its role in training a high-level specialist.

The first approach is the most common – this is the study of computer graphics as a separate topic. With such an approach, computer graphics are considered as a science dedicated to the study of drawing techniques using "electronic drawing board" instead of a pencil and a drawing board [1].

At the same time, students do not have enough knowledge to use graphic computer technologies in the course and graduation work projects, and in the future they will additionally need to attend specialized design courses at manufacturing enterprises.

Such an approach is not justified, because computer graphics in general should be considered in a single context with engineering graphics [2]. Computer-generated views, but drawn with design errors, clippings lead to misunderstanding of the drawing and ultimately to incorrect assembly of the item in production. When working with a computer, students should not only master the AutoCAD graphic package, but also continue to study engineering graphics in order to understand the learning process and achieve the correct final result. In order to effectively study the topics of the educational process, it is necessary to reduce the number of hours allocated and overcome a number of shortcomings associated with the desire not to lose in solving pedagogical tasks, that is, to be able to develop spatial and logical thinking of students at the required level. Most students do not want to work with a pencil on paper because they do not draw at school, and many cannot correctly place a small-sized cut on format paper. In this case, working in a graphic editor can also help.

After all, for the student, the computer should become a tool along with the pencil and ruler. At the same time, in engineering graphics, the requirements master the methods and rules of drawing drawings with a pencil, and with computer graphics, they simultaneously learn the basic techniques and interface of the program, namely: setting the working environment, determining the drawing format, working with primitives, editing drawings, linking objects, blocks, connect with layers, texts, etc., learn to work with blocks, layers, texts, etc. At the same time, at any stage of drawing, the student can see a clear image of the object, which is very important in the learning process.

Results and discussion. When using information technologies in the educational process, the traditional tasks of engineering graphics are implemented in a new context. For example, it is easy to construct a 2D image of a "bullet" detail from a 3D clear image.

Implementation of the established task requires the creation of appropriate methodical instructions with step-by-step actions and explanations. The creation of a set of methodological instructions for performing drawings on a computer is in the process of development. All these tasks are performed like a manual drawing - according to the drawing line, while the drawing technique is developed, the methods of placement in the format and the rules of detail drawing in scale are taken into account. At the same time, you can always check the correct execution of the graphic task and correct the drawing in time. Using the same method, the teacher creates a geometric model of the detail specified in the task, and then automatically constructs its orthogonal projections using a three-dimensional model. By comparing his solution to the problem, the student can independently determine his mistakes and analyze the correctness of his solution.

The mistakes that students make in performing these tasks are related to the unclear representation of the model shape, and solving graphical problems of mathematical graphics can help with this. Such exercises are a preparatory stage for solving projection problems. They also

help teachers to identify which part of the learning material has not been mastered by students and immediately overcome difficulties in understanding the detail form [3].

Prospective undergraduates should be equally proficient in computer technology such as drafting and manual work. In addition, spatial perception is definitely more developed when performing flat images on paper format in construction and project activities, as well as in reading drawings in production. A person who does not know how to properly read and execute drawings on paper cannot do them correctly on a computer. Basic knowledge can be taught using pencils, clear images, layouts and models. The introduction of computer technology should be in reasonable amounts. We don't need to switch priorities. The computer graphics program should be aimed not only at learning the features and capabilities of the computer, but also at learning the rules and techniques for solving graphic problems.

At the same time, the introduction of computer technologies in engineering graphics classes allows us to implement the idea of educational development, increase the speed of the lesson, make the lesson more lively and interesting. Working with computer programs develops constructive and creative thinking, spatial imagination, helps to form knowledge and skills and abilities to work with graphic editors, meaningful ownership of information and its subsequent processing. Practice shows that the use of computer graphics increases the quality and efficiency of teaching, develops educational activities. At the same time, it effectively encourages students to learn. At the beginning of the academic year, it was interesting to observe that these same students, who did not know how to use a multimedia presentation, measured the detailed drawing on the computer screen with a ruler, and at the end of the training, they could easily draw the assembly drawing.

For us, the computer in the classroom has a wide range of possibilities that allow us to present this topic in a colorful and interesting way, prepare didactic materials along with the lesson, repeat the necessary constructions an unlimited number of times, and develop graphic tasks and tests for students. The use of computer technologies in teaching engineering graphics allows to fill many knowledge needs of students.

Conclusion. A sufficient material base for the use of computer technologies has been created in higher education institutions: there are computer auditoriums with interactive whiteboards equipped with a set of drawing programs. A student who has the skills to work with a computer can have a method of using computer technologies in any lesson.

In the lesson, using electronic textbooks, manuals, sets of practical work, thematic plans based on the lesson in engineering graphics were developed, which allows to save time during the preparation of the lesson and optimally structure the lesson process using modern computer technologies at various stages of the lesson.

The main result is to increase the motivation of students to study the science of "engineering graphics", as well as to better understand the topics and to apply it in practice, to improve personal abilities and to develop cognitive activities, to develop logical thinking and spatial imagination.

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STAGES OF OPEN PIT MINING. MINING METHODS AND THEIR PROCESSES

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Abstract. *Open pit mining is usually done through a a series of mining steps, commonly known as pushbacks. Metallized in open pit mining, each push considers the mining of one or more benches at the same time, the main operational tasks include: drilling, blasting, loading and transportation. In large open pits, shovels and front end loaders can be used to perform loading operations. Type and number shovels are selected during the planning process and determine their productivity benches, thrust and mining speed. available space for loading is part of the rollback design. This determines its shape and size benches for placing equipment. It is a relevant stage of mine design a description of the location and sequence that the loading equipment must follow finish benching each push. Placement of loading equipment in a mine is usually called exploitation scheme. This term is commonly used in the mining industry, but no often found in literature. The design of a haul road for an open pit mine can have a significant impact on the associated costs with the transport of ore and waste to the surface. This study proposes a new way to design traffic lanes open pits to support efficient trucking operations.It was also changed by the road scheme reflecting the radius of curvature recommended in road design manuals. Finally, three-dimensional a model representing the results of road design is created by combining road layout changes resulting in the slope of the open pit and the design of the bench. The proposed program the way to the area with the gold mines made it possible to design a freight route for the open-pit mines thus, it supported efficient trucking operations; Also, the time required for the truck traffic along the road could be predicted. The proposed method is expected to be useful assist in the improvement of open pit planning and design and road design functions existing mining software applications. The purpose of this article is to learn in the context of the concept of exploitation scheme in open-pit mining strategic mine planning activities. In the first part, the concept is introduced examples where the thrust size is fixed and the number of spades is changed. The second part includes a discussion of motivations and limitations may be taken into account by the mine planner when designing. Multiple paddle and bench configurations in the same push a challenge to design a scheme mainly due to limited space download In such cases, mathematical and optimization tools can be useful; however, models must be able to represent realistic constraints affect the productivity of shovels at different levels. Aggressive in general and expensive schemes are rarely used by highly ambitious mining companies performance and low operating costs. However, choosing an the appropriate operating scheme should be suitable for the main purpose of mine planning activities, ie: value creation through exploitation mineral resource.*

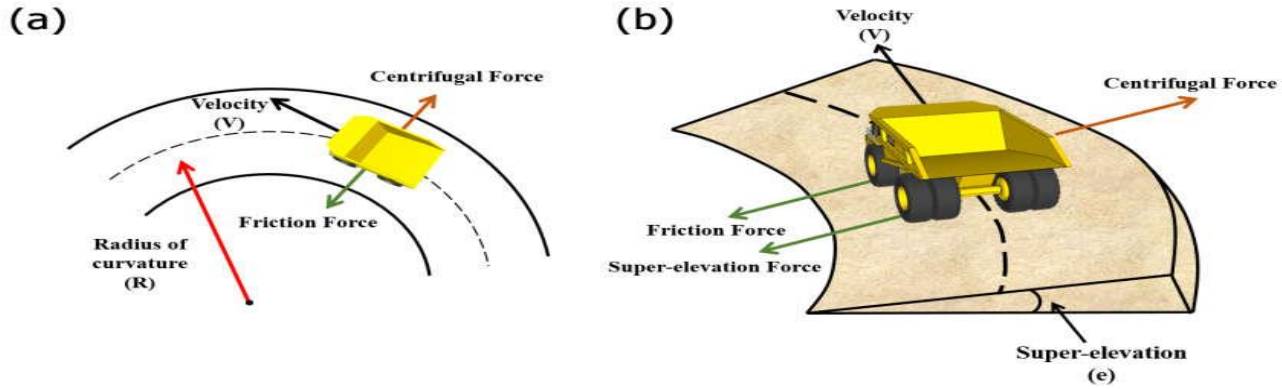
Keywords: *open pit mining, design of the freight route, open pit, calculation of the range of dimensions of movement of mining machines, least cost path analysis,truck transport operation, mine design.*

Introduction

Designing an efficient haulage route for the movement of mining equipment in open pits is important because the cost of transporting ore and waste can vary greatly depending on it road design results. To date, many manuals have been developed for the design of roads in open pit mines. These guidelines describe the design of widths, slopes and curves of haul roads to ensure safety of trucking operations as well as road construction and maintenance procedures. However, one limitation of these manuals is that they do not provide an efficient road design method supporting efficient trucking operations throughout the life of an open pit mine. Surface mining is characterized as a highly capital intensive mining method productivity and lower costs compared to underground methods. Material extraction is usually done in steps or called pushes. Each one pushback includes waste and ore mined through the layers from the mine called benches. Unitary operations in an open mine include: drilling, blasting, loading and transportation. Capital investments in the mine are mainly related to acquisitions equipment for each unit operations. In large metal mines, loading can be done with shovels and mounted front loaders different thrusts of the operation. Planning the use of a mineral deposit is a complex activity. The The main difference from other branches of the industry is the corresponding ore body to the fixed asset of the business, limited and non-renewable. Besides, A mine plan should be developed with uncertain information such as ore body characteristics and economic factors mining project. Strategic mine planning is an activity in which key decisions are made that regulate these activities exploitation of a mineral deposit and the main goal is value Create. These decisions are suitable for choosing: mine method, the processing route, mining sequence, operation volume and intersections variables that separate the valuable part of the ore from step to step cut category in mine. On the other hand, tactical mine planning deals with routine planning activities aimed at actually capturing business value and the like relevance of the mayor during the mining operation. These activities include: strengthening the operation, etc., for example, medium and short term production plans, budget preparation, equipment and production placement monthly, weekly or daily planning. Literature in the field of strategic mine planning has mainly attracted attention key decisions of the mining project. The research in this area was highlighted the complexity of the problem arising from the interdependence that exists among its variables. For example, mining cannot be defined a method without predetermining the mining sequence, intersections, volume operation and processing route. Similarly, there can be no other variables defined without predetermining the remaining variables. A solution requires hence recursive and iterative methods.

Picture 1.

Scale limit for ensuring the movement of mining machines when calculating the dimensions of the mine



The radius of curvature should be taken into account when determining the horizontal arrangement of cargo the way. Failure to allow sufficient curve radius may increase travel time and cost due to reduced performance stability of the truck. If a sufficient radius of curvature is obtained, it is possible to maintain a stable speed of the truck and reduce the wear of the truck wheels, which efficient shipping operation. The radius of curvature must be designed in such a way that the centrifugal force acts on the truck during rotation and the friction between the truck tires and the road surface is balanced (see Picture 1a).

Equation for the minimum radius of curvature to be considered in road design as follows:

$$R = \frac{V^2}{127(e+f)}$$

Here R is the radius of curvature (m), V is the speed of the vehicle (km/h), e is the degree of elevation (m/m) and f is the coefficient of friction between the tire and the road surface. Means the speed of the car maximum speed when the truck is operating on a downhill slope without load. Super high is implied bank level at one end of the road (see Picture 1b). Applying the height difference reduces and allows the truck to exert centrifugal force when turning on either side of the road for the truck to rotate stably. The top elevation should not exceed 6%-7% (approx. 5˚–6˚). proposed a super-height in the freight path according to the radius. curvature and vehicle speed. The coefficient of friction varies depending on the road surface and 0.13 if the surface is sandy and soft or muddy, or 0.453 if it is partially paved. Pushback design and loading equipment selection are two activities of the mayor about planning activities. Pushback design involves sizing and each push form and its seating and access features routes. On the other hand, the choice of loading equipment takes definition into account type and number of shovels or front loaders used for loading activity. Various options considered in selecting the final thrust design included in the final pit definition and mining sequence. On on the other hand, the choice of loading equipment is mainly determined at the time of operation the measuring stage in which the size of the mill and mine is determined. Both activities are available has been extensively studied in the strategic mine planning literature. Location and sequence of loading during the mine design phase it is determined that the equipment must be followed to finish the machines. placement of The loading equipment on different benches of each push is called a exploitation scheme. Although this concept is widely used in the mining industry less covered in the literature. Scheme of operation suitable for placement of loading equipment during completion of benches for each push. This will change with the development of mining and therefore it defines the extraction sequence of the machines. Utilization design schemes are part of the mine design phase and therefore part of strategic and tactical mine planning activities. from a strategic point of view, definition of exploitation schemes,

mining design and loading equipment selection are interrelated activities. Their definition directly affects the mining speed of the mine. For example, a particular recoil design may have the same loading equipment giving different extraction rates as a result of different exploitation schemes. Therefore, exploitation schemes play a crucial role in the evaluation of production rate and other key variables of the strategic mine planning process.

Content and essence of the article

The purpose of this article is to explore the concept of exploitation scheme open pit mining. The idea is to introduce the concept and discuss the goals and the constraints that govern its proper design. The scope of this paper is metallurgical open pit mining with electric shovels development of loading activities. It is a part of operational design schemes strategic and tactical mine planning. However, the focus will be strategic point of view. Nevertheless, conclusions and discussions can be extrapolated tactical mine planning activities. The article describes the processes of opening a mine, and as the main task, the sequential execution of mining processes in the mine is of great importance.

Conclusions

Finally, the shipping lane An open pit mine is designed using a terrain model of the mine along with the transport route layout as input for AutoCAD 3D and rendered in three dimensions. application of the proposed method made it possible to determine the slope limit for the area with gold deposits 10° (16-18%) as proposed open pit haulage route scheme. It was also possible estimate the approximate working time, travel distance and speed associated with road transport designed for trucks. The proposed method can solve the problems that arise when the layout of the traffic path is determined only the traditional mining method. Designing exploitation schemes is a complex activity involving depth knowing the parameters that govern the operation. Experience and the creativity of the mine planner is key to creating schemes that solve problems the ultimate goal of value creation and respect for constraints operation. This paper explored the concept of exploitation scheme, proposed a discussion of the formal definition and relevant considerations design. Support for complex scenarios with multiple shovels in a reduced area Mathematical and optimization tools can be useful for dealing with circuit design. However, optimization models must be able to represent the design purpose and operational constraints. Further research may be warranted search for existing and new mathematical methods that can be useful for optimization design schemes for use in open pit mining. As a result, our method allows not only analysis optimal route for trucks traveling along the existing road in open pit mines during the production phase their life cycle as well as the design of the haulage route for the open pit mine which is still being planned and the project step and the path for it do not exist. Open mines have many obstacles such as trees, rocks or other equipment. reduces the visibility of drivers. Reduced visibility often creates dangerous situations for the truck drivers. Therefore, it will be interesting to develop an extended method to consider in future work stopping and sight distances when designing the radius of curvature.

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METHOD OF EXAMINATION BITUMEN ADHESION TO VARIOUS MINERAL MATERIALS

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Abstract. *Experimental data on the assessment of the adhesion strength of bitumen to the surface of various mineral materials are presented. graphical dependences of the adhesion of bitumen BOR 60/90 and BOR 90/130 with additives to various mineral materials are constructed. with the same acid-base characteristics of mineral materials, the adhesion strength of bitumen to the surface of a rough material (granite crushed stone) is greater than with the surface of a smoothly rolled material (gravel).*

Keywords: *bitumen, oil sludge, gossypol resin (fat-oil plant), technical sulfur, asphalt concrete, road pavement.*

INTRODUCTION

For the research, the following mineral materials were used [1, 2]:

1. Gravel is a round or ovoid round or ovoid rock fragments with a smooth surface, usually of river or sea origin. In the research, granite gravel of fraction 5-20 mm was used, used in the construction of roads. Granite is an acidic igneous rock.

2. Crushed stone is an inorganic material obtained by crushing rocks. The average density of crushed stone is from 1.4 to 3 g / cm. Granite crushed stone is crushed stone from solid rock of granular structure, consisting of crystals of feldspar, quartz, mica. In the studies, a fraction of 5-20 mm was used, since it is in the greatest demand and is used in road and airfield pavements.

3. In the studies, marble was used as a mineral material containing CaCO3. Marble consists of dolomite (calcium and magnesium carbonate - CaMg (CO3) 2) or calcite (calcium carbonate - CaCO3), or both. Marble almost always contains admixtures of other minerals, such as iron oxide, iron sulfide, iron-containing silicates (chlorite and epidote), iron and manganese carbonates, bitumen or graphite admixtures.

The marble was used as an analogue of crushed limestone. It is a product of the crushing of sedimentary limestone rock, consisting mainly of calcite (calcium carbonate-CaCO3). This is one of the main types of crushed stone, which, in addition to gravel and granite crushed stone, is used in road construction. The choice of marble as an analogue of crushed limestone is also justified by the fact that during metamorphism limestones recrystallize and form marbles.

Thus, the mineral materials were selected:

1) by acid-base properties: acidic: granite crushed stone and gravel, - basic: marble.

2) according to the characteristics of the surface charge of the material:

- electronegative: crushed granite and gravel,
- electropositive: marble.

Experimental data [3, 4] on the assessment of the adhesion strength of bitumen with the surface of various mineral materials are shown in Table 1.

MATERIAL AND METODS

Table 1

Adhesion strength of bitumen to the surface of various mineral materials

Additive % mass.	Mineral materials					
	Granite rubble		Granite gravel		Marble	
	%coverage	**points**	**% coverage**	**points**	**% coverage**	**points**
BND-60/90	76	3	74	2	78	3
BND-60/90 +O-1, 35%	83	3	78	3	87	3
BND-60/90 +O-2, 40%	87	3	85	3	91	4
BND-60/90 +O-3, 45%	93	4	90	4	94	4
BND-60/90 +O-4, 35%	92	4	90	4	94	4
BND-60/90 +O-5, 40%	94	4	91	4	96	5
BND-60/90 +O-6, 45%	97	5	93	4	98	5
BND-90/130	69	2	67	2	70	2
BND-90/130 +O-1, 35%	80	3	78	3	79	3
BND-90/130 +O-2, 40%	85	3	84	3	86	3
BND-90/130	90	4	90	4	90	4

+O-3, 45%						
BND-90/130 +O-4, 35%	83	3	80	3	85	3
BND-90/130 +O-5, 40%	91	4	90	4	92	4
BND-90/130 +O-6, 45%	93	4	92	4	94	4

O- remnants of the industry.

O-1 composition (oil sludge-25% and sulfur 10%);

O-2 composition (oil sludge -25% and sulfur 15%);

O-3 composition (oil sludge -25% and sulfur 20%);

O-4 composition (tar (gossypol resin) -25% and sulfur 10%);

O-5 composition (tar (gossypol resin) -25% and sulfur 15%);

O-6 composition (tar (gossypol resin) -25% and sulfur 20%).

RESULTS. Note: decoding of points: 2 - "unsatisfactory", less than 75% of the surface of crushed stone particles is covered with a binder film; 3 - "satisfactory", 75% of the surface of the crushed stone particles is covered with a binder film; 4 - "good", a binder film covers 90% of the surface of crushed stone particles; 5 - 95% of the surface of the crushed stone particles is covered with a binder film.

Based on the tabular data, graphical dependencies were built, presented in Figures 1 - 2.

Fig-1.

Bitumen adhesion BND 60/90 with additives to various mineral materials

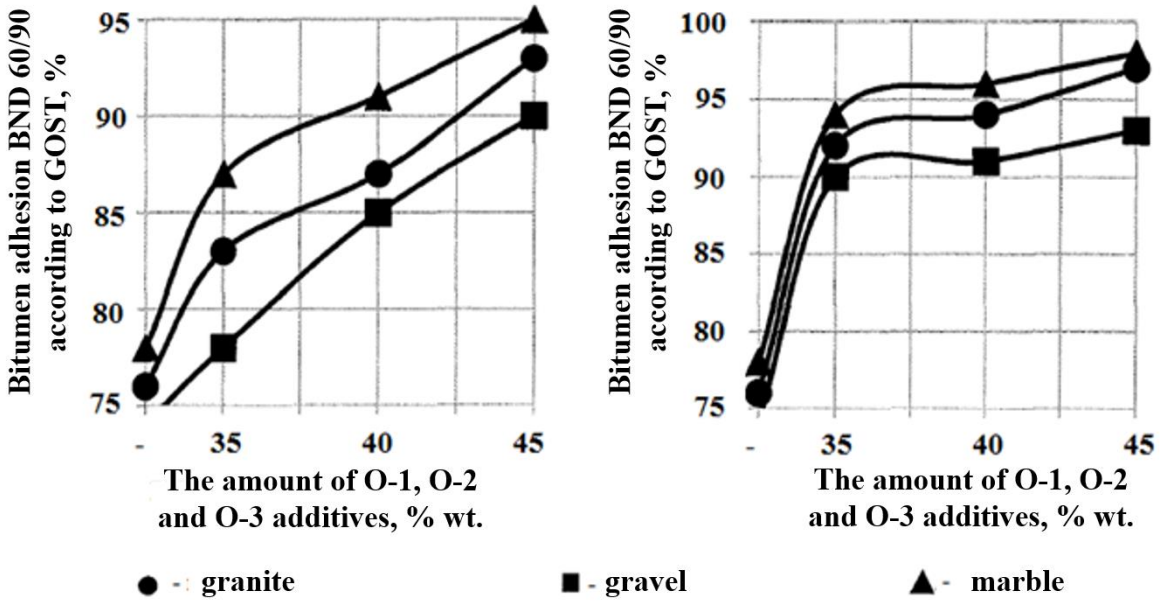
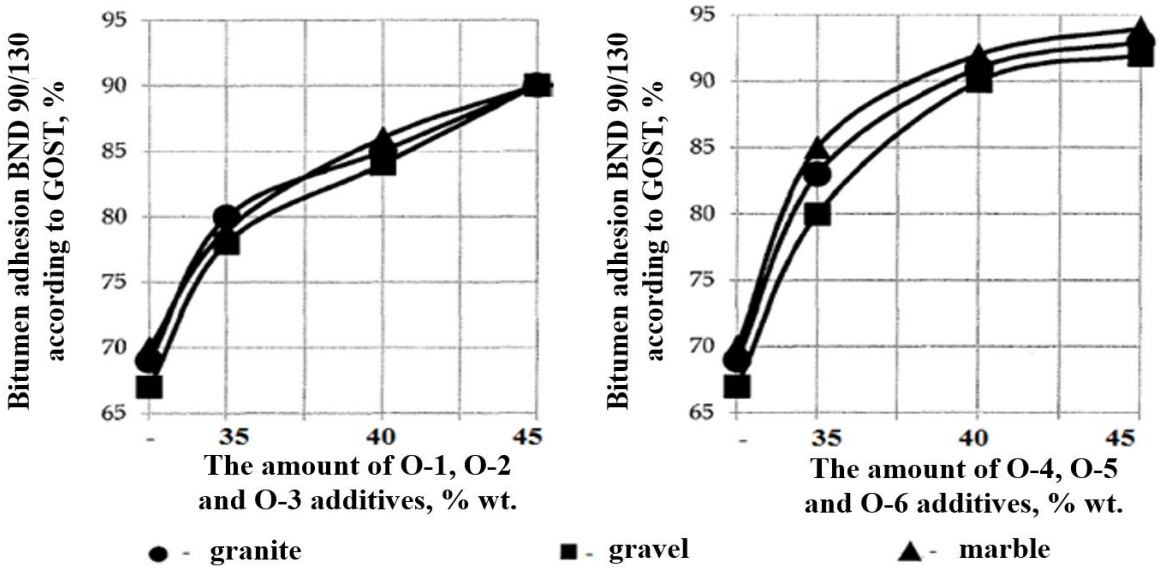


Fig-2.

Bitumen adhesion BND 90/130 with additives to various mineral materials



According to Table 1 and the graphs presented in Figures 1 and 2, it can be concluded that the adhesion of bitumen decreases in the following order: marble - granite crushed stone - granite gravel. In other words, the bond strength of bitumen with basic rocks (marble) is better than with acidic rocks (granite materials). Also, according to the table, it can be seen that with the same acid-base characteristics of mineral materials, the adhesion strength of bitumen with the surface of a rough material (granite crushed stone) is greater than with the surface of a smoothly rolled material (gravel). This can be explained using some of the reference points of the mechanical theory of adhesion [5, 6]. When bitumen adheres to an uneven surface, a "key-lock" type of adhesion occurs: bitumen penetrates into the unevenness of the mineral material, followed by physical fixation, while any movements of the two phases are limited by the fact that the bitumen is plastically deformed and acts as an energetically absorbing mechanism, bringing an obvious increase boundary strength.

The surface roughness of the mineral material prevents abrupt load transfer in the horizontal plane, loads are transferred through the bitumen, which behaves like a viscoelastic material. In addition, surface roughness improves adhesion by physically increasing the contact area. The sum of the interactions between the active centers of the bituminous binder and the mineral material increases in proportion to the increase in the contact area.

According to the data in Table 1, it can be seen that the adhesion of bitumen is better to a mineral material with electropositive surface characteristics (marble) and worse to materials with electronegative surface characteristics (granite materials). It is logical to explain this effect within the framework of the electrostatic theory of adhesion.

RECOMMENDATIONS

1. Experimental data on assessing the adhesion strength of bitumen with the surface of various mineral materials are presented.

2. According to the tabular data, graphical dependences of the adhesion of bitumen BND 60/90 and BND 90/130 with additives to various mineral materials were built.

3. According to Table 1 and the graphs presented in Figures 1 and 2, it can be concluded that the adhesion of bitumen decreases in the row: marble - granite crushed stone - granite gravel.

In other words, the bond strength of bitumen with basic rocks (marble) is better than with acidic rocks (granite materials).

4. The table shows that with the same acid-base characteristics of mineral materials, the adhesion strength of bitumen with the surface of rough material (granite crushed stone) is greater than with the surface of smoothly rolled material (gravel).

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PROBLEMS OF THE INFORMATION WORLD AND THE INTERNET

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Abstract. *When we talk about the informative world and the Internet, we must have an understanding of the Internet and information. Nowadays, it is difficult to comfort our lives without the Internet. Of course the Internet has opened the doors of a great opportunity for us, no one denies it. But as the coin has both sides, the Internet has its advantages and disadvantages. We mentioned this in this article. There are also problems and solutions in the information world.*

Keywords*: Internet, information, information, means of communication, large library, quality communication, business development, youth consciousness, negative situations, cybercrime, security, reliable information, subconscious impact, idleness, wasted time.*

When we talk about the informative world, naturally the question arises as to what the information is. Information is allocated to all information that the human senses receive. It means to convey or convey an opinion from the word "Information". Information can be used in different ways. Announcement of agreements between states and agreements. The fact that the organization changes the laws and regulations of the organization is also understood as information, information and transmission. Or there is no information about discussions between universities, muhukamas, solutions to important issues, and in writing. But the two are a very close concept. There are many types of information. For example: audio information, video information, textual information, graphic information, digital information In addition, there are types of political information, social information, technical information and hoci. There are also features and qualities of information. Features, such as how to describe that information. Properties of Information:

- Expressed in letters
- Expressed in number
- Continuous formation
- More or less. And the quality:
- How meaningful information is in the first place, in terms of meaning
- Information is sufficiently fully covered
- Reliability of information
- Information stability Decrees and others.

Information is not a description of information, it refers to the relationship between information and the consumer. It does not make sense without consumer. The information is licked to the information only when it is mastered by the consumer. There are information units that measure information. This is a standardized rule.

Bit, byte, KB, MB, GB, TB, PT, ZT, YT.

Bits are accepted as the smallest unit of information. 1 byte - means 8 bits. 8 bits are required to encode all 256 characters on a computer keyboard. If we look at previous centuries, it was a very easy concept to express information. To date, the concept of information has been widely used in all fields, if it has studied nature, plants, fruits and animals and presented them and presented them and presented them. For example, now there are more types of use, such as the

study of some organization, factories, devices, the collection of technical and software information about them. Distributed information may be insignificant to someone. For example: you are on the road with the driver of the car, so (on the radio, on the anti-radar) you are warned not to increase speed, so the driver will be careful and vigilant. But a passenger in a car is ignored.

It is impossible to imagine the process of exchanging information or the process of obtaining information without the Internet. When we say Internet, a lot of people understand the www. This is called the whole world's cobweb. Internet (from Latin to network). This is an open system of information and information exchange. In this case, the data carrier protocol TCI / IP DIR.This protocol plays a key in the spread of data on the Internet. The 1st Internet was founded by the U.S. in the 1970s. This was a low level of development due to the war years. Then, gradually, data from one point to another began to develop. The Internet is the only system that has assembled computers into one point. The data was first exchanged between computers and later between the modem and the telephones. The Internet is a repository of world knowledge. Initially, it transmitted only textual data, but was gradually intended to send files such as picture and audio, which appeared in Switzerland in 1989. This is called the World Wide Web. The first Internet was organized, and then the WWW was organized. That is, this is the 1st part of the Internet (www). The reason for the U.S. military to create the Internet was to work even when there were networked networks during the war years. The most advanced time of the Internet was in the 1980s. Thus, the Internet has evolved around the world. Nowadays, everything we do is have an integral part of the Internet. Let's look at the internet connection. Cables, wireless, modem, Wi-Fi network, Internet cards, communication channel, optical fiber, satellite communication, radio channels, etc.

Cable connection - this is done through copper wires. Provides high-speed Internet access.

Optical fiber cable is a fiber-optic data. The main part of it is what we mentioned above. The top section used plastic protection. Currently, fiber-optic cables have increased and developed due to high-speed operation. For example, if there are 3 or 4 optical fibers inside a plastic-covered wire, each glass fiber (optical fiber) provides simultaneous conversations over 10 million phones and audio and video signals when the frequency is high. Examples of wireless data are simply our current mobile phones and computers. The process of sharing information with each other is carried out by radio logs. The development of the Internet has made our lifestyle much easier our lives. Simply put, you can easily share information (various information processes), do the things you need if you are standing, where you live, where your area is insignificant. Here are some useful and unnecessary aspects of the Internet.

1. **You can find books all over the world**.

The largest library is the largest library. You can find the book you want and want, the information you are looking for, everything you want in an instant. You can achieve the desired result without losing extra time, without spending on the way, without waiting queues. Of course, you have a computer or phone and antenna, and you have money in your account.

2. Plenty and diversity of the database.

Whether we call it a book in our school's library, from information in the Paris Library on the Internet, everything is available and the diversity of information is also noteworthy.

3. Not only information search but also quality communication is available on the Internet.

Now you can watch online with the popular Telegram, Instagram, Facebook, WhatsApp and many governors.

4. Develop yourself.

You can learn to be the best in every field and study it online at home. At the same time, you can upload videos by watching videos or enriching your knowledge with information.

5. You can develop your personal block.

For example, you have groups in Telegram or chats with loved ones. You can create and distribute ads to them and talk to them with the field you need, or teach them to do good results by talking about them.

6. Reduces vacancies.

A person who is idle on the Internet can get a job by contacting them with a variety of advertising and a profession or field of interest. It will pay vacancies.

7. Availability of information about each field, each profession.

8. How many people keep data on the Internet. (based on cloud technology, etc.). 9. Renewing or organizing your personal business.

10. Convenience in all areas.

11. Freedom to comment.

12th. Hybrid system high.

13. Receive or provide technical support.

14. The news database is updated frequently.

15. Global communication.

16. 24/7 performance.

Disadvantages of the Internet.

• The negative impact of the Internet on the human body.
• Negative impact on young people's minds.
• Failure to be caused by Internet use.
• The lack of Internet culture in young people at all.
• Our information, personal information is not kept confidential.
• Plenty of cybercrime.
• Connection or technical problems.
• Availability of incorrect information as well.
• Being lazy using something ready, easy without hassle.
• Easy flight to the deception of bad and corrupt people.
• Search for reliable information.
• threat to life.
• Being connected to the Internet.
• The breakdown of peace.
• Psychologically a person's changes.
• All interests and desires are an integral part of the Internet, Telegram, etc.
• The transformation of life into a virtual world.

Now let's explain what we mentioned above:

Shameless videos, pictures. The abundance of immoral acts on social media. The lack of development and lack of understanding of spirituality and humanity in humans is upsetting. When we simply download a program to our smartphone or computer, we don’t know that app asks us

for our personal information and only finds out that we can use it and use it and then use it. This is also part of a dangerous process. It is important to say that it is a tradition to deceive you through various phone numbers, links, audio, photo, video types, which are distributed by unsubstantiated individuals. Disruption or failure of our work weapon, low Internet or lack of antena, etc. when working on the Internet. With a lot of information on the Internet, we need to know if it is well known. The competition will be strong. The use of the Internet, sitting in front of a computer, seems to be the norm, especially the young generation, which has a profound effect on their health and spirituality. Scientists say that since the younger generation has not yet formed ideological immunity, they will be able to teach destructive ideas and be involved in terrorist acts, and there will be a lot of belief. In such cases, we need to enrich the psyche and shape the spirituality. From an early age, we need to instill in them an understanding of who our ancestors were and who should have a suitable child for them. If we enrich and shape our beliefs about our religion, our beliefs, the above will not be observed. At the same time, there are many people sitting on the Internet day and night. Sitting on the Internet at night, the number of people greeting the day is growing. When I hear that, I get scared. Isn't the future of Uzbekistan in our hands? Shouldn't we and we contribute to the development and future of our state for tomorrow?! Shouldn't we make the most of our time without playing useful and useless games?! They say time is a flying car. Aren't we missing a lot of things without even realizing it? Each of us has to ask each of us every morning. We must set goals and objectives and move them forward. We need to protect ourselves from it without being in the Internet. On current social media, more than 60% of people sit in vain to spend time. If we are so indifferent, this indicator will increase in the next 2.3 years. People who are involved in the Internet and social network are even diagnosed with various new diseases. Nimophobia - fear of being left without the Internet. Igronomy is a link to computer games. This will not happen when we first understand what we have come to the world. We should not be left without the Internet or be left without a light, we should not be able to study in this world, be an ignorant, selfish person, and be afraid that our name will die without going into the world. We have to have our own place and our own way in this world!

Conclusion

The conclusion is that the Internet is not a deterioration of the media, because no one denies how much easier the Internet has made our lives. You just have to be more discriminating with the help you render toward other people. If we surf the Internet day and night, if we don't separate white from black, we'll be a mancont. So let’s take advantage of everything on time. If we understand it, the Internet is a repository of information on the example of an inexhaustible treasure for us. We talked about how difficult the process of developing the Internet and the exchange of data is. What is the informative world? We found answers to the questions of what the problems were.

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MECHANIZED APPARATUS FOR CUTTING MELON FRUIT INTO ANNULAR SLICES

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Abstract. *The article is devoted to the mathematical description of the process of cutting elastic-viscous materials on the example of a melon fruit. A method for deriving theoretically calculated equations for determining the critical cutting force and the destructive contact stress is given. A schematic diagram of an experimental laboratory installation for determining the elastic modulus and Poisson's ratio of plant raw materials and the principle of its operation are described.*

Keywords: *elastic-viscous material, cutting, process, force, contact stress, blade, deformation modulus, relative compression, coefficient of friction, installation, pressing, melon.*

INTRODUCTION

Melon production in the agricultural sector of Uzbekistan occupies one of the leading places. Highly sugary melon fruits are a good raw material for industrial processing to produce a wide range of food and technical products: melon jam, buckmeat, candied fruit, dried melon, etc.[1]. Currently, only the production of dried (dried) melon prevails from the products of processing melon fruits. Such production is concentrated mainly only in Uzbekistan and Turkmenistan, characterized by a hot climate and a variety of high-yielding varieties of melons [2]. It has been established that with waste-free processing from 1000 kg of fresh fruit, 75-80 kg of excellent dried melon can be obtained. Dried melon is a viscoelastic product of straw-yellow or yellow – pink color with a sickly sweet taste and a specific melon aroma

When processing any material, it is necessary to have information about their physical, mechanical and technological properties, that is, about the properties that promote or counteract this type of mechanical processing, especially when cutting elastic-viscous products with a blade, such as meat or vegetable products. When processing these materials, the interaction of the blade with the base of the material is characterized by complex physical phenomena that are difficult to describe analytically, in contrast to Hooke's law. Therefore, only when combining theoretical calculations with full-scale experimental studies, it is possible to understand the true physical essence of the process. Taking into account some assumptions and assumptions, it is possible to determine theoretically the main factors affecting the process under study, and subsequent experimental studies show the adequacy of the accepted judgments [1, 2].

Elastic-viscous materials can, with some assumptions, include the model of melon pulp, which consists of a solid skeleton (cellulose fiber) and a semi-liquid substance that fills the gaps between the solid elements. Being deformed by the action of the knife blade, the fibers will press on the liquid medium, forcing it to move to less stressed areas. In accordance with the laws of hydrodynamics, the resistance of the medium during such a movement depends on the speed of its movement, that is, it states the fact that in viscous bodies, the deformation is a function of the load and the time of its action. Generically, the model of plant material, from the point of view of rheology, can be considered as a model obeying the Hooke-Newton law [3-5].

The production of dried melon is mainly carried out by small farms and private farmsteads. The entire technological process is focused on the use of manual labor. Due to the growing demand for dried melon and the transition to an industrial scale of processing, there is a question of mechanization of some labor-intensive processes: peeling, cutting into slices and drying. One of the well-known and common methods of drying melons is cutting the fruit into ring-shaped slices, hanging them on poles and drying them in a stream of warm air [3]. Currently, the cutting of the fetus into rings was carried out manually, while the thickness of the rings was different, the work was monotonous and monotonous, which quickly tired the workers. In this regard, the development of a device for cutting melons into slices is in demand.

As the basis of our research, we chose the method of drying melons, which consists in cutting the fruit into ring-shaped slices perpendicular to its axis with a width of the resulting slices of 15-21 mm. When developing the device, the most common and recommended varieties of melons for drying were taken into account.

The shape, weight and overall dimensions of the fetus were taken into account. this is why the development of a device for cutting melons into slices is in demand. The mechanized chain conveyor developed by us with a discretely moving web is shown in Fig.1-3[4], which contains a chain conveyor 2 mounted on the frame 1 with a leading 3 and driven 4 sprockets and a drive 5. A load-bearing platform is fixed on the links of the roller chain, 6 on which a bed 7 with a cross–section is installed.but located through the slits 8, while needle spikes 9 are provided between the slits along the bottom of the bed. On the frame, pylons 10 are welded on both sides, on which a rotary lever 11 is attached, a cutting device mounted on it, made in the form of a package of disc knives of different diameters.

Fig. 1.

***General view of the machine for cutting the melon fruit into ring* slices**

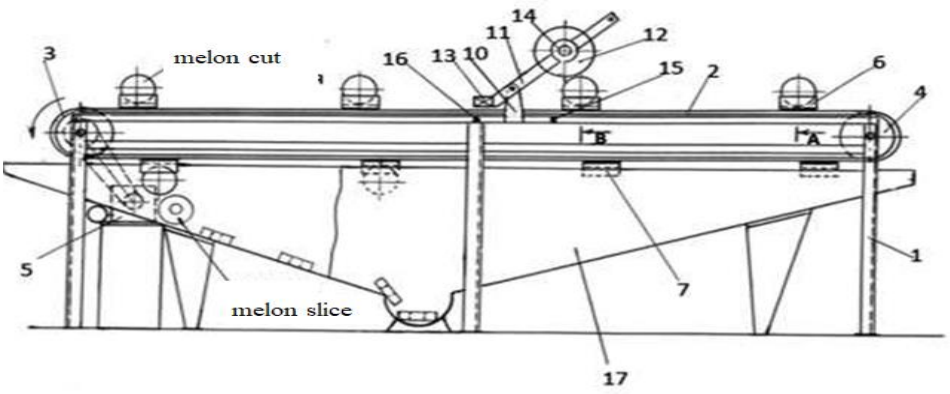
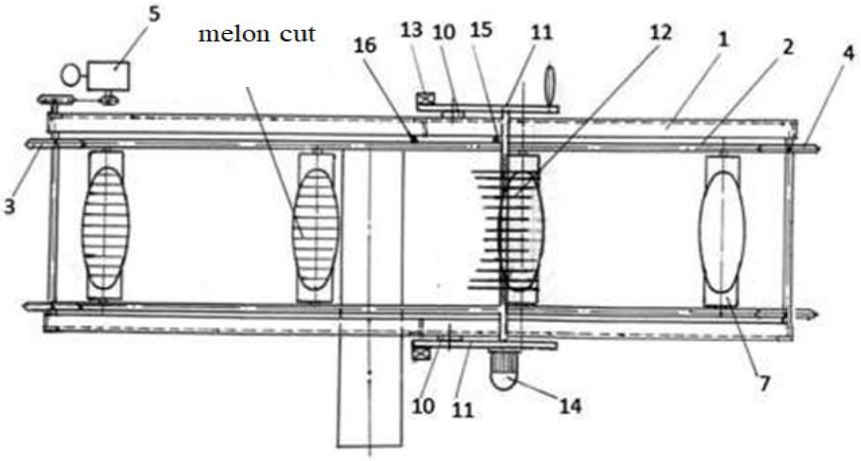


Fig. 2.

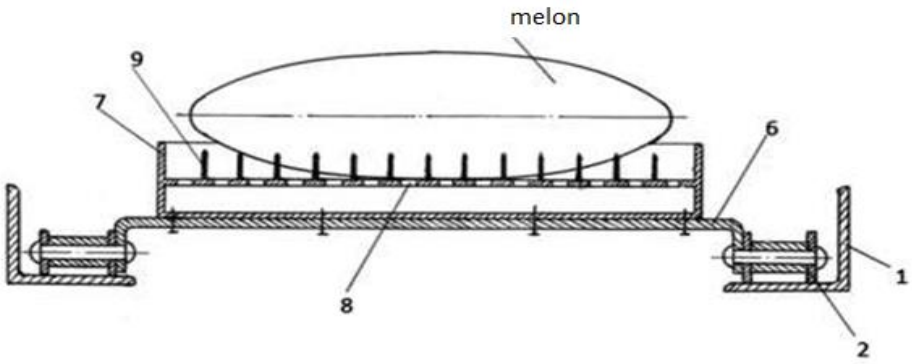
General view of the machine in the plan



The lever 11 is balanced by a counterweight 13, and the knives are driven by a flanged electric motor 14. Two electromechanical plungers are installed on the frame in the cutting zone: one 15 – for remote disconnection of the conveyor drive, the second 16-for switching on the electric motor of the cutting device. Under the frame there is a hopper 17 for collecting sliced melon slices and collecting placentas with seeds.

Fig.3.

A fragment of fixing a melon fruit on a bed.



The device works as follows. Sorted melons by size and shape (preferably spindle-shaped) are peeled according to the method described [2].Then the conveyor drive 2 is started and the peeled melon fruit is placed on the bed 7, while the fruit is impaled on needle spikes and fixed motionless. As you move forward, in the cutting area, the lodgment contacts the plunger 15, which turns off the conveyor drive and turns on the drive of the cutting device 12. The operator lowers the rotary lever 11 on the melon fruit located under the package of disc knives. At the same time, since the knives are mounted on a curve corresponding to the outer surface of the melon, they simultaneously pierce into its flesh and cut it into annular slices. The width of the lobules is determined by the technological requirements of the melon drying process and depends on the density of the pulp of its structure, sweetness, varietal characteristics and other differences. For many varieties of melons, the cutting thickness ranges from 15 to 21 mm.

At the end of the cutting process, the rotary lever 11 goes up, the second plunger 16 is triggered, which turns off the electric motor 14 and turns on the chain conveyor drive. The bed with cut melon slices with discrete intermittent movement of the conveyor removes the leading sprocket 3 and, when inverted, is freed from the slices that slip off the spikes and fall into the

hopper 17. When the lobules fall, the placentas with the seeds come off, from the pulp and all this mass is sent along the discharge chute for separation

Thus, the proposed device makes it possible to mechanize the cutting of melon fruits into ring slices and provides automatic removal of cut slices from the beds, which reduces processing time, increases machine productivity and facilitates the work of employees of farms specializing in the production of dried melons. The device has a relatively simple design and does not require large material and monetary costs.on separation. .

For the manufacture of an experimental model of the machine, a single-row roller chain PR-19.05-3180 (GOST 13568-75) and a worm gearbox RFU-100-40 were used.

Disc knives and lodgements are made of 1.2mm thick non-rusting steel sheet. A positional electric switch is used as an electric contact plunger. Experimental studies have shown that the machine has shown good reliability of action and provided high-quality cutting of melons in a wide range of fruit sizes and lobule thickness.

CONCLUSIONS

The determined values of the elastic modulus and the Poisson's ratio provide a basis for the theoretical determination of the critical cutting force, but to determine the exact value of the local modulus of deformation corresponding to the moment of compression of the material by the edge of the cutting tool blade, laboratory studies are required.International Journal of Modern Agriculture, Volume 10, No.2, 2021 ISSN: 2305-7246

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IMPROVEMENT OF ORGANIZATIONAL AND ECONOMIC MECHANISMS OF REGIONAL TOURISM DEVELOPMENT (IN THE CASE OF KASHKADARYA REGION)

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Abstract. *In this scientific-practical article, the issue of improving the organizational and economic mechanisms of regional tourism development is studied in the case of Kashkadarya region. The author developed proposals and recommendations for the development of tourism in the region.*

Keywords: *regional tourism, tourism infrastructure, Kashkadarya region, barrier-free tourism, tourism.*

Introduction

In the modern world, tourism is considered as a socio-economic phenomenon that directly and indirectly affects the development of all related infrastructure. In the 21st century, tourism is based on the high level of development of transport, social and service sectors, which ultimately turns it into a highly profitable sector of the economy.

According to the World Tourism Organization, today tourism is one of the most profitable and dynamic sectors of the world economy. In terms of profitability, it ranks second after oil extraction and processing. Tourism accounts for nearly 6 percent of the world's gross national product, 7 percent of global investment, one in 16 jobs, 11 percent of global consumer spending, and 5 percent of all tax revenues. In this regard, the tourism industry is actively developing with the support of the government in many countries [1].

Within the framework of the 3 directions of the "Strategy of Actions" for the strategic development of the country in the Republic of Uzbekistan in 2017-2021, the mission and goal is to "rapidly develop the tourism industry, increase its role and share in the economy, diversify and improve the quality of tourist services, and expand the tourism infrastructure." was promoted, and as a result of the measures implemented within this framework, the tourism infrastructure was improved. In particular, the number of wi-fi zones reached 230, the number of information centers serving tourists reached 33, the number of hotels and hostels reached 914, and the number of buses serving tourists reached 133 [2]. In the new development strategy of Uzbekistan for 2022-2026, comprehensive development of regions, bringing their infrastructure to the level of world standards, development of barrier-free tourism infrastructure, development of infrastructure of tourism and cultural heritage objects, and improvement of effective use of more than 8 thousand cultural heritage objects are addressed [12].

But this is not enough. First of all, in terms of promotion of tourist products and quality service, we are seriously lagging behind the international level in terms of the condition of tourist facilities and vehicles. In addition, the funds allocated by the state for the development of tourism are not high, they amount to 3.4% of the GDP. However, this indicator is 21.9% in Thailand, 16.1% in Tunisia, 13.2% in Azerbaijan from the CIS countries, and 7.8% in Tajikistan [3].

Public investment in infrastructure and sometimes expensive tourism infrastructure encourages investment by many small businesses. Over time, the initial investment in tourism attracts more investment in the supporting sectors of the economy: hotels, restaurants, shopping centers, ports, airports, etc.

In the world experience, it is possible to see that the main tool for the development of tourism in the regions is the state, which stimulates the development of various directions of tourism in the regions and thereby creates organizational conditions for increasing the level of employment, increasing the gross income of the region, and developing infrastructure. .

There are regions in our country where tourism needs to be developed with state support. One such region is Kashkadarya region. According to the data of September 2022, the services provided for foreign tourists are very low in Kashkadarya, and no tourism services are provided in Shahrisabz, Yakkabog, Qamashi, Kasbi districts [4]. For this reason, extensive research on the topic is urgent.

Literature review

In the research of the world economy, theoretical and methodological issues have been considered based on various aspects of the development of the tourism market in the literature prepared by world scientists. Among the scientists of the CIS countries M.B.Birzhaakov, V.S.Bogolyubov, V.I.Azar, I.T.Balabanov, A.Yu.Aleksandrova, M.N.Dmitriev, A.B.Zdorov, N.B.Zorin, V.A.Kvartalganov[5] theoretical analysis of economic relations characteristic of tourism economy, tourism market economy topics such as basics and practical issues, as well as problems of using tourist resources, are studied in scientific works. I.S. Tukhliev, B.Kh.Toraev, D.Q.Usmanova, N.Tukhliev, K.Kh.Abdurakhmonov, Ye.V.Golisheva, N.S.Ibragimov, M.Q.Pardaev, A.F.Saidov, A.Abduvakhidov, M.T.Alieva on the priority issues of tourism development in our national economy and their solutions , B.SH.Safarov, T.Tashmuratov, O.Khamidov [6] and a number of other economist-scientists scientific researches were used and studied.

Most tourism researchers view tourism as a modern phenomenon that arises from the need to enjoy the joys of life, the nature of various attractive landscapes, the growing sense of joy, the sense of pleasure and living, as well as the sense of enjoyment of life[7].

On the other hand, tourism was recognized by the International Academy of Tourism in 1961 as an expression called recreat, which is defined as a human activity that works to achieve this type of travel, an industry that helps to satisfy the desires of the tourist [8].

Therefore, tourism is another aspect of activities and events that take place within or outside the borders of any country, and therefore it has become a social, cultural and mass media that is reflected in all the entertainment and activities of that country.

Analysis and results

Cities in our country with ancient rich tourism potential, such as Bukhara, Tashkent, Samarkand, have always been the center of attention of foreign and local tourists. They have attracted tourists with their historical monuments, architecture and culture.

The initiative of the government to create tourist areas is widely implemented even in the regions that do not have many historical monuments, but have their own nature and national cuisine. Kashkadarya region is one of the regions with a rich cultural heritage, national values and traditions, attracting foreign tourists with its unique nature. Today, 1,311 objects of cultural heritage are registered in the region, of which 1,41 are archaeological, 200 are architectural, 43 are

statues, and 27 are attractions. Along with the protection of these cultural heritage objects, it is very important to carry out reconstruction and repair work in them. There are many examples of our national heritage, especially in Kitab, Shahrisabz, Yakkabog, Guzor and Karshi districts. 45 hotels operate in the region. The most interesting thing is that their prices are much lower compared to other regions of the country (Table 1).

The government approved the plan of measures for the establishment of new tourism destinations in Kashkadarya region.

According to it, the following will be organized in the region:

ethnotourism direction - 5 guest houses will be built in the villages of Gilan and Kol. Ethnovillage - a military training camp of Amir Temur's fighters will also be founded;

agrotourism direction - in the villages of Varganza and Hazrat Bashir. The "Pomegranate" festival will be held within this direction;

extreme tourism - in Tatar, Zarmast and Vari villages. 5 guest houses, 5 campsites and 10 huts will be built in each of them;

ecological tourism - in the villages of Sarchashma and Suvtushar;

astronomical tourism - in the territory of the Kitab latitude station.

A MICE-tourism direction will be opened under the "City of Festivals" brand [9].

In addition, the Cabinet of Ministers approved the procedure for the use of benefits and subsidies, as well as the amount of the local tourist tax charged for accommodation, as determined by the Decree of the President of February 9, 2021. According to it:

— "Fergana-Urganch-Fargana", "Termiz-Urganch-Termiz" and "Karshi-Urganch-Karshi" flights;

— "Termiz-Karshi-Khiva", "Khiva-Urganch-Nukus" and "Termiz-Karshi-Samarkand" railway routes were launched [10].

In order to provide the opportunity to travel through the territories of Uzbekistan to tourists with any social opportunities, "barrier-free tourism" has developed, and since 2023, the implementation of the "Barrier-free tourism infrastructure development program" has been determined in the republic's territories in the following stages. placed:

• in 2023 — Samarkand, Bukhara, Khorezm and Kashkadarya regions;

• in 2024 — Fergana, Namangan, Andijan and Jizzakh regions;

• In 2025 — Republic of Karakalpakstan, Navoi, Surkhandarya and Syrdarya regions;

• in 2026 — Tashkent city and Tashkent region;

• Financing of the "Barrier-free tourism infrastructure development program" is carried out through the state budget of the Republic, sponsorship funds and grants;

• The above goals will be included in the five-year New Uzbekistan development strategy and the state program for its implementation [11].

Table 1.

Hotels in the regions and their starting prices

	Regions	Number of hotels	Prices
	Bukhara region	193	It starts from 120 thousand soums
	Samarkand region	149	It starts from 110 thousand soums
	Tashkent region	109	It starts from 185 thousand soums

	Fergana region	98	It starts from 240 thousand soums
	Khorezm region	82	It starts from 70 thousand soums
	Republic of Karakalpakstan	60	It starts from 100 thousand soums
	Kashkadarya region	45	It starts from 80 thousand soums
	Jizzakh region	43	It starts from 60 thousand soums
	Namangan region	36	It starts from 100 thousand soums
	Navoi region	34	It starts from 200 thousand soums
	Surkhandarya region	29	It starts from 60 thousand soums
	Andijan region	21	It starts from 60 thousand soums
	Syrdarya region	14	It starts from 60 thousand soums

Along with the implemented measures, there are problems in the area that are waiting to be solved. Including:

- The need to build a new world-standard terminal of the international airport;
- Inadequate internal roads leading to historical monuments and beautiful nature of the region;
- Lack of tourism personnel in the province;
- Absence of guest houses, inns or hotels in the regions where the nature of the region is beautiful and there is a possibility to develop gastronomic tourism, and even if there are, there are no conditions for providing services to foreign guests;
- The lack of demand for restaurants and services that can show the gastronomic possibilities of the region;
- The main thing is that the touristic image of the region has not been formed.

Conclusion and recommendations

As a result of the conducted analysis, the following recommendations were formed:

- Providing incentives to business entities providing tourist services in the region;
- To open specializations that train personnel in tourism, restaurant services, cooking in regional higher and secondary special educational institutions;
- The ecological potential of the region creates conditions for the development of ecological tourism there. In particular, it is advisable to organize entertainment and fun activities such as horse riding, trekking, camel travel, rafting in the area.
- Improvement of transport infrastructure in the region, etc.

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ON DYNAMICS OF ISING-POTTS MAPPING IN THE FIELD Q_2 AND ITS APPLICATIONS

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Abstract. *In this paper, we study the Ising-Potts in the field of 2-adic numbers the dynamics of its reflection have been studied. This is a reflection all fixed points are found.*

Keywords: *p-adic numbers, Ising-Potts model, fixed points.*

1. Introduction

p-Adic numbers were first described by Kurt Hensel in 1897. The p-adic numbers were motivated primarily by an attempt to bring the ideas and techniques of power series methods into number theory. Their influence now extends far beyond this. For example, the field of p-adic analysis essentially provides an alternative form of calculus.

However, numerous applications of these numbers to theoretical physics have been proposed papers [2],[23] to quantum mechanics and p-adic valued physical observables [7]. A number of p-adic models in physics cannot be described using ordinary probability theory based on the Kolmogorov axioms. New probability models – p-adic probability models were investigated in [3],[6],[8],[11],[12],[13],[14]. In [9] a theory of stochastic processes with values in p-adic and more general non -Archimedean fields was developed, having probability distributions with non-Archimedean values.

In this article, the dynamics of the Ising-Potts reflection for order k =2 in the 2-adic number field is studied. All fixed points of this reflection have been found. We recall that p-adic Ising model (and its generalizations) when p ≠ 2 were studied by many authors like as Ganikhodjaev N.N., Rozikov U.A., Mukhamedov F.M.

In [3] it has been constructed p-adic Gibbs measure for Ising model on Z. Moreover, the authors proved a p-adic analogue of Kolmogorov's extention theorem. In [4] it has been shown that there exists a unique p-adic Gibbs measure for Ising model with four competing interaction on specific trees. In [21] it has been described a set of all translation-invariant generalized p-adic Gibbs measures for Ising model on a Cayley tree of order three. In [16] the authors studied dynamics of p-adic Ising-Potts mapping (p ≠ 2) and they showed that under some conditions on parameters the Ising-Potts mapping is chaotic. The present paper is a continuation of these works.

The paper is organized as follows. Section 2 presents definitions and known results. In section 3 we study dynamics of 2-adic Ising-Potts mapping.

2. Preliminaries.

p *-adic numbers.*

By Q, as usual, we denote the field of rational numbers. Let p be a fixed prime number, then every $x \neq 0$ can be represented as x = $p^r \frac{n}{m}$, where $r, n \in Z$, m is a positive integer, and n and m are relatively prime with p: (p; n) = 1, (p;m) = 1. The

p-adic norm of x is defined by

$$|x|_p = \begin{cases} p^{-r}, x \neq 0 \\ 0\ , x = 0 \end{cases} \qquad (2.1)$$

The absolute value $|\cdot|_p$ is non-Archimedean, meaning that it satisfies the strong triangle inequality $|x+y|_p \leq max\{|x|_p, |y|_p\}$. We recall a nice property of the norm, i.e. if $|x|_p > |y|_p$ then $|x+y|_p = |x|_p$. Note that this is a crucial property which is proper to the non - Archimedenity of the norm.

Any p -adic number $x \in Q_p$, $x \neq 0$ can be uniquely represented in the form

$$x = p^{\gamma(x)}(x_0 + x_1 p + x_2 p^2 + \cdots), \qquad (2.2)$$

where $\gamma = \gamma(x) \in Z$ and x_j are integers, $0 \leq x_j \leq p-1$, $x_0 > 0$, $j = 0, 1, 2, \ldots$ In this case $|x|_p = p^{-\gamma(x)}$.

For each $a \in Q_p$, $r > 0$ we denote

$$B(a,r) = \{x \in Q_p : |x-a|_p < r\}$$

and the set of all *p-adic integers*

$$Z_p = \{x \in Q_p | : |x|_p \leq 1\}.$$

The set $Z_p^* = Z_p \setminus pZ_p$ is called a set of p -adic units.

Theorem 1. [24] The equation $x^2 = a$, $0 \neq a = p^{-\gamma(a)}(a_0 + a_1 p + \cdots)$, $0 \leq a_j \leq p-1$, $a_0 > 0$ has a solution $x \epsilon Q_p$ iff hold true the following:

i) $\gamma(a)$ is even;

ii) $y^2 \equiv a_0 (mod) p$ is solvable for $p \neq 2$; the equality $a_1 = a_2 = 0$ holds if $p = 2$.

For $a \in Q_p$ and r > 0 we denote

$$B(a,r) = \{x \in Q_p : |x-a|_p < r\}$$

p-adic logarithm is defined by the series

$$log_p(x) = log_p(1 + (x-1)) = \sum_{n=1}^{\infty} (-1)^{n+1} \frac{(x-1)^n}{n},$$

which converges for $x \in B_1(1)$; p-adic exponential is defined by

$$exp_p(x) = \sum_{n=0}^{\infty} \frac{x^n}{n!},$$

which converges for $x \in B(0, p^{\frac{-1}{p-1}})$.

Denote

$$\varepsilon_p = \left\{x \in Q_p : |x-1|_p < p^{\frac{-1}{p-1}}\right\}.$$

This set is the range of the p-adic exponential function. The following fact is well-known.

Lemma 1. [20] The set ε_p has the following properties.

(a) ε_p is a group under multiplication.

(b) If $a, b \in \varepsilon_p$ then the followings are true

$$|a-b|_p < \begin{cases} \frac{1}{2}, p = 2, \\ 1, p \neq 2, \end{cases} \qquad |a+b|_p = \begin{cases} \frac{1}{2}, p = 2, \\ 1, p \neq 2, \end{cases}$$

(d) If $a \in \varepsilon_p$, then there is an element $h \in B(0, p^{\frac{-1}{p-1}})$ such that $a = exp_p(h)$.

Lemma 2. Let $\in B(0, p^{\frac{-1}{p-1}})$. Then

$$\left|exp_p(x)\right|_p = 1, \qquad \left|exp_p(x) - 1\right|_p = |x|_p, \qquad \left|log_p(1+x)\right|_p = |x|_p,$$

$$log_p\left(exp_p(x)\right) = x, \qquad exp_p\left(log_p(1+x)\right) = 1 + x.$$

A more detailed description of p-adic calculus and p-adic mathematical physics can be found in [10, 15, 16].

Let (B, X) be a measurable space, where B is an algebra of subsets of X. A function $\mu: B \to Q_p$ is said to be a p-adic measure if for any $A_1, \dots, A_n \in B$ such that $A_i \cap A_j = \emptyset,\ i \neq j,$ the following holds:

$$\mu(\cup_{j=1}^{n} A_j) = \sum_{j=1}^{n} \mu(A_j)\,.$$

A p-adic measure is called a probability measure if $\mu(X) = 1$. A p-adic probability measure μ is called *bounded* if $\sup\{|\mu(A)|_p : A \in B\} < \infty$ (see, [5]).

We call a p-adic measure a probability measure [3] if $\mu(X) = 1$.

3. Dynamics of the Ising-Potts Function in Q_2.

In this section we consider the following Ising-Potts function

$$f_{\theta,k}(x) = \left(\frac{\theta x+1}{x+\theta}\right)^k, \qquad \theta = 1 + 2 + 2^{2n-2}, n \geq 4\,. \qquad (3.1)$$

We notice that $f_{\theta,k}(x) = \left(f_{\theta,1}(x)\right)^k$. Moreover, we find all its fixed points and study their behavior.

3.1.The Fixed Points of the Function (3.1)

Let us recall some necessary notions. Let $x^{(0)}$ be a fixed point of an analytic function f and

$$\lambda = \frac{\partial f}{\partial x}(x^{(0)})\,.$$

The fixed point $x^{(0)}$ is called *attracting* if $0 < |\lambda|_p < 1$, *indifferent* if $|\lambda|_p = 1$, and *repelling* if $|\lambda|_p > 1$. We denote

$$A(x^{(0)}) = \{x \in Dom(f): f^n(x) \to x^{(0)}\}$$

the basin of attraction of the attractive fixed point $x^{(0)}$, here $Dom(f)$ stands for the domain of a function f and $f^n = \underbrace{f \circ f \circ \dots \circ f}_{n}$. [25]

We are going to find all fixed points of the function (3.1). Note that $Dom(f_\theta\, x) = Q_p \setminus \{-\theta\}$.

In what follows, for the sake of simplicity, we assume that p =2, k = 2 , $0 < |\theta - 1|_2 = \frac{1}{2}$. Namely, the fixed points are x_0 = 1 and

$$x_1 = \frac{(\theta-1)^2-2+(\theta-1)\sqrt{(\theta-1)^2-4}}{2} \qquad (3.2)$$

$$x_2 = \frac{(\theta-1)^2-2-(\theta-1)\sqrt{(\theta-1)^2-4}}{2} \qquad (3.3)$$

Theorem 3.1. $x_0,\ x_1, x_2$ fixed points will be *indifferent fixed points.*

Proof. Let x_i be a fixed point of (3.1). Then we have

$$f'_{\theta,2}(x_i) = \frac{2(\theta x_i+1)(\theta^2-1)}{(x_i+\theta)^3}, \qquad (3.4)$$

(i) From (3.4) we get

$$f'_{\theta,2}(x_0) = \frac{2(\theta-1)}{\theta+1}$$

Since $|\theta - 1|_2 = \frac{1}{2}$ and $|\theta + 1|_2 = \frac{1}{4}$ using non-Archimedean norm's property we obtain

$$\left|f'_{\theta,2}(x_0)\right|_2 = \left|\frac{2(\theta-1)}{\theta+1}\right|_2 = 1.$$

which means x_0 that is an indifferent fixed point.

(ii) Using (3.2) and (3.3) one can calculate that

$$\left|\theta x_{1,2}+1\right|_2=\frac{1}{4},\quad \left|x_{1,2}+\theta\right|_2=\frac{1}{4},\ |\theta-1|_2=\frac{1}{2}\ ,\quad |\theta+1|_2=\frac{1}{4}.$$

Putting these into (3.4) we can easily get

$$\left|f'_{\theta,2}(x_{1,2})\right|_2=\left|\frac{2(\theta x_{1,2}+1)(\theta^2-1)}{(x_{1,2}+\theta)^3}\right|_2=1.$$

So that $x_0,\ x_1$ and x_2 are indifferent fixed points.

Corollary 3.1. *Let* $r=|2^n(\theta-1)|_2$. *Then one has* $B_r(x_1)\cap B_r(x_2)\neq\emptyset$.

Proof. It is enough to show that $x_1\in B_r(x_2)$. From (3.2) and (3.3) , using non-Archimedean norm's property we have

$$|x_1-x_2|_2=\left|(\theta-1)\sqrt{(\theta-1)^2-4}\right|_2\leq r$$

which yields $x_1\in B_r(x_2)$.

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ANALYSIS OF THE METHODS OF IMPROVING THE FRYING PROCESS IN THE PRODUCTION OF VEGETABLE OILS

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Abstract. *This article describes the findings of a study on the enhancement of pipeline process equipment for vegetable oil manufacturing. Dry and moist roasting methods. Water, heat, and steam have an impact on the roasting process. Specialized equipment and aggregates are used to carry out procedures. Gas boilers and humidifying-evaporating screws are used for this purpose. Also explored are methods for improving the efficiency of frying foods in a cooking pot. In estimating food processing regimens, physicochemical qualities of the product are crucial.*

Keywords: *pipe, dry, wet, heat, process, solution, moisture elasticity, vaporizer, enzyme, steam, open steam, seed, and screw.*

The government of our country has devoted significant attention to the expansion of the oil sector in recent years. The technology for the cultivation and processing of indigenous non-traditional oil plants, such as sunflower, flax, sesame, and fruit, has progressed, although slowly. The manufacture of oils began. The activity of oil sector businesses is highly dependent on the leadership and management expertise of its executives. Today, the "Digital Uzbekistan-2030" program was implemented in our nation, and the "On Measures for the Widespread Introduction of Digital Economy and Electronic Government" decision was approved. According to him, the digital economy's part of the country's gross domestic product would be quadrupled by 2023. In the manufacture of vegetable oils, a thin layer of oil is deposited on top of the pulp particles. The oil coating on the particle's surface is maintained by the attraction between oil and solid molecules. To mitigate these pressures, the fluid is hydrated and the product is heated. When oil is hydrated and subjected to heat, the physico-chemical characteristics of the oil gel portion and the fat components inside it alter, and as a consequence, the potential of extracting the greatest quantity of oil arises. Important are the processes of wetting and heat treatment. These operations are conducted using specialized machinery and aggregates. Gas boilers and humidifying-evaporating screws are used for this purpose. Meat that has been dried and cooked is called mezga. The production roasting procedure consists of two phases:

The first step of roasting involves a humidifying-evaporating screw. At this step, the solution is saturated with a combination of water and steam and heated with technical steam. In the second step of the roasting procedure, the moistened-steamed meat is continuing to be heated, i.e., the product is brought to a condition in which its moisture and temperature meet the technical criteria and the roast is made ready for pressing. If undesirable chemical and biological reactions occur in the process of moistening, steaming, and roasting the seeds, then these oilseeds are produced by "dry roasting." The procedure of wetting-steaming and heat-processing the oil is carried out under circumstances suited to the various oilseed varieties. In addition, while processing the same oil, it is cooked under several circumstances, depending on the objective of producing oil from it: initial pressing, full pressing, and oil extraction.

The oil in the crushed product is known to exist in two states:

The thin coating of oil atop a particle is referred to as free oil.

The oil inside the inner cells that has not been completely or partly digested is referred to as bound oil.

Intermolecular forces of attraction are always present between oil molecules and the solid particle's surface, regardless of whether the two kinds of oil are on the particle's surface or inside it. In addition, capillary forces bind the oil inside the intact cells much more tightly. Due to this, it is extremely difficult to extract oil from the resulting pulp by direct pressing. Therefore, in order to reduce the force of attraction between solid particles and oil molecules, the product is fried with water and heat prior to pressing, and the resulting product is known as mezga, which means fried. We refer to this as the roasting procedure and split it into two phases: First, the material is saturated with water and evaporated using steam (vlagoteplovaya obrabotka).

The second stage consists of direct frying, while the first period consists of heating the product with high humidity using technical steam, i.e., continuing the frying process while raising the product's temperature and decreasing its humidity. A portion of the additional water and steam forms a hydrate, or a water shell, between the solid particles and the oil layer. This lowers the intermolecular interaction between particles and oil molecules significantly. In this instance, the product becomes less elastic and more plastic. Despite the fact that oil molecules are kept in this product with minimal effort, the pressing process cannot extract the required quantity of oil owing to the product's flexibility. It is important to lower the product's moisture content once again in order to impart elasticity. In order to do this, the water supply to the product is cut off, and heating with technical steam, or frying, is maintained. Due to the rise in the product's temperature, surplus water is evaporated, and the product's moisture content is lowered to the appropriate level. While the product is being fried and its humidity is being lowered, the released water vapor permeates the whole layer of the product, giving the impression that it is being cooked in its own steam. This is known as cooking in one's own steam. The product acquires the appropriate porosity and flexibility as a result of being roasted in its own steam. Using the pressing procedure, such a product is ready to receive oil, and the finished item is known as fried. According to the preceding considerations, during the frying process, not only does the aggregate state of the fatty product change, but also very complicated biochemical reactions occur. All oil seeds are known to contain the physiologically active enzyme lipase. This enzyme breaks down triglycerides in a moderately and somewhat heated environment due to its catalytic activity. When the temperature exceeds 80-85°C, the catalytic activity of lipases essentially vanishes, as lipases enter the protein complex, denature, and lose their activity at high temperatures. In addition to lipases, there are chemicals and enzymes unique to each oilseed that enhance their activity during the soaking and steaming process and generate compounds with a detrimental impact on the product that are astringent, bitter, mildly or severely poisonous. can do. For instance, rapeseed and mustard (mustard) seeds contain thioglucosides, which, when exposed to the physiologically active enzymes myrosinase, thioglucosidase, etc., produce extremely fine allyl-mustard or crotonyl-mustard oils. Therefore, during the first period of roasting, these seeds are crushed without the addition of water, and at the beginning of the second period, after the activity of the enzyme system has decreased, if required by technological requirements, water is added to the product or the second period of direct frying commences. This approach is known in technology as dry roasting. It is not feasible to achieve the desired quantity of oil by pressing when the dry roasting technique is utilized for other oilseeds in the business; thus, wet roasting is the method of choice for current technology. The number of oxidizing chemicals rises with heating. Therefore, it is suggested not to elevate the temperature of

the product over 105°C during the frying process in order to decrease the contact between the meat and oil with oxygen in the air and avoid the reaction. At high temperatures, protein compounds undergo denaturation, which is significantly affected by moisture.

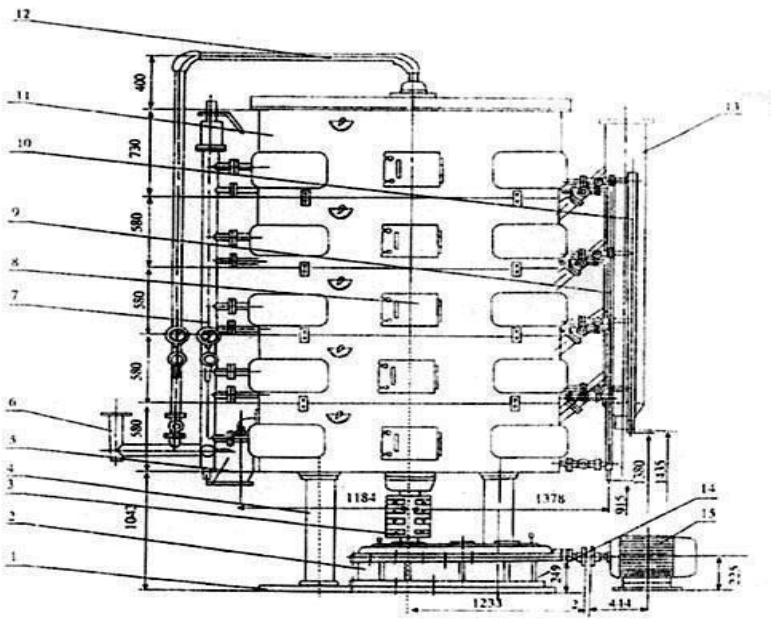
Steam transports both heat and moisture. If open steam is used during the frying process, the steam initially contacts the product at a low temperature and condenses into water. In the solution, condensed steam is equally distributed. As the temperature of the liquid reaches that of the steam, the steam starts to dry and heat the product without condensing into water. Instead of the surface of the cauldron, the open steam swiftly and evenly warms the material. In the process of soaking and heating the solution, biochemical changes occur. During the roasting process, the activity of enzymes rises with the increase of temperature and humidity; when a specific temperature and humidity are achieved, this activity reaches its peak, then it diminishes, and ultimately it disappears. Enzyme activity is diminished by an environment that promotes protein denaturation.

At the same time, it is feasible to limit the activity of enzymes or eliminate them entirely at temperatures between 80 and 85 degrees Celsius by adding water to the extract and rapidly heating it. Before the frying pans, such an atmosphere might be established in the steaming screws. Different families of oilseeds include unique enzymes, therefore "optimal" conditions are specified for each. Between 20 and 70 degrees Celsius, water-insoluble phosphatides are generated during the processing of pistachio nuts. If the decrease of activity is accomplished rapidly and vigorously, that is, phospholipase activity is eliminated, the creation of such phosphatides is diminished. The transformation of gossypol is the most critical step in the roasting of seed pulp. In its natural, or "native," condition, gossypol is exceedingly poisonous. If native gossypol is found in oil, kunjara, and flour, the quality of these items degrades significantly. In addition, gossypol has a detrimental impact on the oil purification process and darkens the color of the oil. Under the influence of heat, gossypol combines with oxygen, moisture, free amino acids, proteins, and phosphatides during the frying of greasy foods. Currently, our experts have devised methods for entirely converting gossypol to oil or fusing it with the solution's gel component.

Depending on the model, the diameter of the grill's inside varies (see table). 1500, 1800, 2100, 2400, 2500, 2800, 3000 or 3600 mm. Each bowl of the grill is fitted with scrapers for consistent mixing of minced meat, which are operated by the gearbox-connected main shaft. Under and rotating with the scrapers is a mechanism for injecting live steam; this assures consistent evaporation of the mint. A mechanism is fitted in the steam boiler to eliminate surplus moisture produced by the oilseed during steaming. A live steamer is situated underneath the grater and rotates with it, ensuring that the mint is uniformly steamed. A mechanism is fitted in the steam boiler to eliminate surplus moisture produced by the oilseed during steaming. Each container is equipped with its own bypass valve to regulate the mint supply, an internal material supply level sensor, and an exterior slider to show the layer height. The apparatus for unloading is placed at the base of the lower tank. Detailed explanation of the heating system (see drawing) The functioning organs of the grill are the side walls and bottom of each container.

Explanations to the drawing: steam from the boiler is supplied to the head 6, from it to the steam distribution pipe 7 and steam inlet pipes 12. Steam enters the bottom of each pot for jacketing and heating, as well as 12 direct steam into the roaster to equalize mint moisture. The roast should have a plastic and spreadable structure. Extraction of oil from frying is based on the

principle of slowly squeezing it in screw presses. Due to the shortening of the pitch of the auger winding and the greater displacement of the auger walls relative to each other, the oil separates from the auger. Oil leakage is not only caused by external forces, but also the resistance of the substances contained in the core to external influences is of great importance. The fact that the roast is in a plastic state plays a big role in facilitating this process. In order for the product to be plastic and homogeneous, it is necessary to pay good attention to the frying process, including the uniform operation of the mixers, the even distribution of steam, and the thickness of the product in the pans. Wet preparation of roast is carried out in 2 stages. In the first stage, the solution is moistened and heated with steam. In the second stage, the wet solution is dried, that is, it is necessary to create such conditions that its humidity and temperature should be optimal according to the technology. The first stage of roasting is carried out in a moistening screw. If a chemical and biochemical process occurs unintentionally in the process of moistening the pulp, then dry roasting of the pulp is required. The seed pulp is moistened with saturated steam and condensate in a moistening auger installed above the boiler to 11.5-13.5% for 1-3 types of seeds, and to 13.5-15.5% for 4 types of seeds. it is moistened, the temperature should be 70-80°C for 1-3 varieties, and 60-70°C for 4 varieties. The temperature of the product after the 1st round of roasting is 80-85°C, the moisture content is 9-11% for all oilseeds except for cottonseed, 11.5-13.5% for 1-3 types of seed. 4 varieties should be 13.5-15.5% for seeds. The process of steaming and moistening is as fast as possible equal to 15-20°C. After the cauldron fryers, i.e. after the 2nd round of frying, the temperature of the roast should not exceed 100-105°C. For low-grade seeds, it should be 5-10°C lower than the indicated level. If the product is prepared for pre-pressing, the moisture content should be around 5.5% without extraction, and for pressing it should be 3-4% or 2.5-3%, depending on the type of pressing machine used. The temperature of the roast prepared in this case is higher than that prepared for pressing, it is 110-1200C. At the same time, the amount of shell in the product is limited, and for sunflower seeds, the amount of shell in the roast should not exceed 8-10%, and cotton seed kernels should not exceed 15% for 1-3 varieties, and 17% for 4 varieties. should not increase. The 2nd period, i.e. the 2nd period of roasting, is on average 50-60 minutes. will be around.



When the engine is heated, the temperature of the oil in it rises, which accelerates the movement of the oil. This leads to a reduction in viscosity. However, the viscosity decreases slightly until the temperature reaches 50-600C. And then the decline slows downThus, the effect of heat is that it reduces the connection between the gel part and the oil, and allows the oil to separate and flow easily. However, the amount of oxidizing substances increases during heating. Therefore, it is better not to increase the temperature above 1050C, to prevent the frying and oil

from reacting with oxygen in the air. When heated, protein substances are denatured, moisture also has a significant effect. Reheat transports moisture and heat. In this instance, steam condenses into water and is evenly dispersed throughout the liquid. The steam's temperature then begins to dry and heat the powder. The product is heated more quickly and uniformly by steam than by the surface of the boiler. In most cases, steam is more advantageous than water and heat.

During roasting, as the temperature and humidity rise, the activity of enzymes rises; when a specific temperature and humidity are achieved, this activity reaches its peak, then drops, and ultimately ceases. Conditions that result in protein denaturation diminish the activity of enzymes. In addition, it is feasible to limit the activity of enzymes at temperatures between 80 and 850 degrees Celsius by moistening the liquid and rapidly heating it. It is transported through the evaporator screws before to roasting. Various families of oilseeds have their own enzymes, therefore their circumstances are "ideal." The texture of the roast should be plastic and rubbery. The extraction of oil from roasted seeds using screw presses is based on the notion of progressive compression. Due to the reduction in the pitch of the screw's winding and the increased compression of the screw's walls, the screw separates from the oil. In addition to external pressures, the resistance of the compounds inside the core to external influences also plays a significant role in oil leakage. To aid this procedure, it is crucial that the roasted coffee be in a plastic form. During the frying process, the consistent functioning of the stirrers, the distribution of steam, and the thickness of the roast assure the roast's plasticity and consistency.

At a temperature of 1000°C, water-soluble protein is resistant to heat and converts into insoluble nitrogen. If the heating is maintained without the addition of moisture, and the temperature hits 1100 degrees Celsius, salt-soluble proteins become alkali-insoluble proteins. Therefore, the maximum temperature for roasting the product should be 1100C, and the relative humidity should range from 6.9% to 17.5%. (Rjexin).

After being subjected to hydrothermal impacts, the product ripens. The roast emerges from the pot with a distinct texture. The orange-colored, talc-like roast that emerges from the bottom of the boiler must have a moisture content of no more than 3.5% and a temperature of 108-1100C.

The data shown in the table was derived from locally cultivated seeds at the Gulistan extract oil JSC firm in the Syrdarya area.

In conclusion, it can be said that when the liquid is moistened and subjected to heat, the physico-chemical characteristics of the liquid gel portion and the fatty components inside it change, and as a consequence, the greatest quantity of oil may be extracted. When meat is cooked, the temperature of the oil inside it rises, accelerating the oil's mobility. It is known that the creation of non-hydratable phosphatides is caused mostly by their hydrolysis during the meat-frying process.

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ABOUT THE MODEL OF THE CONTROL SYSTEM IN CONDITIONS OF INACCURATE INFORMATION AND ITS APPLICATION TO ONE ECONOMIC PROBLEM

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Abstract. *The paper considers a mathematical model of a control system under conditions of inaccurate information about the initial data and the parameter of external influences. The model is presented as a controlled differential inclusion with a parameter. A problem of optimal control with a non-smooth terminal functional is studied. Necessary and sufficient optimality conditions are obtained. A general scheme - an algorithm for using these optimality conditions - is given. The application of the obtained results to the economic problem of the optimal distribution of investments is shown.*

Kerwords: *mathematical model, control system, information inaccuracy, optimal control, non-smooth functional, optimality conditions, optimal distribution of investments.*

Introduction

Mathematical models of processes and objects from the economy and technology are very diverse in form and content. Mathematical methods are widely used to make informed decisions when planning the comprehensive development of industries, regions, enterprises, consumers, and naturally, they serve the interests of various parties involved in economic relations. With the help of a modern method of mathematical modeling and computational experiment, it is possible to conduct active scientific, theoretical and practical research aimed at automating control and making optimal decisions.

At present, economic systems are distinguished by the variety and scale of control parameters and influences, which, as usual, have material and financial content, as well as by the large influence of the factor of random changes and risk (additional funds for raw materials and material resources, investments in various forms, new economic indicators, market price changes, etc.). Many management tasks in the field of economics are implemented in the form of dynamic optimization models with different objective functions and many restrictions on state and control variables [1,2,3]. To describe the behavior of dynamic control systems, various classes of differential equations are used, including differential equations with multivalued right-hand side - differential inclusions.

Differential inclusions, which proved to be an effective mathematical apparatus of research [4], deserve special attention in the theory of optimal control. To date, the theory of differential inclusions has been developing in various directions, controlled differential inclusions are being studied, both with delay and without delay, as well as their discrete analogs [5–20]. Differential inclusions with a control parameter play an important role as a model of control systems under conditions of data inaccuracy - informational limitations. They are also of interest in the study of

problems of differential games, which are a mathematical model of conflict situations, which is characteristic of the relations of a market economy.

Materials and methods of research

An important class of dynamic models of control systems under conditions of information constraints is controlled differential inclusions with a parameter [7,8,12]. In the study of such models, various problems arise for controlling the ensemble of trajectories of a dynamical system. Basically, these problems belong to the class of non-smooth optimal control problems.

Let's consider the control system described by the differential inclusion

$$\frac{dx}{dt} \in A(t)x + b(t,u,v), x(t_0) \in X_0, u \in U(v), v \in V, t \geq t_0, \qquad (1)$$

where $x = x(t) \in R^n$, $A(t)$ – given $n \times n$ - matrix, $b(t,u,v) \subset \mathrm{R}^n$, $U \subset R^m$, $V \subset R^k$. In contrast to the control influence $u = u(t), t \in [t_0, t_1]$, parameter v represents as an additional factor, the consideration of which is associated with the purpose of management. It can also be considered that it is a parameter of some external influences or a parameter of permissible changes in the structure of the control system, the identification of which is required in the control process.

It should be noted that model (1) describes, in particular, the process of controlling a linear system from the form

$$\frac{dx}{dt} = A(t)x + B(t,u)v + q(t), u \in U(v), \mathrm{v} \in \mathrm{V} \qquad (2)$$

where $B(t,u)$ – $n \times k$ -matrix, external influences $q = q(t)$ are priori unknown, there is no statistical description and only the set of possible values is known: $q(t) \in Q$, $Q \subset R^n$.

We will assume that the following assumptions are fulfilled for the control system (1):

1) elements of the matrix $A(t)$ are continuous on $T = [t_0, t_1]$; 2) for any $t \in T, u \in U(v), v \in V$ the set of $b(t,u,v)$ is a non-empty compact from R^n; 3) multivalued mapping $(t,u,v) \to b(t,u,v)$ is contionuous; 4) $X_0 \subset R^n$, $U(v) \subset R^m$, $V \subset R^k$ – convex compacts.

Let be $U(T)$ – the set of all piecewise continuous controls $u = u(t), t \in T$, with the values from the set of $U(v) \subset R^m$; $X(t_1,u,v)$ – the set of those points of the state of space R^n, which are reachable by absolutely continuous trajectories at time t_1. The quality of system control (1) will be estimated by the terminal functional of the form

$$J(u,v) = \max\left\{\min_{p \in P}(p,\xi) : \xi \in X(t_1,u,v)\right\}, \qquad (3)$$

where P – compact R^n. The goal of the control is to minimize the functional (3), i.e. the minimax problem is considered:

$$\max\left\{\min_{p \in P}(p,\xi) : \xi \in X(t_1,u,v)\right\} \to \min, u \in U, v \in V. \qquad (4)$$

A characteristic feature of this control task is determined by the non-smoothness (non-differentiability) of the minimized functional. Such problems often arise in cases where the goal of control is to obtain a guaranteed result under conditions of inaccurate information regarding the initial data and perturbation parameters.

Let us study the control system (1) using the results of the theory of differential inclusions, multivalued mappings, and convex analysis [4]. The main goal of the study is to obtain necessary and sufficient optimality conditions in problem (4). It is also planned to study the issue of developing a general scheme - an algorithm for solving problem (4), based on the use of optimality conditions. We will discuss the application of the obtained results on the example of a dynamic problem of the optimal distribution of investments between industries. The work develops research [7,8,13,17].

Main results

Let: $F(t,\tau)$ be fundamental matrix of solutions to the equation $\frac{dx}{dt} = A(t)x,\ F(\tau,\tau) = E$; $C(D,\psi) = \max\limits_{d\in D}(d,\psi)$ – support function of a compact $D \subset R^n$. It can be shown that functional (3) satisfies the representation:

$$J(u,v) = \min_{p\in coP}[C(F(t_1,t_0)X_0, p) + \int_{t_0}^{t_1} C(F(t_1,t)b(t,u(t),v), p)dt], \qquad (5)$$

where $coY-$ convex hull of a compact $P \subset R^n$. Using formula (5), we obtain the following necessary optimality condition in problem (4).

Theorem 1. *If $u^*(t), t \in T,$ – optimal control and v^* – the optimal value of the parameter in the task (4), then there is a global minimum point $p^* \in coP$ of the function*

$$\eta(p) = C(F(t_1,t_0)X_0, p) + \min_{v\in V}\int_{t_0}^{t_1} \min_{u\in U(v)} C(F(t_1,t)b(t,u,v), p)dt, \qquad (6)$$

such that the following equalities hold:

$$\min_{v\in V}\int_{t_0}^{t_1} \min_{u\in U(v)} C(F(t_1,t)b(t,u,v), p^*)dt = \int_{t_0}^{t_1} \min_{u\in U(v^*)} C(F(t_1,t)b(t,u), v^*), y^*)dt, \qquad (7)$$

$$C(F(t_1,t)b(t,u^*(t),v^*), p^*) = \min_{u\in U(v^*)} C(F(t_1,t)b(t,u,v^*), p^*),\ t \in T. \qquad (8)$$

Note that these necessary optimality conditions are also sufficient optimality conditions in the problem under consideration, i.e., the following is true.

Theorem 2. *The pair $(u^*(\cdot), v^*)$ constitutes a solution to problem (4) if and only if there is a global minimum point $p^* \in coP$ of the function $\eta(p)$ and conditions (7),(8) are satisfied.*

Based on the results obtained, we can propose the following general scheme - an algorithm for applying optimality conditions for solving the minimax problem (4).

Algorithm*:*

Step 1. *To calculate the fundamental matrix $F(t,\tau)$ of the system $\dot{x} = A(t)x,\ F(\tau,\tau) = E$.*

Step 2. *To calculate support functions $C(F(t_1,t_0)X_0,\psi), C(F(t_1,t)b(t,u,v),\psi)$.*

Step 3. *To compute function $\eta(p)$, defined by the formula (6).*

Step 4. *To calculate minimum point $p^* \in coP$ of the function $\eta(p)$.*

Step 5.*To find a point $v^* \in V$, satisfying the condition (7).*

Step 6. *To find the function $u^*(t)$ from the condition (8).*

After performing the operations of these steps, we get a pair $(u^*(t), v^*)$, which is the solution to the problem (4).

In this algorithm, steps 3 and 4 are key steps. In the case when the function $\eta(p)$ is determined by an analytically explicit formula, step 4 represents as a solution to the non-linear programming problem. Under certain conditions on the right side of the system (1), in step 4, the problem of convex programming is solved. Steps 5 and 6 also represent a non-linear programming problem, and in step 6 such a problem is solved depending on the parameter $t \in T$.

The operations of each step of this algorithm can be refined and specified taking into account the conditions on the parameters of the problem. To ensure the practicality of the algorithm, it is necessary to use numerical optimization methods and computer technologies.

The discussion of the results

The considered system (1) is of interest from the point of view of application in studies of various control processes with inaccurate information that arise in economics and technology.

As an example, let's consider the application of the considered model and the results obtained to the problem of optimal distribution of investments between industries. Let there be industries in which investments are supposed to be made to ensure their growth over a certain period of time $T = [t_0, t_1]$. Coefficients a_i of annual disposal of fixed production assets $\mathrm{K}_i(t)$ of each of the industry $i = \overline{1,n}$ are known. To ensure the growth of production assets, it is planned to invest $R_i(t)$ in the year $t \in T$ in each of the industry $i = \overline{1,n}$. We assume that the initial state of fixed production assets and the total volume of the allocated investment are known. Then the dynamic system of distribution of capital investments between industries can be represented by the following model [3]:

$$\frac{d\mathrm{K}_i(t)}{dt} = -a_i \mathrm{K}_i(t) + R_i(t), t \in T, \mathrm{K}_i(t_0) = \mathrm{K}_i^0, \sum_{i=1}^{n} R_i(t) \le M .$$

Now let's make some changes to this model. It is planned to invest in the amount $R_i(t) = \nu_i u(t)$ every year $t \in T$ in each of the industry $i = \overline{1,n}$, while on the coefficients ν_i acceptable limits: $0 < \underline{\nu}_i \le \nu_i \le \overline{\nu}_i$ are set. In the system under consideration, we will take into account the factors of the influence of external parameters on the process of growth of production assets with the attraction of investments. As such factors, it should be noted the change in prices in the market for purchased materials, resources and new equipment. However, these factors are distinguished by their indefinite nature of change in the considered period of time, and therefore, one can only use the forecast of their admissible sets of values: $q_i(t) \in [\underline{q}_i, \overline{q}_i]$. As a result, we obtain an investment management system in which there are external perturbations, i.e. system

$$\frac{d\mathrm{K}_i(t)}{dt} = -a_i \mathrm{K}_i(t) + \nu_i u(t) + q_i(t), t \in T, \mathrm{K}_i(t_0) = \mathrm{K}_i^0, \sum_{i=1}^{n} \nu_i u(t) \le M .$$

Since the total amount of input investments is limited by the condition $\sum_{i=1}^{n} \nu_i u(t) \le M$, then $u(t) \in U(\nu) = [0, m(\nu)], m(\nu) = M / \sum_{i=1}^{n} \nu_i$. The goal of system management is to maximize the total states of the production assets of industries at the end of the period. To evaluate this criterion, one can use the terminal functional

$$J(u,v)=\sum_{i=1}^{n}\max_{\gamma_i\in[\underline{\gamma}_i,\bar{\gamma}_i]}\min_{q_i\in[\underline{q}_i,\bar{q}_i]}\gamma_i \mathrm{K}_i(t_1,u,v_i,q_i).$$

Then the problem of optimal distribution of investments is reduced to the following problem:

$$\sum_{i=1}^{n}\min_{q_i\in[\underline{q}_i,\bar{q}_i]}\max_{\gamma_i\in[\underline{\gamma}_i,\bar{\gamma}_i]}\gamma_i \mathrm{K}_i(t_1,u,v_i,q_i)\to\max, u\in[0,m(v)], v_i\in[\underline{v}_i,\bar{v}_i].$$

This problem is equivalent to a problem of the form (4):

$$\sum_{i=1}^{n}\max_{q_i\in[\underline{q}_i,\bar{q}_i]}\min_{p_i\in[\underline{p}_i,\bar{p}_i]}p_i \mathrm{K}_i(t_1,u,v_i,q_i)\to\min, u\in[0,m(v)], v_i\in[\underline{v}_i,\bar{v}_i],$$ где

$\underline{p}_i=-\bar{\gamma}_i, \bar{p}_i=-\underline{\gamma}_i$.

To solve this problem, we apply the algorithm proposed above. Fundamental matrix of the system $\frac{d\mathrm{K}_i(t)}{dt}=-a_i\mathrm{K}_i(t), t\in T,$ has a form:

$$F(t,\tau)=\begin{pmatrix} e^{-a_1(t-\tau)} & 0 & \dots & 0\\ 0 & e^{-a_2(t-\tau)} & \dots & 0\\ \dots & \dots & \dots & \dots\\ 0 & 0 & \dots & e^{-a_n(t-\tau)}\end{pmatrix}.$$

Considering that the initial set consists of one point

$\mathrm{K}^0=(\mathrm{K}_1^0,\mathrm{K}_2^0,...,\mathrm{K}_n^0)$, и $b(t,u,v)=\{b: b=(b_1,...,b_n), b_i=v_iu+q_i(t), q_i(t)\in[\underline{q}_i,\bar{q}_i]\}$,

we define a function $\eta(p)$ of the form (6). We have:

$$\eta(p)=\sum_{i=1}^{n}\mathrm{K}_i^0e^{-a_i(t_1-t_0)}p_i+\min_{v_i\in[\underline{v}_i,\bar{v}_i]}\frac{M}{\sum_{s=1}^{n}v_s}\sum_{i=1}^{n}(e^{-a_i(t_1-t_0)}-1)v_ip_i+\sum_{i=1}^{n}\underline{q}_i(e^{-a_i(t_i-t_0)}-1)p_i=$$

$$=\sum_{i=1}^{n}\{\underline{q}_i-(\mathrm{K}_i^0+\underline{q}_i)e^{-a_i(t_1-t_0)}\}\gamma_i+\min_{v_i\in[\underline{v}_i,\bar{v}_i]}\frac{M}{\sum_{s=1}^{n}v_s}\sum_{i=1}^{n}(1-e^{-a_i(t_1-t_0)})v_i\gamma_i.$$

Let $\underline{q}_i-(\mathrm{K}_i^0+\underline{q}_i)e^{-a_i(t_1-t_0)}\ge 0, i=\overline{1,n}$. Then it can be shown that the global minimum of the function $\eta(p)$ on $P=\{p=(p_1,...,p_n):\underline{p}_i\le p_i\le\bar{p}_i, i=\overline{1,n}\}$ is reached at the point $p^*=-(\bar{\gamma}_1,...,\bar{\gamma}_n)$. Now let's define optimal value v^* of the parameter $v=(v_1,...,v_n)$, as a solution to a problem:

$$\frac{M}{\sum_{s=1}^{n}v_s}\sum_{i=1}^{n}(e^{-a_i(t_1-t_0)}-1)v_i\bar{\gamma}_i\to\min, \underline{v}_i\le v_i\le\bar{v}_i, i=\overline{1,n}.$$

Then we get the optimal distribution of investments:

$$R_i^*=\frac{M}{\sum_{s=1}^{n}v_s^*}v_i^*, i=\overline{1,n}.$$

Conclusion

The studied nonsmooth optimization problem (4) is of direct interest for further studies of similar models of optimal control problems. The results obtained can be generalized for analogous discrete dynamic control systems. And this allows the study of models of multi-step control processes, which take into account the limited and incomplete information on external uncontrolled parameters.

The proposed algorithm for solving the considered problem is a step-by-step application of necessary and sufficient optimality conditions. According to this scheme, the solution of an infinite-dimensional non-smooth optimization problem can be obtained after performing several steps of finite-dimensional optimization.

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METHODS FOR EVALUATING THE UNCERTAINTY OF THE RESULTS OF DIRECT AND INDIRECT MEASUREMENTS OF ANALYTICAL VALUES

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Abstract. *Methods of estimating uncertainty of results of direct and indirect measurements of analytical values have been analysed. Analytical expressions for numerical calculation of main sources of physical and chemical values are given. Significant sources of measurement uncertainty have been simulated. The apparatus effects may include, for example, mistake limits of the analytical weights; The presence of a temperature regulator that can maintain an average temperature that differs (within specified limits) from the temperature recorded; Automatic analyzer, which can be subject to overload effects. Taking into account these specifics of analytical measurements, calculations of standardized standard uncertainties of measurement results according to GOST 1770 have been performed.*

Keywords: *Coverage factor, coverage probability, coverage interval, type A uncertainty, type B uncertainty, extended uncertainty, measurements, measured value, analytical values, direct measurements, indirect measurements, correlated value, uncorrelated value.*

Introduction

Many important decisions are based on the results of chemical quantitative analysis; results are used, for example, to estimate yields, to check materials against specifications or statutory limits, or to estimate monetary value. Whenever decisions are based on analytical results, it is important to have some indication of the quality of the results, that is, the extent to which they can be used to achieve the stated goal. Users of chemical analysis results, especially in those areas related to international trade, are facing increasing pressure to eliminate duplication of effort often expended in obtaining them [1-3]. Confidence in data from outside the user's own organization is a prerequisite for achieving the above goal.

Main part

In some analytical chemistry sectors, it is now a formal (often legal) requirement for the laboratory to introduce quality assurance measures to ensure the ability and provide data of the required quality. Such measures include: use of proven methods of analysis; использование определенных процедур внутреннего контроля качества; participation in proficiency testing programs; accreditation based on ISO / IEC 17025: 2017 and establishing traceability of measurement results. Depending on the type of information available about the quantity and on the possible variability of the quantity value (statistical or non-statistical), it is known that the uncertainties of the input quantities are estimated by type A or type B.

If the information about a quantity is statistical, that is, it is obtained experimentally by repeated measurements or tests, then its standard uncertainty due to random effects is estimated by type A (1) [4,5]:

$$u_A(\bar{x}) = s(\bar{x}) = \sqrt{\frac{1}{n(n-1)} \cdot \sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2} \quad (1)$$

where $\bar{x}$ is the estimate (arithmetic mean) of the input X quantity; x_i – result of the i-th observation of the input quantity; n – number of observations.

In this case, the experimental variance of observations is estimated by (2):

$$s^2(x) = \frac{1}{n-1} \cdot \sum_{i=1}^{n} \left(x_i - \bar{x}\right)^2 \quad (2)$$

Before measuring, first of all, we compile a list of influencing factors on the expanded measurement uncertainty.

When measuring the density of ethanol (C_2H_5OH) using a volumetric flask (according to GOST 1770), the density is found by the equation.

$$\rho\left(C_2H_5OH\right) = \frac{m_2 - m_1}{V} \quad (3)$$

where m_1 - is the mass of the flask, m_2 – weight of the flask with ethanol.

This mathematical model reflects the main sources of uncertainty (Fig. 1).

Fig. 1. it can be seen that the main sources of measurement uncertainty are directly related to the total mass of the flask and volume. In addition, the standardized mistake limit of the flask is regulated at t=20 ºC [6].

The total standard uncertainty is calculated by the formula (4):

$$u_c(y) = \sqrt{\sum_{i=1}^{n} \left(\frac{\partial f}{\partial x_i}\right)^2 u^2(x_i)} \quad (4)$$

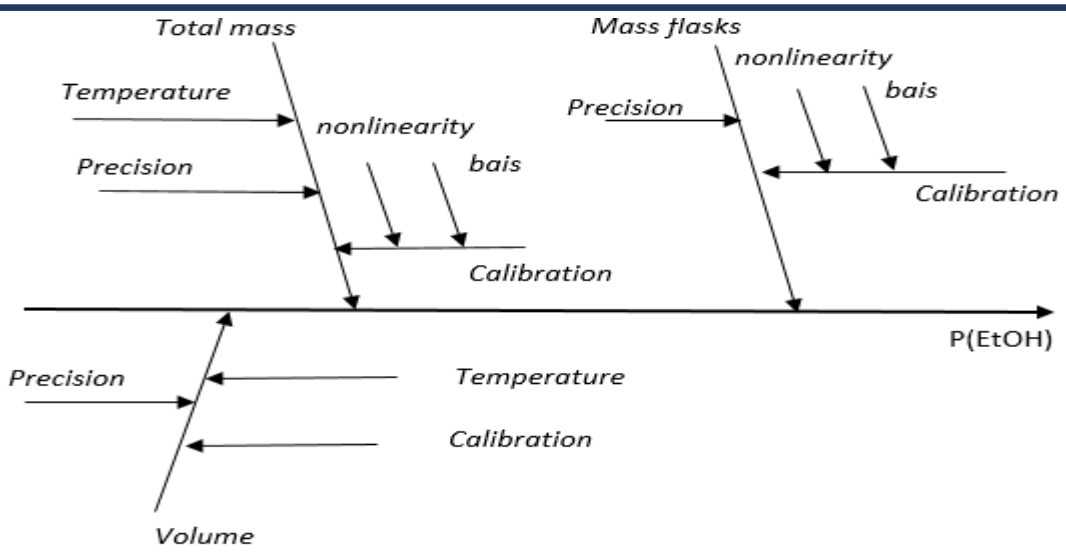
if the input quantities are uncorrelated. Otherwise, i.e. for correlated input quantities, it is calculated by the formula (5):

$$u_c(y) = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n} \frac{\partial f}{\partial x_i}\frac{\partial f}{\partial x_j} u(x_i, x_j)} = \sqrt{\sum_{i=1}^{n} \left(\frac{\partial f}{\partial x_i}\right)^2 u^2(x_i) + 2\sum_{i=1}^{n-1}\sum_{j=i+1}^{n} \frac{\partial f}{\partial x_i}\frac{\partial f}{\partial x_j} u(x_i, x_j)} \quad (5)$$

where are the partial derivatives $\partial f / \partial x_i$ – sensitivity coefficients; $u(x_i,x_j)$ – covariance of input quantities.

Fig. 1.

The main groups and subgroups of sources of uncertainty when measuring the density of ethanol



Sensitivity coefficients [7.8]

$$c_i = \frac{\partial f}{\partial x_i} \qquad (6)$$

show how the output estimate y changes with the change in the values of the input estimates $x_1, x_2, ..., x_n$.

Taking into account (6), formulas (4) and (5) are transformed into the following expressions

$$u_c(y) = \sqrt{\sum_{i=1}^{n} \left(\frac{\partial y}{\partial x_i}\right)^2 \cdot u^2(x_i)} = \sqrt{\sum_{i=1}^{n} u_i^2(y)} \qquad (7)$$

$$u_c(y) = \sqrt{\sum_{i=1}^{n} \left(\frac{\partial y}{\partial x_i}\right)^2 \cdot u^2(x_i) + 2\sum_{i=1}^{n-1} \sum_{j=i+1}^{n} \left(\frac{\partial y}{\partial x_i}\right) \cdot \left(\frac{\partial y}{\partial x_j}\right) \cdot u(x_i) \cdot u(x_j) \cdot r(x_i, x_j)} \qquad (8)$$

$$u_i(y) = \frac{\partial y}{\partial x_i} \cdot u(x_i) \qquad (9)$$

For the special case, when all input estimates are correlated with the correlation coefficients r (xi, xj) = +1, equation (8) is reduced to

$$u_c(y) = \sum_{i=1}^{n} u_i(y) \qquad (10)$$

For the sum or difference of two correlated quantities (Y = X1 ± X), the total standard uncertainty (in accordance with (8)) will be equal to:

$$u^2(y) = u^2(x_1) + u^2(x_2) \pm 2 \cdot u(x_1) \cdot u(x_2) \cdot r(x_1, x_2) \qquad (11)$$

If two input quantities Xi and Xj are correlated to a certain extent, that is, they are dependent on each other in one way or another, then when evaluating the total standard uncertainty among the contributions of the uncertainties of the input quantities, their covariance should be taken into account, which is estimated by the following formula [9, 10]:

$$u(\bar{x}_i, \bar{x}_j) = u(\bar{x}_i) \cdot u(\bar{x}_j) \cdot r(\bar{x}_i, \bar{x}_j), \quad i \neq j \qquad (12)$$

The degree of correlation is determined using the correlation coefficient. The estimated correlation coefficient is obtained from equation (1.12).

$$r(\bar{x}_i, \bar{x}_j) = u(\bar{x}_i, \bar{x}_j) / u(\bar{x}_i) \cdot u(\bar{x}_j) \cdot, \ i \neq j, \ \left| r(\bar{x}_i, \bar{x}_j) \right| \leq 1 \quad (13)$$

Figures 2 and 3 show the permissible mistakes from the nominal capacity of glass volumetric glassware and the permissible mistake limits for the volume of pipettes with one mark. If the certificate or other technical documentation gives the limits of permissible mistake without specifying the confidence level, or the estimate is given in the form of a maximum range (± a), and the shape of the distribution is unknown, a uniform distribution law should be used (Fig. 4.)

Table 1

Permissible mistakes from the nominal capacity of glass volumetric glassware, см^3

Nominal Capacity	Permissible mistake				
	Cylinders		Beakers	Flasks	
	1st class	2nd class		1st class	2nd class
5	0,10	0,10	-	0,025	0,05
10	0,10	0,20	-	0,025	0,05
25	0,25	0,50	-	0,04	0,08
50	0,25	1,00	2,50	0,06	0,12
100	0,50	1,00	5,00	0,10	0,20
200	-	-	-	0,15	0,30
250	1,25	2,00	5,00	0,15	0,30
300	-	-	-	0,20	0,40
500	2,50	5,00	12,50	0,25	0,50
1000	5,00	10,00	25,00	0,40	0,80
2000	10,00	20,00	-	0,60	1,20

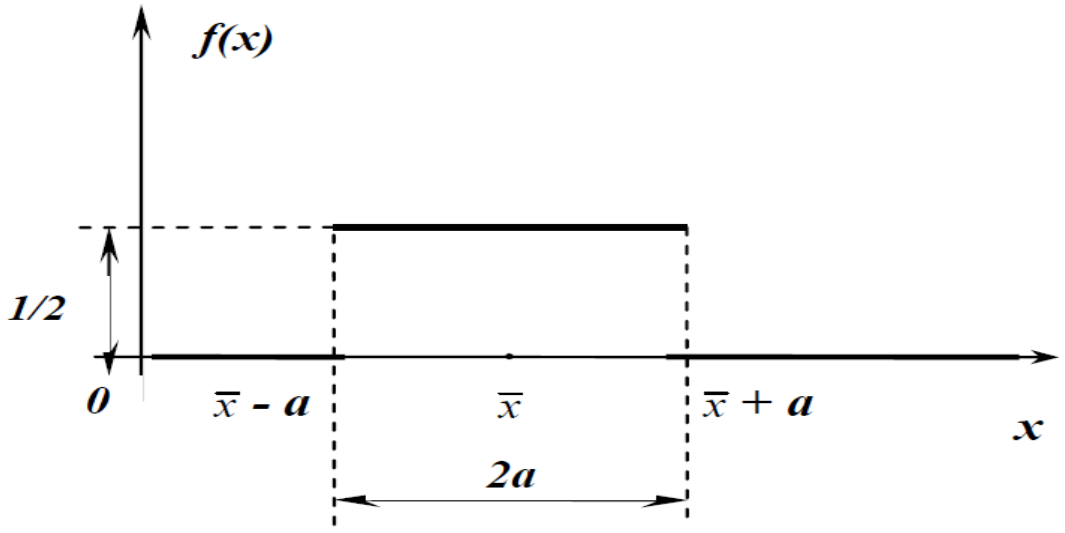
Table 2

Limits of permissible mistake for the volume of pipettes with one mark, см^3

Mistake of nominal	Limit of permissible mistake	
	1st class	2nd class
0,5	±0,005	±0,01
1	±0,008	±0,015
2	±0,01	±0,02
5	±0,015	±0,03
10	±0,02	±0,04
10,77	±0,02	±0,04
20	±0,03	±0,06
25	±0,03	±0,06
50	±0,05	±0,1
100	±0,08	±0,15
200	±0,1	±0,2

Fig 2.

Probability density function of uniform distribution



(a- is the half-width of the interval, x- is a random measurement result)

Fig. 3.

Normalized standard uncertainty (*Ust*) of the cylinder, K = 1 (accuracy class)

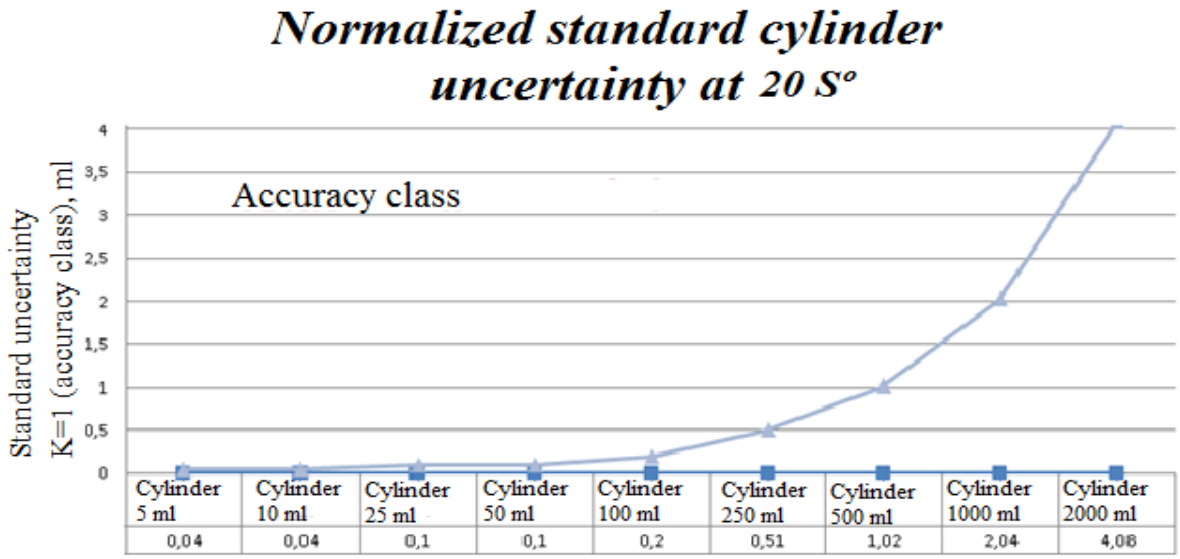
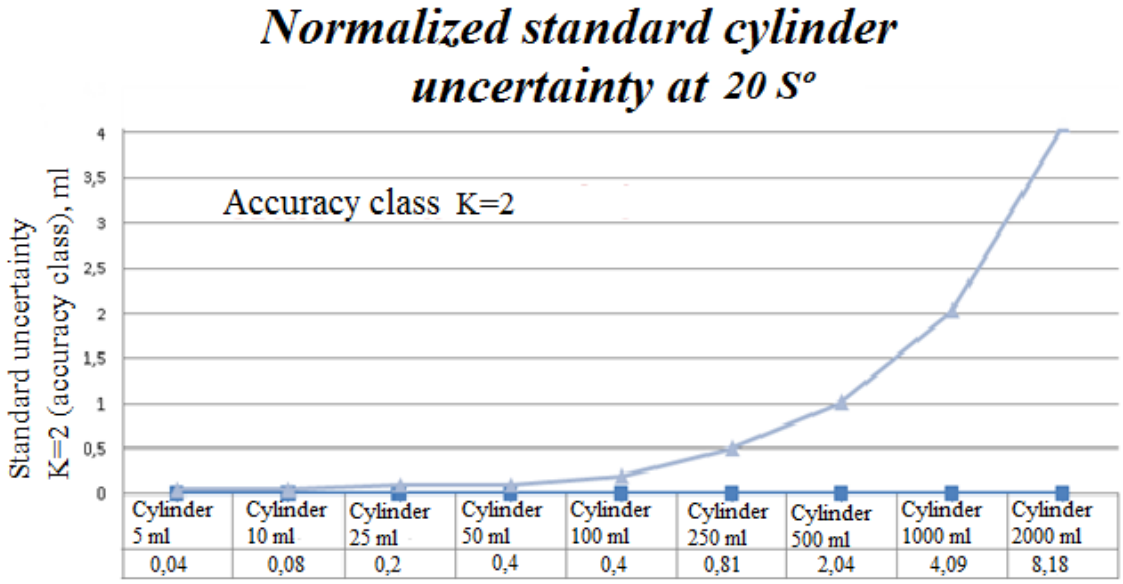


Table 1. 2 shows the permissible mistakes from the nominal capacity of glass volumetric glassware and the permissible mistake limits for the volume of pipettes with one mark. If the certificate or other technical documentation gives the limits of permissible mistake without indicating the confidence level or the estimate is given in the form of the maximum range (± a), and the shape of the distribution is unknown, then a uniform distribution law should be used (Fig. 2.). Fig. 3 shows the normalized standard uncertainty of the cylinder, K = 1 (accuracy class). Fig. it can be seen that the standard uncertainty decreases accordingly with an increase in the nominal volume of the cylinder. In addition, the value of uct depends on the accuracy class K (Fig. 4).

Fig. 4.

Normalized standard uncertainty (*Ust*) of the cylinder, K=2 (accuracy class)



Output: The main factors (not in all cases they are significant) affecting the total measurement uncertainty are discussed in the document of the International Organization for Cooperation in the Field of Laboratory Accreditation (ILAC), which also deals with the introduction of the concept of measurement uncertainty during testing, taking into account the application of the ISO / IEC 17025. According to ISO 10012, some components of uncertainty may be of little importance compared to other components, so their detailed determination may not be justified for economic or technical reasons. In this case, the decisions and justifications must be registered. In all situations, the effort to evaluate and record measurement uncertainty should be commensurate with the importance of the measurement results for product quality assurance.

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MATHEMATICAL DESCRIPTION OF THE PROCESS OF GRAIN DRYING BY THE CONVECTIVE METHOD

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Abstract. *The paper emphasizes that at present one of the tasks of the country's development is to increase grain production based on a significant increase in yield and reduce losses at all stages of its processing. During the period of harvesting and post-harvest processing, agro-climatic conditions are in most cases unfavorable, therefore, in the system of technological operations and post-harvest processing of seeds and grain, an important place belongs to their drying. In the article, the mathematical description of the grain drying process is based on a mathematical model in which the heat fluxes in the layer due to thermal conductivity were neglected, and shrinkage and pressure gradient were not taken into account. The zonal calculation method is considered, in which these characteristics are assumed to be constant.*

Keywords: *grain drying, bulk materials, moisture meter, grain, humidity.*

Grain is the most important product produced in agriculture. It is the basis for the production of a large number of different products, such as flour, cereals, feed, etc. One of the main aspects of grain processing is the process of its storage. The main task of this stage is to ensure the safety of grain crops in terms of minimizing their losses, improving quality characteristics at the lowest cost of labor and funds. The main characteristics during storage are the temperature of the grain mass, its humidity [1]

At present, one of the tasks of the country's development is to increase grain production on the basis of a significant increase in yields and reduce losses at all stages of its processing. During the period of harvesting and post-harvest processing, agro-climatic conditions are in most cases unfavorable, therefore, in the system of technological operations and post-harvest processing of seeds and grain, an important place belongs to their drying. As is known [2], grain moisture above 14% enhances the vital activity of microorganisms and increases its temperature, resulting in the risk of its spoilage. Unripened grain also contributes to this. Thus, the deterioration of the quality of rye, for example, can begin after 10 days if the humidity is 18% and the temperature is about 20 °C. At a humidity of 20% and a temperature of 20 ° C, 500 tons of grain loses, for example, 4 tons of its mass within 15 days. It follows from this that the grain must be processed immediately after harvesting to prevent its loss. Timely and properly carried out drying not only increases the stability of grain during storage, but also improves its food and seed qualities. Ensuring the high quality of drying requires the skillful use of grain drying equipment, its uninterrupted operation and the use of correctly selected drying modes. If the recommended drying modes are observed, the post-harvest ripening of grain is accelerated, the grain mass is leveled in terms of moisture and maturity, the color, appearance and other technological properties of the grain are improved. Drying has a depressing effect on the vital activity of microorganisms and pests. It has a positive effect on the yield and quality of products when processing grain into flour. that the grain must be

processed immediately after harvesting to prevent its loss. Timely and properly carried out drying not only increases the stability of grain during storage, but also improves its food and seed qualities. Ensuring the high quality of drying requires the skillful use of grain drying equipment, its uninterrupted operation and the use of correctly selected drying modes. If the recommended drying modes are observed, the post-harvest ripening of grain is accelerated, the grain mass is leveled in terms of moisture and maturity, the color, appearance and other technological properties of the grain are improved. Drying has a depressing effect on the vital activity of microorganisms and pests. It has a positive effect on the yield and quality of products when processing grain into flour. that the grain must be processed immediately after harvesting to prevent its loss. Timely and properly carried out drying not only increases the stability of grain during storage, but also improves its food and seed qualities. Ensuring the high quality of drying requires the skillful use of grain drying equipment, its uninterrupted operation and the use of correctly selected drying modes. If the recommended drying modes are observed, the post-harvest ripening of grain is accelerated, the grain mass is leveled in terms of moisture and maturity, the color, appearance and other technological properties of the grain are improved. Drying has a depressing effect on the vital activity of microorganisms and pests. It has a positive effect on the yield and quality of products when processing grain into flour.

There are various ways to remove moisture from grain. Free moisture on the surface of the grain can be removed mechanically, for example, by spinning in a centrifuge or by mixing the grain with another substance that quickly absorbs water. Methods for drying grain can be conditionally divided into two groups. The first group includes the method of mechanical dehydration and the method of sorption drying. In both cases, moisture is removed from the grain in liquid form. The energy consumption for such drying is relatively small, and the moisture content of the grain can be reduced only by a small amount (1–2%). In addition, sorption drying of grain is long. The second group includes the thermal method of drying grain. The main amount of moisture in the grain is strongly associated with dry matter. It can be removed from the grain only by evaporation. With this method of drying, much more energy is required than with mechanical dehydration or sorption drying. Energy in this case is spent on overcoming the force of bonding moisture with the dry matter of the grain, as well as on the heat of vaporization. Such drying is called thermal. At grain-receiving enterprises, when preparing grain for storage, only thermal drying is used as the most effective one, which allows you to quickly reduce grain moisture.

The heat required to convert moisture into steam can be supplied to the grain in various ways: convective, conductive, infrared rays, and other methods. In grain drying, the most common method is the convective method, in which heat energy is transferred to the grain from heated gas (heated air or a mixture of air with fuel combustion products). An enlarged scheme of the technological process that implements this method is shown in fig. 1. The air-heated dryer consists of 3 zones: heating zone, drying zone and cooling zone. In the heating zone, by burning fuel or supplying thermal energy in some form (eg hot water), the air flow is heated and reaches a certain humidity and temperature. The heated air flow in the drying zone meets the grain flow. Heat and moisture exchange between air and grain takes place here. The air cools and heats the grain. At the same time, heat is required for vaporization. The humidity of the grain decreases, the released moisture passes into the air, while its absolute humidity increases. The grain leaves the drying zone relatively warm and requires cooling. This is carried out in the cooling zone by the flow of

atmospheric air. The flow of grain leaves the cooling zone with a moisture content that is lower than its moisture content after the drying zone. Therefore, an additional drying effect is observed in the cooling zone. The cooling air absorbs moisture and leaves the cooling zone. In practice, 3 technically possible options for drying with heated air have found distribution: The released moisture passes into the air, while its absolute humidity rises. The grain leaves the drying zone relatively warm and requires cooling. This is carried out in the cooling zone by the flow of atmospheric air. The flow of grain leaves the cooling zone with a moisture content that is lower than its moisture content after the drying zone. Therefore, an additional drying effect is observed in the cooling zone. The cooling air absorbs moisture and leaves the cooling zone. In practice, 3 technically possible options for drying with heated air have found distribution: The released moisture passes into the air, while its absolute humidity rises. The grain leaves the drying zone relatively warm and requires cooling. This is carried out in the cooling zone by the flow of atmospheric air. The flow of grain leaves the cooling zone with a moisture content that is lower than its moisture content after the drying zone. Therefore, an additional drying effect is observed in the cooling zone. The cooling air absorbs moisture and leaves the cooling zone. In practice, 3 technically possible options for drying with heated air have found distribution: than its moisture content after the drying zone. Therefore, an additional drying effect is observed in the cooling zone. The cooling air absorbs moisture and leaves the cooling zone. In practice, 3 technically possible options for drying with heated air have found distribution: than its moisture content after the drying zone. Therefore, an additional drying effect is observed in the cooling zone. The cooling air absorbs moisture and leaves the cooling zone. In practice, 3 technically possible options for drying with heated air have found distribution: direct-flow drying; countercurrent drying; drying with cross movement of heated air.

The method of using cross-flow air (as well as cross-flow air) is the most unfavorable for drying. For almost the entire length of the dryer, the grain on the side where the air is supplied is drier than on the side where it exits. Despite this, almost all shaft dryers for grain operate on this principle. Good mixing of grain during passage through the dryer also contributes to improved drying.

The advantage of this method is the supply of air in any amount to a wide variety of zones with relatively small pressure losses, since the layer thickness remains constant, and the area of the incoming air flow also increases with an increase in the height of the dryer. Due to the possibility of supplying air to different zones, it is also possible to supply air at different temperature levels.

In [3-7], the mathematical description of the grain drying process is based on a mathematical model in which the heat fluxes in the layer due to thermal conductivity were neglected, and shrinkage and pressure gradient were not taken into account. We consider the zonal calculation method in which these characteristics are taken constant. In this case, the system of equations of A.V. Lykov is represented by equations in a spherical coordinate system:$r$is the spatial coordinate referred to the equivalent radius of the ball$r = x/R_{\text{экв}}$;$T = (\theta - \theta_0)/(\theta_c - \theta_0)$is the dimensionless temperature of the body, referred to the temperature of the mediumθ_c; $U = u/u_0$- dimensionless moisture content of the body, referred to the initial moisture contentu_0:

$$\frac{\partial T}{\partial \tau} = A_{11}\left(\frac{\partial^2 T}{\partial r^2} + \frac{2}{r}\frac{\partial T}{\partial r}\right) + A_{12}\left(\frac{\partial^2 U}{\partial r^2} + \frac{2}{r}\frac{\partial U}{\partial r}\right),$$
$$\frac{\partial U}{\partial \tau} = A_{21}\left(\frac{\partial^2 T}{\partial r^2} + \frac{2}{r}\frac{\partial T}{\partial r}\right) + A_{22}\left(\frac{\partial^2 U}{\partial r^2} + \frac{2}{r}\frac{\partial U}{\partial r}\right), \quad (1)$$

where $(U, T) \geq 0$, $(U,T) < \infty$ при $r \to 0$ $r \in [0,1]$, $\tau \in [0,1]$, $\tau = t / t_k$, with the condition that the solution is bounded:

$$|T,\ U| < \infty, \quad (2)$$

boundary conditions of the third kind:

$$-\left.\frac{\partial T(r,\tau)}{\partial r}\right|_{r=1} + a_1[1 - T(r,\tau)|_{r=1}] - a_2[U(r,\tau)|_{r=1} - u_p / u_0] = 0,$$
$$\left.\frac{\partial U(r,\tau)}{\partial r}\right|_{r=1} + b_1[1 - T(r,\tau)|_{r=1}] + b_2[U(r,\tau)|_{r=1} - u_p / u_0] = 0, \quad (3)$$

and initial conditions:

$$T(r,0) = 0,\ U(r,0) = 1, \quad (4)$$

where the complexes of criteria are determined by the equations: $A_{11} = 1 + \varepsilon\, KoLu\, Pn$, $A_{12} = \varepsilon KoLu$, $A_{21} = LuPn$, $A_{22} = Lu$, $a_1 = Bi_q$, $a_2 = (1-\varepsilon)KoLuBi_m$, $b_1 = Pn\, Bi_q$, $b_2 = Bi_m(1-(1-\varepsilon)PnKoLu)$, and the criteria used are: $Ko = r_0 u_0 / c_q(\theta_c - \theta_0)$ – Kosovicha; $Lu = a_m / a$ – Likova; $Pn = \delta(\theta_c - \theta_0)/u_0$ – Posnova; $Fo = a\,t / R^2_{экв}$ – Fure; the Fourier number; heat transfer and mass transfer Biot criteria, respectively $Bi_q = \alpha\, R_{экв} / \lambda$, $Bi_m = \beta\, R_{экв} / a_m$, где θ – Body temperature, θ_0 – initial body temperature, θ_c – medium temperature, K; u – moisture content of the examined body, u_p, u_0 – respectively, the equilibrium and initial moisture content of the body under study, (kg wl. / kg w. w.); ε – phase transformation criterion, dimensionless value characterizing the fraction of moisture moving in the form of steam; r_0 – specific heat of vaporization, kJ/kg; a_m – moisture diffusion coefficient, m^2/s; δ – thermogradient coefficient, 1/K; α – heat transfer coefficient, W/(m^2 · K); β – mass transfer coefficient, m/s, c_m – specific heat capacity of grain, J/(kg.K); ρ_0 – density of absolutely dry product, kg/m^3.

After replacing unknown functions:

$$T = Z(\tau, r)/r\ ,\ \ U = W(\tau, r)/r\ ,\ (Z, W) \in C^{(3)}(0 \leq r \leq 1), \quad (5)$$

system (1) relatively Z и W takes on a simpler form.:

$$\frac{\partial Z}{\partial \tau} = A_{11}\frac{\partial^2 Z}{\partial r^2} + A_{12}\frac{\partial^2 W}{\partial r^2}\ ,\quad \frac{\partial W}{\partial \tau} = A_{21}\frac{\partial^2 W}{\partial r^2} + A_{22}\frac{\partial^2 W}{\partial r^2}\ , \quad (6)$$

with boundary conditions:

$$-\left.\frac{\partial Z(r,\tau)}{\partial r}\right|_{r=1} + a_1\left[1 - Z(r,t)\right]_{r=1} - a_2\left[W(r,t)|_{r=1} - u_p / u_0\right] = 0,$$
$$\left.\frac{\partial W(r,\tau)}{\partial r}\right|_{r=1} + b_1\left[1 - Z(r,t)\right]_{r=1} + b_2\left[W(r,t)|_{r=1} + u_p / u_0\right] = 0, \quad (7)$$

and initial conditions:

$$Z(0,r) = 0,\ W(0,r) = r. \quad (8)$$

Since the functions T and U at $r \to 0$ limited by condition (2), which also agrees with the physical meaning of the problem, then from (5) it follows:

$$Z(\tau,r)\big|_{r=0} = W(\tau,r)\big|_{r=0} = 0. \quad (9)$$

Thus, the problem is reduced to finding a solution to system (6) that satisfies boundary conditions (7), (9) and initial conditions (8). The complexity of this initial-boundary value problem lies not only in system (1), but also in the setting of boundary conditions of various kinds at $r=1$ conditions of mixed type (3), with $r=0$ Dirichlet conditions (9). If a solution were found, then on the spherical grain boundary at $r=1$ functions Z and W take on some values:

$$Z\big|_{r=1} = \varphi(\tau),\ W\big|_{r=1} = \psi(\tau), \quad (10)$$

and $\varphi(\tau),\ \psi(\tau)$ – yet unknown functions.

The method used below to expand unknown functions into modified Fourier series allows us to replace the complex form of boundary conditions (7) with simpler and more convenient conditions (10). This leads to a simplification of the boundary conditions, but at the same time, two new unknown functions appear $\varphi(\tau),\ \psi(\tau)$, which will later be found under the boundary conditions (7). The following new problem arises: to find a solution to system (6) with initial condition (8) and boundary conditions (9) and (10), where the unknown functions $\varphi(\tau),\ \psi(\tau)$ should be determined so that the boundary conditions (7) are satisfied.

With this formulation, the solution of the problem can be represented by the following modified Fourier series developed by Professor A. D. Chernyshov:

$$Z = M_z + \sum_{m=1}^{\infty} Z_m(\tau)\sin(m\pi r),\quad W = M_w + \sum_{m=1}^{\infty} W_m(\tau)\sin(m\pi r). \quad (11)$$

where dependencies M_z and M_w look like:

$$M_z = \varphi(\tau)\,r + \varphi_0(\tau)\left(\frac{r^2}{2} - \frac{r^3}{6} - \frac{r}{3}\right) + \varphi_1(\tau)\left(\frac{r^3}{6} - \frac{r}{6}\right),$$
$$M_w = \psi(\tau)\,r + \psi_0(\tau)\left(\frac{r^2}{2} - \frac{r^3}{6} - \frac{r}{3}\right) + \psi_1(\tau)\left(\frac{r^3}{6} - \frac{r}{6}\right). \quad (12)$$

Construction of boundary functions M_z and M_w is arranged so that expansions (11) converge uniformly inside the segment $r\in[0,1]$, and on its boundaries, together with the second partial derivatives with respect to the radius r up to and including the second order. Expressions for Z and W at (11) together with the second partial derivatives at $r=0$ and $r=1$ turn into identities. This property makes it possible to differentiate expansions (11) term-by-term twice and substitute them into differential equations (6), initial conditions (8), and boundary conditions (7). Thus, expansion (11) with expressions for M_z and M_w represent modified Fourier series. Their convergence has the order $(\pi m)^{-5}$, where m - ordinal number of the term in the sums of system (11). When functions (11) are substituted into (6) with $r=0$ and $r=1$ we get the equations:

at $r=0$: $A_{1,1}\varphi_0(\tau) + A_{1,2}\psi_0(\tau) = 0$, $A_{2,1}\varphi_0(\tau) + A_{2,2}\psi_0(\tau) = 0$, (13)

at $r=1$: $\varphi'(\tau) = A_{1,1}\varphi_1(\tau) + A_{1,2}\psi_1(\tau)$, $\psi'(\tau) = A_{2,1}\varphi_1(\tau) + A_{2,2}\psi_1(\tau)$. (14)

Therefore, from (13) and (14) we can find:

$$\varphi_0(\tau) = \psi_0(\tau) = 0, \quad (15)$$

$$\varphi_1(\tau) = \frac{A_{2,2}\varphi'(\tau) - A_{1,1}\psi'(\tau)}{\Delta},\ \psi_1(\tau) = \frac{A_{1,1}\psi'(\tau) - A_{2,1}\varphi'(\tau)}{\Delta}, \quad (16)$$

where $\Delta = A_{11}A_{22} - A_{12}A_{21} \neq 0$ according to the task. Taking into account (15), expressions (11) take the form::

$$Z(r,\tau) = \varphi(\tau)r + \varphi_1(\tau)\left(\frac{r^3}{6} - \frac{r}{6}\right) + \sum_{m=1}^{\infty} Z_m(\tau)\sin(m\pi r) = 0,$$
$$W(r,\tau) = \psi(\tau)r + \psi_1(\tau)\left(\frac{r^3}{6} - \frac{r}{6}\right) + \sum_{m=1}^{\infty} W_m(\tau)\sin(m\pi r) = r. \quad (17)$$

We find the initial conditions for them from (8). Assuming $\tau = 0$ in expressions T and U from (5) and (11), we obtain:

$$\varphi(0)r + \varphi_1(0)\left(\frac{r^3}{6} - \frac{r}{6}\right) + \sum_{m=1}^{\infty} Z_m(0)\sin(m\pi r) = 0,$$
$$\psi(0)r + \psi_1(0)\left(\frac{r^3}{6} - \frac{r}{6}\right) + \sum_{m=1}^{\infty} W_m(0)\sin(m\pi r) = r. \quad (18)$$

Thus, we have two differential equations (14), two algebraic equations obtained from (7) taking into account (17):

$$-a_1\varphi(\tau) - \frac{1}{3}\varphi_1(\tau) - a_2\psi(\tau) + \pi\sum_{m}^{N}(-1)^{m+1} mZ_m(\tau) = h_1,$$
$$b_2\psi(\tau) + \frac{1}{3}\psi_1(\tau) + b_1\varphi(\tau) - \pi\sum_{m}^{N}(-1)^{m+1} mW_m(\tau) = h_2, \quad (19)$$

where $h_1 = a_1 + a_2u_p/u_0,\ h_2 = b_1 + b_2u_p/u_0$, and $2N$ differential equations, which are obtained from the expansion of expressions (6) taking into account (17). We multiply both equations of the system by $\sin(m\pi r)$ and integrate over r within $[0,1]$, which corresponds to the operation of expanding functions into Fourier series and we get:

$$k = 1..N: \quad \frac{(-1)^{k+1}\varphi'(\tau)}{k\pi} + \frac{(-1)^k\varphi_1'(\tau)}{k^3\pi^3} + \frac{1}{2}Z_k'(\tau) = = A_{1,1}\left[\frac{1}{2}\pi^2k^2Z_k(\tau) + \frac{(-1)^k\varphi_1(\tau)}{\pi k}\right] + A_{1,2}\left[\frac{1}{2}\pi^2k^2W_k(\tau) + \frac{(-1)^k\psi_1(\tau)}{\pi k}\right],$$
$$k = 1..N: \quad \frac{(-1)^{k+1}\psi'(\tau)}{k\pi} + \frac{(-1)^k\psi_1'(\tau)}{k^3\pi^3} + \frac{1}{2}W_k'(\tau) = = A_{2,1}\left[\frac{1}{2}\pi^2k^2Z_k(\tau) + \frac{(-1)^k\varphi_1(\tau)}{\pi k}\right] + A_{2,2}\left[\frac{1}{2}\pi^2k^2W_k(\tau) + \frac{(-1)^k\psi_1(\tau)}{\pi k}\right]. \quad (20)$$

The initial conditions in the form (18) must be satisfied for any r. As $r,\ r^3, \sin m\pi r$ – linearly independent functions, then from (18) it follows:

$$\psi(0) = 1,\ \varphi(0) = \varphi_1(0) = Z_m(0) = \psi_1(0) = W_m(0) = 0;\ m = 1 \div N. \quad (21)$$

Let us transform the system (14), (19), (20) to the standard form by introducing the notation:

$$\varphi(\tau) = y_1(\tau),\ \psi(\tau) = y_2(\tau),\ \varphi_1(\tau) = y_3(\tau),$$
$$\psi_1(\tau) = y_4(\tau),\ Z_m(\tau) = y_{m+4}(\tau),\ W_m(\tau) = y_{m+4+N}(\tau), m = 1...N. \quad (22)$$

In this case, system (14), (19), (20) will contain $(4+2N)$– linear equations:

$$y_1' - A_{1,1}y_3 - A_{1,2}y_4 = 0,\ y_2' - A_{2,1}y_3 - A_{2,2}y_4 = 0,$$
$$a_1y_1 + a_2y_2 + \frac{1}{3}y_3 + \sum_{m=1}^{N} y_{m+4}m\pi(-1)^m = h_1,$$
$$b_1y_1 + b_2y_2 + \frac{1}{3}y_4 + \sum_{m=1}^{N} y_{m+4+N}m\pi(-1)^m = h_2,$$

$$\frac{(-1)^{m+1}}{m\pi}y_1' + \frac{(-1)^m}{m^3\pi^3}y_3' + \frac{1}{2}y_{m+4}' - \\ -A_{1,1}\left[\frac{1}{2}\pi^2 m^2 y_{m+4} + \frac{(-1)^m}{m\pi}y_3\right] - A_{1,2}\left[\frac{1}{2}\pi^2 m^2 y_{m+4+N} + \frac{(-1)^m}{m\pi}y_4\right] = 0, \quad (23)$$

$$\frac{(-1)^{m+1}}{m\pi}y_2' + \frac{(-1)^m}{m^3\pi^3}y_4' + \frac{1}{2}y_{m+4+N}' - A_{2,1}\left[\frac{1}{2}\pi^2 m^2 y_{m+4} + \frac{(-1)^m}{m\pi}y_3\right] - A_{2,2}\left[\frac{1}{2}\pi^2 m^2 y_{m+4+N} + \frac{(-1)^m}{m\pi}y_4\right] = 0.$$

We find the initial conditions for it from (21) using (22):

$$y_1(0) = y_j(0) = 0,\ y_2(0) = 1,\ j = 3 \div 4 + 2N. \quad (24)$$

The solution of the system of equations (23) with initial conditions (24) can be obtained by the classical method. After performing the reverse renaming in accordance with expression (22), we find the functions $\varphi(\tau), \varphi_1(\tau), \psi(\tau), \psi_1(\tau), Z_m(\tau), W_m(\tau)$, $m = 1 \div N$. Finally, we obtain expressions for the desired functions:

$$T = \frac{1}{r}\left[M_z + Z_1(\tau)\sin(m\pi r)\right], \quad U = \frac{1}{r}\left[M_w + W_1(\tau)\sin(m\pi r)\right]. \quad (25)$$

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SCIENTIFIC AND THEORETICAL FOUNDATIONS OF PROJECT FINANCING RISK MANAGEMENT IN COMMERCIAL BANKS

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Abstract. *The article examines the mechanisms, scientific-theoretical and practical aspects of risk management in project financing. The current state of risk management has been analyzed, and proposals and recommendations for further development in the practice of commercial banks have been developed.*

Keywords: *investment, project financing, risk, risk management, risk managing, quality indicators.*

Introduction

Current socio-economic processes in the world, globalization of the world economy, as well as intensification of competition in international and local markets show the urgency of financing projects in commercial banks, existing problems, and improving the mechanisms used in risk management.

In order to effectively and timely implement the financing of investment projects aimed at ensuring the rapid development of economic sectors in our country, the new version of the Law of the Republic of Uzbekistan "On Investments and Investment Activities"[1], decrees of the President of the Republic of Uzbekistan "On the Development Strategy of the New Uzbekistan for 2022-2026" [2], "On measures of transition to a qualitatively new system of investment program formation and implementation of the Republic of Uzbekistan" [3] and resolution "On measures to improve the mechanism of management of investment projects with the participation of international financial institutions and donor countries" [4]] were adopted and consistent measures are being taken to actively attract funds. Based on this, within the framework of these measures, a qualitatively new procedure for state programs and financing of the country's development has been introduced, with clearly defined sources of economically justified project financing.

It can be said that in recent years, we can see the growth of investment loans in the total loan portfolio of the banking system of our country. This creates the need and increases the relevance of commercial banks to improve risk management mechanisms in project financing.

In addition, it is worth noting that project financing is considered a high-risk activity of banks, and the management of this type of risk is a complex and multi-step process.

Based on this, it is important for commercial banks engaged in project financing to form their own scientific and theoretical foundations that help the process of "risk management" in order to manage risks.

Review of literature on the topic

According to economist Ya.M. Mirkin, as the investment activities of commercial banks recognizes activities focused on "universal and specialized commercial banks financing investment projects on the basis of loans and shares, organizing and placing the issue of securities

on the primary market, managing assets, managing an investment company, carrying out transactions with real estate, consulting-analytical and broker-dealer operations» **[**5**]**.

Also, in the research conducted by A.Naryana, it was mentioned that risk management processes in the investment activities of commercial banks are carried out in the following stages: that is, identification and analysis of the essence of risk; risk assessment and calculation of losses; development of risk management recommendations, risk reduction through the authority of officials involved in risk management; to control that the submitted reports on risk management are prepared in accordance with the established criteria and rules; earning income depending on the level of risk (high risk high income, low risk low income). Emphasis is placed on balancing risk and return[6].

In addition, P. Rose, one of the foreign economists, takes a broader approach to the concept of bank risk and emphasizes that it consists of 6 main types of risk, namely, credit risk, risk of non-profitability, liquidity risk, market risk, interest risk, and non-payment risk. At the same time, P. Rose considers the above six risks as very important, crucial risks in banking, and political risk and currency risk as secondary risks for the bank [7].

Foreign economist A. Shapkin describes the risk of loss equal to or more than the value of the borrower's property as an "extraordinary risk" arising in the investment activities of commercial banks. In his opinion, "emergency risk" usually leads to bankruptcy and complete insolvency of the enterprise, because in this case there is a risk of losing not only all the funds invested in the project, but also its property**[**8**]**.

Sh.Abdullaeva, one of the economists from Uzbekistan, also researched the concept of bank risk, she claims that «banking risk is the possibility of losing part of the bank's funds in the process of carrying out banking activities, or carrying out bank operations (deposit, credit, investment, currency) hoping for a positive result in the absence of income»**[**9**]**.

D. Ismailov in his research on the further improvement of investment financing methods of commercial banks by reducing risk claims that "since the implementation of high-tech projects based on scientific innovations and discoveries usually has a high level of risks, and also the demand for venture financing is high in our republic, and this risky investment method has not been developed, then it is necessary to actively attract foreign venture funds to positively solve the problem»[10].

Also, D. Nafasov proposed the following approach to the concept of bank risks: "In international banking practice, relations referred to risks mainly occur in the course of asset transactions. However, it should be noted that not all asset operations of commercial banks are associated with risk. In particular, it is appropriate to emphasize credit and investment operations as the main risk-related asset operations of commercial banks. We can see that it is recognized that banks generate their income through these operations because of the high level of risk involved in these asset transactions**[**11**]**.

Bank risk, in particular, some aspects of bank risk arising in the financing of investment projects, have been researched by the aforementioned economists, and their author's approaches in this regard have been put forward. However, the improvement of risk management mechanisms in project financing and the factors affecting it have not been studied as a comprehensive research work. This determines the purpose and specific aspects of this research.

Research methodology

Practical aspects of the article have been formed based on researching the approaches and views of foreign and domestic economists on the subject and expressing the author's attitude towards them, the scientific-theoretical methodological aspects of the article, as well as the improvement of risk management mechanisms that arise in project financing at the international and national level today, the analysis of priority aspects related to risk management in practice. As a research methodology, comparative literature analysis, logical and structural analysis, grouping and contrastive comparison, economic-statistical analysis and hypothesis substantiation methods have been used.

Analysis and results

Investment projects are a system of organizational and economic decisions organized in order to effectively invest financial capital in order to achieve the goal set by the enterprise. The form and content of projects can be different - that is, from the construction of a new enterprise to the purchase of real estate, etc.

Today, trends formed at the international level provide new, modern and innovative opportunities for the banks of Uzbekistan, but also lead to the emergence of certain risks. The implementation of investment projects is associated with the possibility of risk factors, that is, the risk of not being able to fully or partially achieve the goals set for the project. In particular, the following are the main factors that have a negative impact on the development of investment lending practices:

- the insufficient ability of enterprises to repay the loan, which is often explained by the fact that the quality of the current management system is not up to the required level;
- current state of exchange rate policy in the country. The fact that the exchange rate regime is based on exchange rate formation based on supply and demand;
- shortcomings in the legal and regulatory documents that prevent the full consideration of the variability of the refinancing rate and other negative situations in order to ensure that the inflation rate in the country is within the target indicators;
- incompleteness of modern, international mechanisms for financing projects of enterprises in commercial banks;
- high level of risks in crediting investment projects in commercial banks;
- insufficient demand for goods and services produced by local enterprises.

The object of the bank's financing of investment projects is investment projects related to diversification or modernization of production, expansion of production or increase of production safety, as well as purchase of additional production capacities in enterprises of the real sector of the economy.

The following can be subjects of investment activity, i.e. investors and participants of investment activity:

- citizens of the Republic of Uzbekistan (natural persons);
- individual entrepreneurs and legal entities - residents;
- state administration bodies and local state authorities;
- foreign countries, administrative or territorial bodies of foreign countries, international organizations and foreign legal entities and citizens, as well as stateless persons.

In order to determine the specific characteristics of risks in lending investment projects, it is necessary to reveal the essence of the concept of bank risk more widely and to determine the specific characteristics of credit operations for real investment.

As we know, the practice of bank risk management in our country does not have a long history. Before the independence of our country, most of the commercial banks were organized on the basis of state property, as well as they carried out their activities mainly in cooperation with state enterprises and organizations, so the risk problem did not arise in banks. The formation of independent banking system of a modern banking, the establishment of private and joint-stock commercial banks in the banking system opened a wide way for the international integration of banking activities. This made it necessary to pay special attention to the factors that negatively affect the efficiency of bank operations and services, in particular, the factor of bank risks that arise in the financing of investment projects.

Modernization of the economy, technical and technological renewal, sharp increase of its competitiveness, increase of export potential, organization of new productions based on new innovative and energy-saving technologies, mastering the production of new types of goods that are in demand in the world market and thereby ensuring the financial and economic stability of our country investment policy are showing their effectiveness.

In particular, we will consider the analysis of investments in fixed capital in recent years by the composition of the main types of funds (Figure 1) [12].

Figure 1

Composition of investments in fixed capital by types of fixed funds

billion soum

Basic funds	2019 y.	2020 y.	2021 y.
Total	195927,3	210195,1	239552,6
Residential buildings	20621,9	23200,8	29851,0
Non-residential buildings	33408,1	38172,7	50894,5
Other structures	23148,7	27039,0	30290,6
Land improvement	127,3	285,9	277,1
Machinery and equipment, total :	107305,8	110493,8	113863,9
Transport equipment	16588,2	12415,2	14574,5
Information, computer and telecommunication (ICT) equipment	3194,8	7347,0	5325,6
Other machinery and equipment	87522,7	90731,6	93963,8
Animal resources that produce multiple products	2418,9	2843,0	3656,8
Multiple yielding trees, agricultural crops and seedlings resources	372,0	880,7	838,6
Costs associated with the transfer of ownership rights to non-producing assets	198,1	225,0	138,2
Computer software and databases	28,7	25,2	98,6
Original works of entertainment, literature and art	3,7	1,6	0,8

Scientific research and development	5,9	86,5	30,8
Exploration and evaluation of mineral reserves	763,7	26,7	96,4
Other intellectual property products	330,1	229,0	292,3

Analyzing the statistical data, machinery and equipment are leading in the composition of investments in fixed capital by types of fixed funds. In 2021, the total sources of financing in this type of main investment fund were 113,863.9 billion. soums or increased by several percent compared to previous years. Its composition as of 2021 consists of the following:

- 14,574.5 billion soum belongs to transport equipment; - 5,325.6 bln. soum to information, computer and telecommunication (ICT) equipment; - 93,963.8 bln. soum to other machines and equipment.

If we consider the share of investments in fixed capital by commercial banks by specific types of economic activity, it can be seen that the volume of investment funds allocated to industry and individuals has a high weight (Figure 2) [13].

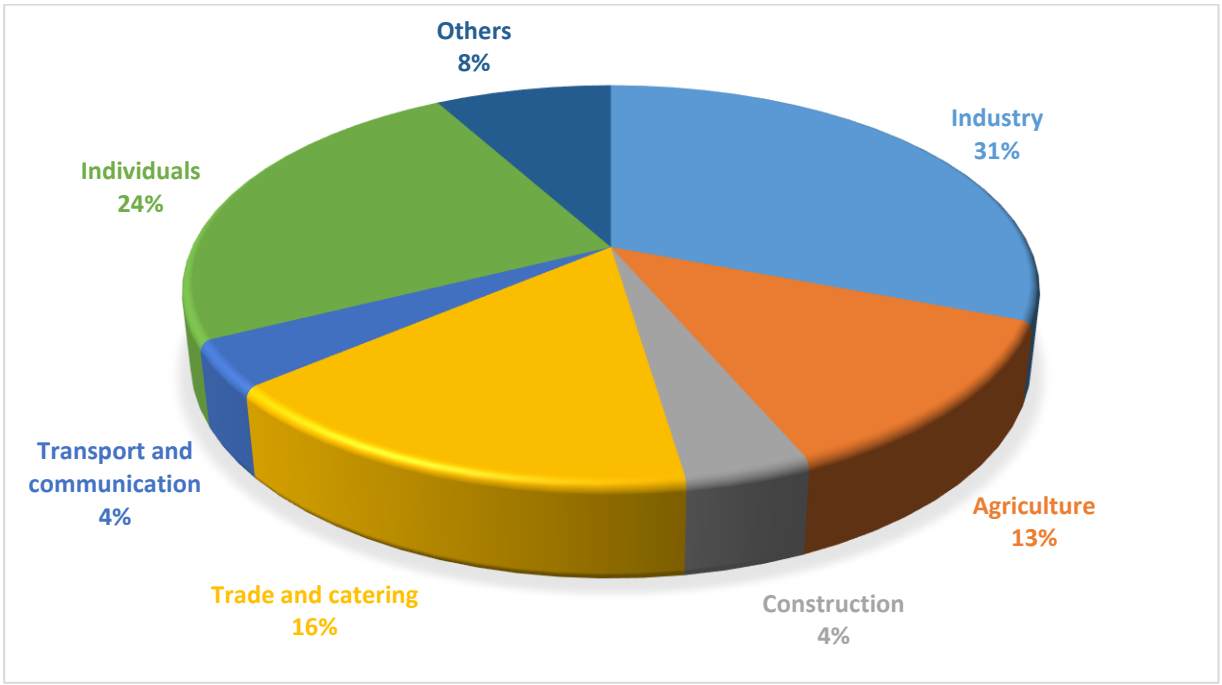
According to the data, 31 percent or 51.3 trillion soums of investments in fixed capital are directed to industry. In addition to other types of economic activity: the volume of investments allocated to individuals made up 24 percent of the total investments or 40.5 trillion soums.

At this point, in the financing of investment projects by commercial banks paying specific attention to to the following quality indicators of the project, i.e. discount rate, payback period, discounted payback period, average rate of return, net income from the project, income index, internal rate of return and modified rate of return plays an important role in ensuring the viability of the project. That is, the high efficiency of the project quality indicators shows the quality of the investment projects under consideration.

Figure 2

Distribution of investments made by commercial banks in basic capital by specific types of economic activity.

As of January 1, 2022, in percents



Today, the following aspects are important in the further development and efficiency of the investment projects of commercial banks in the economic sectors:

- Activity and initiative of commercial banks of the Republic of Uzbekistan in the financing of annual investment programs and regional investment programs, including projects involving foreign investments, participation in the monitoring of post-financing processes, attracting funds aimed at foreign investments, loans and financial and technical assistance;

- expanding and stimulating the volume of investments in economic sectors and regions, further improvement of the investment environment in the republic, implementation of the policy of attracting foreign investments aimed at supporting the development of the activities of enterprises with the participation of foreign capital;

- systematic control of the implementation of investment projects, also, analysis of how investment obligations are fulfilled by investors, determining the factors and risks that prevent the timely and effective implementation of investment projects involving foreign investments and, on the basis of taking prompt measures to eliminate them, increasing the effectiveness of the use of foreign investments attracted to the economy of our country;

- it is considered appropriate to use risk-management widely in the management, monitoring and evaluation of project financing risks in commercial banks. Through risk management, banks constantly monitor the quality and composition of their assets, the current state of possible risks, and the prevention of losses that may occur as a result of risk is ensured.

Conclusions and recommendations

In order to improve risk management mechanisms in project financing in commercial banks, it is advisable to implement the following measures:

1. Constantly analyzing and monitoring the purposeful use of financial funds allocated to investment projects, timely realization of income after the project is launched, taking measures to avoid overdue receivables and payables..

2. Correct and perfect implementation of initial control over the effective use of project financing, in this process, first of all, paying special attention to its current financial condition, knowledge and experience in this field, and the status of the project's quality indicator.

3. It is appropriate to consider the micro and macro level of risk management in project financing. The micro-level importance of bank risk management is ensuring the financial stability of commercial banks, enabling banks to fulfill their obligations to customers in full and on time, and to obtain the appropriate economic benefits.

4. As the importance of risk management at the macro level, we can mention such cases as ensuring the stability of the economy and the positive impact of the banking system on economic growth, strengthening the purchasing power of the national currency and ensuring the target indicators of inflation, creating a positive balance in the country's balance of payments.

In short, improving the mechanisms of risk and their management in the financing of investment projects is a multifaceted process, and the effective implementation of this process will ensure the efficiency of project financing financed by commercial banks, as a result of which it will be possible to increase the level of interest income of commercial banks.

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