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УДК 615.012.1

SYNTHESIS OF PHOSPHONAMIDES AND PREDICTION OF THEIR BIOLOGICAL ACTIVITY

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Abstract. The work presents a modified method for the synthesis of 2-phenylethenylphosphonic acid dichloride and phosphondiamides based on it. It has been shown that the obtained styrene derivatives are promising objects for studying anticancer activity *in vivo.*

Keywords: phosphorus pentachloride, styrene, 2-phenylethenyl dichlorophosphonate, 2-phenylethenylphosphonic acid, piperazine.

СИНТЕЗ ФОСФОНАМИДОВ И ПРОГНОЗИРОВАНИЕ ИХ БИОЛОГИЧЕСКОЙ АКТИВНОСТИ

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Аннотация. В работе приведен модифицированный метод синтеза дихлорангидрида 2-фенилэтенилфосфоновой кислоты и фосфондиамидов на его основе. Показано, что полученные производные стирола являются перспективными объектами для исследования противораковой активности *in vivo.*

Ключевые слова: пентахлорид фосфора, стирол, 2-фенилэтенилдихлорфосфонат, 2-фенилэтенилфосфоновая кислота, пиперазин.

Introduction

Heterocyclic compounds with one or more heteroatoms are currently widely used in pharmaceutical industry, agrochemistry and veterinary medicine. They have a wide range of biological activity due to their ability to reversibly bind to proteins. In medicinal chemistry, heterocyclic compounds are widely used for creation of biologically active molecules [1]. In addition, heterocycles can be used to modify the

solubility, lipophilicity, polarity, and hydrogen bonding ability of biologically active substances.

Nitrogen-containing heterocycles occupy a vital place in the development of new drugs due to their structure [2] and wide spectrum of biological activity [3].

Piperazine and its analogues are one of the key components of a number of drugs undergoing clinical trials, such as anthelmintic (piperazine citrate), antiallergic (cetrizine), antiemetic (meclizine), antidepressant (trazadone, amoxapine) etc. [4–6].

Piperazines have become one of the most biologically important molecules in the development of new drugs due to the ease of structural modification. The combination of a biologically active molecule with a conjugated system can lead to the creation of molecules with photo-controlled biological activity due to the ability of the system for photoisomerization.

One of the possible ways to obtain a phosphorus-containing molecules with a multiple bond is the phosphorylation reaction of unsaturated compounds such as styrene with phosphorus pentachloride.

There is a known method for producing styrylphosphonic acid dichloride, which was carried out by K. N. Anisimov [7] (Figure 1). Styrene was reacted with phosphorus pentachloride in benzene and the resulting adduct was treated with sulfur dioxide.

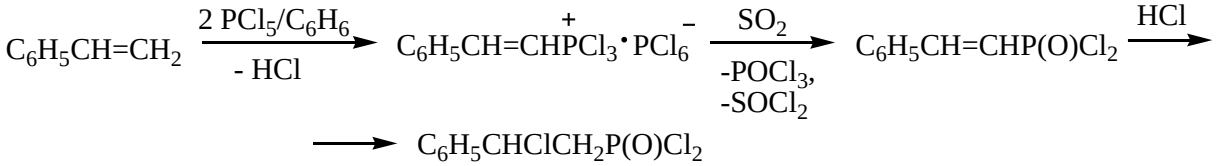


Figure 1. Synthesis of styrylphosphonic acid dichloride reported in [7]

The disadvantages of this method include the use of toxic sulfur dioxide, as well as the duration of the process.

An alternative method for obtaining this acid is synthesis, which involves treating the adduct of phosphorus pentachloride and styrene with sodium acetate at 0-25 °C in an inert organic solvent. The disadvantage of this method is the formation of a number of by-products from which it is necessary to purify.

Mitrasov Yu. N. and Kormachev V. V. have proposed a method for the synthesis of styrylphosphonic acid dichloride using pyrosulfurous acid salts, sodium pyrosulfite and sodium pyrosulfite, instead of sulfur dioxide [8].

Other authors have reported that 2-phenylethenyl dichlorophosphonate is easily synthesized when the adduct was treated with oxygen-containing inorganic or organic reagents [9, 10]. Also, to decompose the adduct, reagents such as sulfur(IV) oxide [11], phosphorus(V) oxide [12], calcium oxide [13], oxygen-containing derivatives of various sulfur acids [14–17], carbonyl compounds [18], carboxylic acids [19], anhydrides [20], esters [21], amides [22] and carboxylic acids salts [23] were used.

Based on the data presented above and in continuation of the study of unsaturated phosphorus compounds, in this work we presented the synthesis of styrylphosphonic

acid dichloride and new heterocyclic compounds containing piperazine fragments based on it. A preliminary assessment of the possible biological activity of the new compounds was also carried out.

Synthesis method

At the first stage, 0.096 mol of phosphorus pentachloride and 70 ml of anhydrous benzene were placed into a three-neck flask equipped with a mechanical stirrer. Through a separating funnel, 0.048 mol of styrene dissolved in 10 ml of anhydrous benzene was slowly added dropwise with constant stirring at 5–6 ℃. Next, the resulting mixture was stirred at 20 ℃ for 12 h.

At the second stage, 0.096 mol of water was added dropwise to the resulting crystalline adduct. Complete dissolution of the intermediate took 3 h (Figure 2). The reaction progress was monitored using ^{31}P NMR spectroscopy. The final product, styrylphosphonic acid dichloride was obtained by vacuum distillation (1 mm Hg) as white crystals.

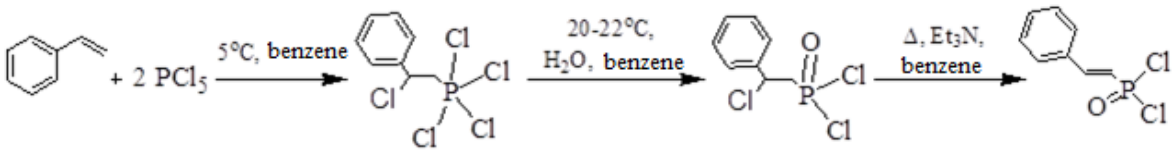
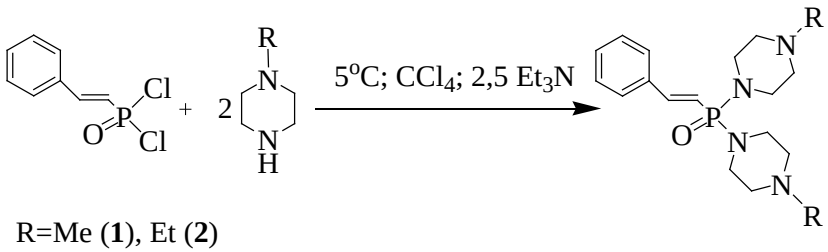


Figure 2. Synthesis of styrylphosphonic acid dichloride

The resulting styrylphosphonic acid dichloride was reacted with selected heterocyclic amines, methylpiperazine and ethylpiperazine (Figure 3). 25 ml of carbon tetrachloride and 0.0025 mol of phosphoric anhydride were placed into a 50 ml round-bottomed flask equipped with a magnetic stirrer. A mixture of 5 ml of carbon tetrachloride, 0.0063 mol of triethylamine and 0.005 mol of the selected heterocyclic amine was slowly added dropwise to the acid dichloride solution at 5 ℃ with constant stirring. The resulting mixture was kept at 20 ℃ for 16 h (Figure 3). After completion of the reaction, the solvent was evaporated, the mixture was treated with 20 ml of tetrahydrofuran and filtered through a paper filter.



R=Me (**1**), Et (**2**)

Figure 3. Synthesis of phosphon diamides **1** and **2**

The solvent was distilled off on a rotary evaporator. The residue was recrystallized from diethyl ether. As a result, the following phosphonamides were obtained: 1,1-{[(*E*)-2-phenylethenyl]phosphoryl}bis(4-methyl)piperazine (1) and 1,1-{[(*E*)-2-phenylethenyl]phosphoryl}bis (4-ethyl)piperazine (2) as white crystals.

Prediction of biological activity of synthesized compounds

Since in modern pharmacology nitrogen-containing heterocycles have a wide range of proven biological activity and are widely used in the modification of drugs, we tested the compounds prepared. Literature data indicate that molecules containing piperazine linker and its analogues show antimicrobial, antituberculosis, anticancer, and antiviral activity.

Prediction of the biological activity of the synthesized compounds was carried out using the PASS Online software package. The data obtained suggest that 1,1-{[(*E*)-2-phenylethenyl]phosphoryl}bis(4-methyl)piperazine (1) possesses high biological activity and can be recommended for testing as an antitumor agent (non-Hodgkin's lymphoma) (Pi 0.866), substrates GST P1-1 and GST P1-1 (Pi 0.813 and 0.802, respectively), and as an antiviral agent (influenza A virus) (Pi 0.693).

At the same time, 1,1-{[(*E*)-2-phenylethenyl]phosphoryl}bis(4-ethyl)piperazine (2) also exhibits high potential biological activity and can be recommended for testing as an antitumor agent (non-Hodgkin's lymphoma) (Pi 0.830), GST P1-1 and GST P1-1 substrate (Pi 0.803 and 0.792, respectively), proteasomal ATPase inhibitor (Pi 0.765), ribulose phosphate 3-epimerase inhibitor (Pi 0.733) and phosphatidylcholine-retinol-O-acyltransferase inhibitor (Pi 0.714).

Conclusion.

In this work, we presented the synthesis of styrylphosphonic acid dichloride using a modified procedure. The reaction of tyrylphosphonic acid dichloride with methylpiperazine and ethylpiperazine afforded 1,1-{[(*E*)-2-phenylethenyl]phosphoryl}bis(4-methyl)piperazine (1) and 1,1-{[(E)-2-phenylethenyl]phosphoryl}bis(4-ethyl)piperazine, which can be recommended to further *in vivo* assay as promising antitumor agents.

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FEATURES OF INCREASING THE ECONOMIC EFFICIENCY OF THE ENTERPRISE USING POWER BI

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Abstract. This article discusses the issue of assessing the economic efficiency of an enterprise. Key indicators such as profitability, return on funds, material consumption, productivity and capital turnover are analyzed. It describes how the use of visualization tools, such as Power BI, helps to analyze these indicators and identify trends to improve the efficiency of resource use and, consequently, the economic efficiency of the enterprise as a whole.

Keywords: economic efficiency, enterprises, profitability, return on funds, material consumption, productivity, capital turnover, Power BI, key indicators.

ОСОБЕННОСТИ ПОВЫШЕНИЯ ЭКОНОМИЧЕСКОЙ ЭФФЕКТИВНОСТИ ПРЕДПРИЯТИЯ С ИСПОЛЬЗОВАНИЕМ POWER BI

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Аннотация. В данной статье рассматривается вопрос оценки экономической эффективности предприятия. Анализируются ключевые показатели, такие как рентабельность, фондоотдача, материалоемкость, производительность и оборачиваемость капитала. Описывается, как использование инструментов визуализации, таких как Power BI, помогает анализировать эти показатели и выявлять тенденции для повышения эффективности использования ресурсов и, следовательно, экономической эффективности предприятия в целом.

Ключевые слова: экономическая эффективность, предприятие, рентабельность, фондоотдача, материалоемкость, производительность, оборачиваемость капитала, Power BI, ключевые показатели.

Economic efficiency is one of the most important components of an enterprise’s success in modern business. Each company strives to increase its profitability, efficiency and competitiveness in the market. Achieving these goals requires a

systematic and consistent approach to improving processes, optimizing resources and developing innovative strategies.

Nowadays, the competition in the market is becoming more and more acute, and the demands of consumers are becoming higher and higher. Businesses are facing rising costs, declining demand and unpredictable economic conditions. Therefore, maximizing economic efficiency is of particular importance for the survival and prosperity of the enterprise.

The essence of the economic efficiency of the enterprise is to achieve an optimal ratio between costs and the results of production and economic activity. This means that the company must maximize its profits or minimize costs, while maintaining high quality products and meeting the needs of consumers.

The key factors affecting the efficiency of the enterprise may include the following:

1. Production costs: the enterprise should analyze the costs of raw materials, materials, labor, energy and other resources to identify possible places to reduce costs. Finding ways to purchase at more favorable prices, improving the efficiency of resource use, for example, by increasing energy efficiency or revising work processes are implied.

2. Labor productivity: the company should pay attention to the organization of the workflow, the distribution of labor resources, as well as the training and development of employees. Improvement of labor efficiency can be achieved through automation of processes, optimization of the work schedule, reduction of indicators of loss of working time, etc.

3. Inventory management: analysis of inventory levels and their turnover to avoid unnecessary storage costs and reduce the risk of obsolescence of goods. The use of a stock management system to maintain an optimal level of stocks and prevent their shortage is required.

4. Quality of products or services: the company should pay attention to quality control processes and feedback from customers. Quality improvement can increase the level of customer confidence, reduce the number of returns or complaints and increase the competitiveness of the enterprise.

5. Marketing strategy: analysis of the market and competitiveness of the enterprise, search for new opportunities to promote products or services, attract new customers and retain existing ones; using different marketing channels and focusing on pricing strategy, product mix and communication tools.

6. Financial management: analysis of financial indicators of the enterprise, including the level of profitability, asset turnover, debt burden, etc. Development of financial planning strategy, liquidity management and financial risk reduction.

7. Using modern technologies: exploring the possibility of introducing new technologies, such as enterprise management systems (ERP), automated production lines, data analysis systems, etc. They can improve the efficiency of business processes and improve enterprise management.

8. Research and Development: investing in research and development to develop new products, improve technologies, adapt to market changes and competition. This

can contribute to the innovative development of the enterprise and the creation of new sources of profit [1, p. 41].

Accounting and data analysis are key to optimizing all these factors. The use of effective accounting and analysis systems will help the company to respond quickly to changes and make informed decisions to improve its profitability and productivity.

Besides, in addition to knowing the factors that affect the economic efficiency of the enterprise, it is equally important to be able to measure and analyze this indicator.

The economic efficiency of production can be determined using the following formula: $E = P/Z$, (1),

where E represents the economic efficiency of the enterprise,

P is the economic result obtained from the production of products,

Z is the cost of labor and funds for production [2].

The economic result is an indicator of the efficiency of an enterprise or organization. It can be determined using direct or indirect indicators.

Direct indicators include factors such as profit, revenue and production volumes. They are usually quantitative and directly reflect the state of financial activity. For example, the company's profit shows how much money is left after deducting all expenses.

Indirect indicators include factors such as product quality, the commissioning of new production facilities and the level of innovation. These indicators are usually qualitative and can be difficult to measure. For example, product quality can be assessed based on customer feedback or the results of testing for compliance with standards.

Direct and indirect indicators are interrelated. For example, improving product quality can lead to increased sales and profit growth. At the same time, cost reduction can improve financial results.

Determining the economic result requires analysis and consideration of all relevant indicators, both direct and indirect. This provides for a more complete and accurate assessment of the financial position and efficiency of the organization.

Resource costs can be measured using the following indicators:

1. Labor costs: one of the main indicators is the number of personnel, that is, the number of employees engaged in the production process or the provision of services.

2. The cost of material resources: this indicator includes the cost of raw materials and materials used, which are included in the cost of products or services provided.

3. Fixed assets costs: the indicator refers to long-term investments in production assets such as buildings, equipment and machinery. This indicator is often distributed over a period of time using the depreciation method.

4. Cost of production: this is an indicator that correlates all costs associated with production with the volume of products produced. It includes the costs of labor and material resources, as well as direct and indirect costs [3, p. 401].

The measurement of these indicators allows you to evaluate and control the cost of resources within the activities of an organization or enterprise. This is an important aspect of management that helps to optimize costs and achieve more efficient use of resources.

In addition, to assess the economic efficiency of an enterprise, one can use an indicator system that includes a number of indicators that are employed to assess the financial and operational efficiency of an organization (Table).

Table – The system of indicators of economic efficiency of the enterprise

Indicator	Characteristic
Profitability	This is the ratio between profit and cost or revenue. Various indicators of profitability, such as return on sales, return on assets or return on investment, allow you to assess the efficiency of the use of resources and capital.
Return on funds and capital intensity	These indicators reflect the efficiency of the use of capital assets. Capital return is the ratio of income or revenue to the value of assets used, and capital intensity is the ratio of the value of assets to income or revenue.
Material consumption and material output	These indicators reflect the efficiency of the use of material resources. Material consumption is the ratio of the cost of materials to revenue or production volume, and material output is the ratio of revenue or production volume to the cost of materials.
Efficiency	The indicator shows the relationship between the output or result of work and the cost of resources. For example, the level of labor productivity is determined by the ratio of the volume of products or services to the number of personnel.
Capital turnover	This is an indicator that measures the rate of capital turnover in an organization. It expresses how many times capital has been used to generate income or profit over a certain period.

The use of these indicators makes it possible to assess the efficiency of the use of resources and capital, as well as to identify opportunities for optimizing production and financial processes [4].

For convenient and visual tracking and analysis of data on these indicators, it is recommended to use the Power BI program. Power BI is a powerful tool for business analytics and data visualization developed by Microsoft.

Let us consider the advantages of using the Power BI program to track profitability, return on capital and capital intensity, material intensity and material return, productivity and capital turnover:

1. Data Visualization: Power BI allows you to present data in the form of interactive graphs, tables and diagrams, which facilitates the understanding and visual analysis of information. You will be able to visually see changes and trends in indicators, as well as compare various aspects of efficiency.

2. Integration with various data sources: Power BI allows you to connect to various data sources, including databases, Excel files, cloud services and APIs. This allows you to get up-to-date information and automate the process of updating data, which ensures the accuracy and relevance of reporting.

3. Flexibility and customizability: Power BI allows you to flexibly customize reports and dashboards to your needs. You can select the necessary indicators, apply

filters and sorting, as well as create calculation fields and measures for data analysis, taking into account the specifics of your business.

4. Collaboration and sharing: Power BI makes it easy to share reports and dashboards with other employees and stakeholders. You can create shared workspaces, set different access levels and rights to view and edit data.

5. Automation and Update schedule: Power BI allows you to automatically update data and schedule updates according to a specific schedule or when new data is available. Thus, you can be sure of the relevance of the reports and promptly receive information for decision-making.

6. Mobile access: Power BI has a mobile application that allows you to access reports and dashboards from any device. You will be able to analyze data and receive information even outside the office, which increases the flexibility of work and decision-making.

All these advantages make Power BI a powerful tool for tracking and analyzing indicators of profitability, return on capital and capital intensity, material intensity and material return, productivity and capital turnover. It allows you to gain a deep understanding of the effectiveness of business processes and make informed decisions to improve the economic results of the enterprise [5].

In conclusion, the economic efficiency of an enterprise reflects its ability to use resources with maximum efficiency and minimum costs. Analysis of key indicators, such as profitability, return on funds, material consumption, productivity and capital turnover, allows you to assess the efficiency of resource use and identify areas for improvement. Using tools like Power BI, you can visualize these indicators, identify trends and relationships, and make informed decisions to improve the economic efficiency of the enterprise.

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BLOCKCHAIN AS A TOOL OF LEGAL TRANSPARENCY: PROSPECTS AND CHALLENGES IN THE LEGAL REGULATION OF THE DIGITAL ECONOMY

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Abstract. The paper discusses the prospects and challenges in the legal regulation of the digital economy of blockchain technology as a tool of legal transparency, the advantages of blockchain for various industries and assesses its potential for optimizing the work of enterprises. The necessity of developing an appropriate legal framework and possible approaches to its creation are also considered. Recommendations for the development of effective legal regulation include an understanding of the basic principles and functions of blockchain, the creation of specialized bodies to monitor the use of blockchain, the establishment of liability for violations of the rules for the use of this technology, support for innovation through the creation of specialized incubators and active interaction with international organizations and other countries. These recommendations will help to develop effective and safe use of blockchain technology in the digital economy.

Keywords: blockchain, information security, digital economy, legal regulation, bitcoin, data.

БЛОКЧЕЙН КАК ИНСТРУМЕНТ ЮРИДИЧЕСКОЙ ПРОЗРАЧНОСТИ: ПЕРСПЕКТИВЫ И ВЫЗОВЫ В ПРАВОВОМ РЕГУЛИРОВАНИИ ЦИФРОВОЙ ЭКОНОМИКИ

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Аннотация. В работе рассматриваются перспективы и вызовы в правовом регулировании цифровой экономики технологии блокчейн как инструмента юридической прозрачности, преимущества блокчейна для различных отраслей и оценивается его потенциал для оптимизации работы предприятий. Также подчеркивается необходимость разработки соответствующего правового фреймворка и возможные подходы к его созданию. Рекомендации по разработке эффективного правового регулирования включают: понимание основных принципов и функций блокчейна, создание специализированных органов для контроля за использованием блокчейна, установление ответственности за нарушение правил использования этой технологии, поддержку инноваций через создание специализированных инкубаторов и активное взаимодействие с

международными организациями и другими странами. Эти рекомендации помогут развить эффективное и безопасное использование технологии блокчейн в цифровой экономике.

Ключевые слова: блокчейн, информационная безопасность, цифровая экономика, правовое регулирование, биткоин, данные.

The digital economy and blockchain technology have become an integral part of our modern world. In recent years, they have attracted increasing attention from the government, business and society as a whole. However, with the development of new technologies, new challenges arise related to the legal regulation of this area. The popularity of blockchain technology is due to the need to ensure the reliability and protection of stored data [1, pp. 496-498].

The prospects for using blockchain technology in the digital economy are huge. Its decentralized nature eliminates intermediaries, increases the reliability and security of operations, and promotes transparency and openness of data. Blockchain can be applied in various industries – from finance to healthcare, from energy to logistics. This technology can significantly simplify processes and improve the efficiency of many enterprises and organizations [2, pp. 4899-4918].

The increased use of blockchain also creates new legal challenges. Legal regulation in the field of digital economy should adapt to new technological realities and take into account the features of the blockchain. It is important to develop appropriate regulations that would establish rules for the use of blockchain, data protection and confidentiality of information, as well as determine the responsibility of the parties when making transactions based on this technology.

Thus, the article will be devoted to the prospects and challenges in the legal regulation of the digital economy using blockchain technology. We will consider the advantages of blockchain for various industries and evaluate its potential for optimizing the work of enterprises. We will also discuss the need to develop an appropriate legal framework and possible approaches to its creation.

Blockchain technology is a decentralized data storage system that allows you to record information about all transactions or operations in a block chain. Each new block contains a link to the previous block, which ensures reliability and the impossibility of data falsification. Thanks to this property, blockchain technology can be used to create secure and reliable digital databases. One of the main areas of application of blockchain technology is the financial sector. In cryptocurrency systems such as bitcoin, blockchain is used to ensure the security and transparency of transactions. Each operation is recorded in the blockchain and is available for verification to all users of the network. This helps to avoid fraud and increase confidence in financial transactions.

However, the potential of blockchain technology is not limited only to the financial sphere. Its capabilities can be used in various sectors of the economy, such as logistics, healthcare, energy and others. For example, blockchain technology can help improve the supply chain by allowing you to track every stage of production and delivery of goods. This will lead to increased efficiency and lower costs.

Another significant area of application of blockchain technology is public administration. Due to the impossibility of changing data in the blockchain, the technology can be used to create transparent voting systems or registration of real estate

rights. This will help eliminate corruption and increase confidence in state bodies [3, pp. 96-113].

One of the main problems in the legal regulation of blockchain is the lack of clarity and unambiguity in legislation. Blockchain creates new forms of storing and transmitting information that do not always fall under existing legal norms.

In the absence of clear legislation, legal uncertainty arises, which can lead to an increase in legal conflicts and complicate interaction between blockchain participants [4, pp. 87-96].

Another issue is data protection and privacy. In the blockchain, information is stored in the public domain and is available for viewing to all network participants. This may create problems with compliance with the legislation on the protection of personal data and trade secrets. It is necessary to develop mechanisms to ensure the confidentiality of data in the blockchain and compliance with relevant legal norms.

In addition, the blockchain may face problems related to cybersecurity. Since blockchain is a distributed system without centralized control, it is at risk of hacker attacks and data manipulation. If attackers gain unauthorized access to the blockchain, they can change data or conduct other types of fraud. Legal regulation should provide for mechanisms to protect against cyber threats and establish responsibility for violating the integrity of the blockchain.

Also, one of the main problems in the legal regulation of blockchain technology is the international harmonization of legislation. Blockchain has no borders and can be used in different countries, which creates the need for a unified legal regulation at the international level. Existing legal systems vary from country to country, which makes it difficult to create a unified legal framework for blockchain. It is necessary to conduct comprehensive research and dialogue between states to develop common standards and principles of legal regulation of blockchain.

The main challenge in the legal regulation of blockchain technology is also the balancing between innovation and the protection of the interests of society. Blockchain provides new opportunities for economic growth and improving the efficiency of processes, but it can also be used for illegal purposes, such as financing terrorism or legalizing the proceeds of criminal activity. Governments should develop policies that promote innovation, but at the same time ensure that illegal actions are combated and the interests of society are protected.

The prospects for the development of blockchain technology are huge. This technology can be applied in a wide variety of industries, ranging from the financial sector to healthcare or public administration. Blockchain allows you to create decentralized systems that ensure transparency and reliability of data, as well as eliminate the need for control by third parties.

First of all, it should be noted that blockchain technology provides new opportunities to improve the efficiency of legal processes. It allows you to create transparent and reliable accounting and information storage systems. For example, blockchain can be used to create digital registers of rights to real estate or intellectual property. This will help eliminate the possibility of forgery of documents and disputable situations during transactions [5, pp. 80-89].

In addition, blockchain can significantly increase data security in the legal field. Traditional information storage systems are often subject to cyber-attacks and hacks, which can lead to the leakage of confidential information. Blockchain, thanks to its

decentralized structure and the use of cryptography, provides a high level of data protection. This is especially important when working with sensitive personal data or commercial information.

Moreover, blockchain technology can significantly simplify the verification and authentication procedures of documents. Instead of relying on complex paper documents or centralized verification systems, blockchain allows you to create digital signatures and record them in an indestructible chain of blocks. This makes the verification process more transparent, fast and reliable.

It is also worth noting that legal regulation in the field of digital economy and blockchain technology is still at the development stage. There are different approaches to regulating the use of blockchain and cryptocurrencies in different countries. Some countries are actively developing legislation that encourages innovative blockchain-related projects, while others restrict its use due to potential risks.

Nevertheless, despite the challenges and difficulties, blockchain technology has significant potential to transform the digital economy. Its application can lead to improved safety and efficiency in various industries. Legal regulation should take into account this potential and create conditions for the development of blockchain-based innovations.

In conclusion, we can say that blockchain technology plays an important role in the digital economy. It ensures the security and reliability of data, increases the efficiency of business processes and promotes innovation in various industries. However, its successful application requires the development of appropriate legal regulation and overcoming existing challenges.

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TRANSITIVE SOCIETY: PHYLOSOPHY AS A SCIENCE AND AS AN ART

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Abstract. The article examines the parameters of transitive society and the relevance of philosophy in this modernising society. The description of the scientific views on philosophy as a science and as an art is given, and a justification for the duality of its nature, which combines elements of scientific research and artistic perception of reality is provided. Based on the study, it was concluded that philosophy is currently undergoing some changes and helps the individual understand the patterns of social development and anticipate the possible consequences of social changes occurring in a changing society.

Keywords: transitive society, philosophy, art, science, methods, social change.

ТРАНЗИТИВНОЕ ОБЩЕСТВО: ФИЛОСОФИЯ КАК НАУКА И КАК ИСКУССТВО

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Аннотация. В статье рассматриваются параметры транзитивного общества и дается объяснение актуальности философии на данном этапе. Приводится описание взглядов ученых на философию как науку и как искусство, дается обоснование двойственности ее природы, сочетающей в себе элементы научного исследования и художественного восприятия реальности. На основании проведенного исследования авторами был сделан вывод, что философия в настоящее время претерпевает некоторые изменения и помогает индивиду понять сложные социальные и политические процессы, происходящие в меняющемся обществе.

Ключевые слова: транзитивное общество, философия, искусство, наука, методы, социальные преобразования.

In a transitional society there are rapid and profound changes that affect all spheres of social life. These changes often lead to social instability and conflicts. In

such conditions, it is important to synthesize the values of a modernizing society and universal human values. Communication becomes a unique kind of search for landmarks in the social space surrounding the individual. In the context of a transitional society, philosophy becomes especially relevant, as it helps to understand the surrounding world in its interconnection and to understand the complex social and political processes taking place in society [1].

An analysis of literary sources allowed us to formulate some parameters by which society at this stage can be considered transitional:

– There is a gradual transition from an information society to a digital society, whose main characteristic is not information, but the electronic-digital way of storing and distributing it and the electronic-digital mediation of social relations [2]. The increasing volume of collection and processing of information makes it possible to plan the risks associated with the modernization of society [3]. The main role in the process of preventing or restraining dangerous transformation trends from the point of view of society is played by information encoded on various types of media, mainly digital.

– There is a transition to a state system that presupposes the power of the "technostructure" and "participatory democracy". This is rather a set of individual features inherent in democratic societies.

– There is a transformation of the economy and a new alignment of forces in the world system.

– There is a transition to postmodern culture with its variability and relativism of values. The model of "catch-up development" is no longer promising and the model of "a special path" in accordance with the civilizational characteristics of transitional societies is becoming relevant [3].

– There are changes in the socio-cultural sphere. Mass migration, cultural mixing, and racial transformations lead to the emergence of new forms and manifestations of culture. Cosmopolitan thinking replaces ethnic and religious identity, and diversity and freedom of choice lead to the fact that traditional values and lifestyles are becoming less stable and permanent.

The symbolic reflection of social reality is individual's life-world, which in the transition period is subject to changing processes associated with the destruction of habitual ways of social communication and the simultaneous construction of meanings and ways of communication that are significant for the new, transforming society.

The stabilization of a transitional society is aligned with the value-normative consensus that is established through the process of communication. In this regard, philosophy as one of the key aspects of examining human experience and understanding the world, becomes especially important in the period of transformation. The doctrine of worldview helps to understand the causes of social and political conflicts in a transitional society, find ways to resolve them and build a more just and sustainable society.

Philosophy has come a long way since its origins in antiquity. One of the most important centers of philosophical development during this period was Ancient Greece, where philosophy was considered as the primary form of public consciousness. Within its boundaries, ancient Greek philosophers sought absolute truths, tried to unravel the mysteries of the universe and sought objective reasons to explain to people the

importance and validity of their existence both within the state (polis) and within the framework of their own, separate from others, life. At the same time, such complex concepts could not be explained through the prism of theoretically-rational models and ideas, for their formation required a high level of skill, talent, and specific methods of cognition. All this was created by philosophers of that time: dialectics, rhetoric, countless works that were written for months, or even years. Even at that time, philosophy showed its dual nature: the desire for objectivity was closely intertwined with creativity and the emotional-volitional side, forming a unity in the face of the Hellenic thinker.

Philosophy, as a discipline, remains one of the key aspects of considering human experience and understanding the world even at the present stage. However, in light of recent scientific achievements, technological progress, and the modernization of society, the question arises of whether philosophy is more of a science or an art. People tend to define clear boundaries for philosophy, rather than seeing it as a kind of "fusion" of the objective with the subjective.

In general, philosophy is considered to be a science. Even in Ancient Greece, one of the birthplaces of philosophy, philosophers were considered to be scientists, and the first sciences directly emerged from philosophy. Philosophy in Ancient Greece also had social significance. Philosophers, expressing their ideas and concepts, influenced the formation of public opinion and political processes. Their thoughts on serving the interests of the state and society, on the role of justice and democracy, had a huge impact on the theory and practice of politics. Plato's dialogue *The Republic*, Aristotle's treatises *Politics* and Cicero's *On the State* still have a huge impact on political thought and many modern politicians are not stingy with quotes from these works.

In the 21st century, the view of philosophy through the prism of science is dominant: in higher education institutions, philosophy is taught as a scientific discipline, within the framework of which the history of philosophy, its figures and main trends and directions, philosophical schools, etc. are studied. In the work of V. A. Uspensky, "Works on non-mathematics", the following explanation of the "scientification" of philosophy is given: "The emergence of the features of an applied science in philosophy is generally very remarkable. This movement began in the 20th century, and it is primarily associated with the successes of physics and cosmology. The new representations that arose in these sciences did not fit into the traditional understanding of the world; to understand and, therefore, to apply these representations, philosophical understanding of them was required and is required" [4, p. 56]. That is, according to V. A. Uspensky, philosophy is a science that is not limited to abstract reasoning, but finds application in real life and allows us to reflect on the meaning and purpose, our place in the world, and the possible ways to achieve harmony.

As a science, philosophy strives for objectivity and reliability of knowledge and uses scientific research methods to analyze social and political phenomena, helps to understand the patterns of social development and predict the possible consequences of social changes. Philosophy as a science relies on methods used in natural and social sciences. These methods include:

– *Analysis*, which is used to identify patterns and relationships between social and political phenomena;

– *Synthesis*, used to create holistic representations of social and political processes;

– *Inductive reasoning*, applied to generalize data about social and political phenomena.

– *Deductive reasoning*, which is used to make new provisions from existing knowledge.

Philosophy as a science uses data obtained in other areas of knowledge, such as history, sociology, political science, economics and psychology, as well as data obtained from its own research.

On the other hand, within the framework of comprehensive development of sciences, philosophy is increasingly being viewed as an art that anyone who desires can engage in. Thus, the works of famous philosophers, such as F. Nietzsche, J.-P. Sartre, A. Camus are largely artistic works [5]. The question of the scientific nature of philosophy is raised in works devoted to the research of the nature of philosophical knowledge.

In the modern understanding, art is the process of expressing the external and internal world in a work of art; it is a special way of knowing reality, a form of artistic activity. According to A. G. Spirkin, art is addressed not only to feelings, but also to the intellect, to the intuition of a person, to all the refined spheres of his spirit. Works of art are not only a source of aesthetic pleasure, but also a source of knowledge [6, p. 684]. Therefore, philosophy, as a method of creating existing ideas through thinking, can quite be thought to be a type of art. Even in ancient times, sophists considered philosophy as the art of persuading, proving own rightness. Dialectics as the art of reasoned argumentation developed within the framework of this philosophical trend.

Philosophy as an art strives for expressiveness and imagery. It uses artistic means, such as metaphors, comparisons, allegories and symbols to reveal the meaning of social and political phenomena and, like art, is capable of inspiring, illuminating and causing new thoughts and emotions.

Art, being one of the expressions of philosophical ideas, allows us to enjoy the beauty and depth of insightful thoughts which creative works consist of. Painting, literature, music – all these forms of art are capable of reproducing philosophical concepts and cause deep reflections in viewers and listeners.

Like a musical instrument, philosophy allows us to reveal the potential of the human mind and contributes to the expansion of its borders. It helps us to explore and understand not only our inner world, but also the world around us. Philosophy is a kind of spiritual compass that allows us to find our place in the universe and understand our role in it.

Like in art, philosophy does not set the goal of final answers, but finds its depth and value in the search and questions. It inspires new thinking, leaving room for own interpretations and judgments. Philosophizing is a process that helps to expand our boundaries and penetrate the world of true values.

Philosophy as an art opens up a majestic world before us and asks deep questions about the nature of man, society, and being. It allows us to look at the world in a new way, go beyond the ordinary and see its hidden harmony and beauty. In the end, philosophy becomes our eye, opening up a universe of possibilities and inspiration before us.

Philosophy as an art uses various forms of expression:

– *Philosophical treatises* are logical and reasoned arguments about social and political phenomena;

– *Philosophical dialogues* are conversations between philosophers about social and political problems;

– *Philosophical parables* are short stories that contain philosophical meaning;

– *Philosophical poems* are poetic works that reveal philosophical ideas;

– *Oral expression.* A certain part of philosophical reflections was expressed only through the lips of philosophers, their sayings reached the people, subsequently such thinkers were composed of legends and plots. The most famous representative of philosophy, who used a similar form of expression of thoughts, is Socrates, who in principle did not set out his ideas on paper, believing that wisdom cannot be comprehended as a scientific fact described in a book. His techniques of irony and maieutic in conversations with people still amaze with their inventiveness.

The lack of a clear understanding of the status of philosophy in the scientific community is a serious problem in its study. As we have found, some believe that philosophy is a science that explores the fundamental questions of being, morality, and knowledge. Others believe that philosophy is an art that allows us to ask questions and seek deep meaning in the world around us.

However, it cannot be said that one of these positions is true and the other is false. There are other views on this issue, one of which we present. “In short, whoever applies moderate effort to the knowledge of philosophy will acquire a sufficient understanding, at least a sufficient ability, for other sciences and arts. Although it does not enter into private and detailed discussions of all things, however, the most important and most general rules, correct and unerring knowledge of nature, strict proof of each truth, the separation of truth from falsehood depend on it alone. Like an architect, not interfering in the detailed composition of each part of the building, however, prescribes rules, order, measure, similarity of parts and the position of the entire structure for each artist, so that without one of them the most skillful artists cannot succeed,” wrote the Rector of Moscow University Nikolay Popovsky in 1775 [7, p. 1].

The analysis of scientific and literary sources made it possible to form a holistic understanding of the status of philosophy in the 21st century and especially in a transitional society. The results of the study showed that philosophy cannot be unambiguously attributed to either science or art, but offers a unique approach to understanding being and understanding the world, combining elements of scientific research and artistic perception of reality.

Based on the analysis, it can be concluded that the philosophy of a transitional society is undergoing some changes. It serves as an important tool for understanding

the deep aspects of human life and provides a unique area of research, contributing to the development of critical thinking and creativity.

There is a need for a deeper understanding of philosophy and overcoming the opposition between science and art. Open discussion of this issue among various academic and philosophical communities can lead to new and more flexible approaches to ways of studying and understanding the world, the deep processes of social transformation, the study of the processes of transmission of old values inherited from a stable society and the designation of new, emerging values. This study helped to clarify the status of philosophy in the modern world, offering new arguments and ways to resolve the contradictions associated with its scientific and artistic character.

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MAIN ASPECTS OF USING MODERN AUTOMATED PROCESS CONTROL SYSTEMS AT THERMAL POWER PLANTS

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Abstract. This paper presents basic information about technologies, solutions and devices in the field of process automation. Special attention is paid to modern automated control systems used at thermal power plants. The functions, tasks and component elements of APCS are considered. The functions of innovative automated control systems for electrical equipment at TPPs and the capabilities of new data collection and transmission devices used in APCS at economic enterprises of the fuel and energy complex are listed.

Keywords: power engineering, TPP, ATP, APCS, digitalization.

ОСНОВНЫЕ АСПЕКТЫ ПРИМЕНЕНИЯ СОВРЕМЕННЫХ АСУ ТП НА ТЕПЛОВЫХ ЭЛЕКТРОСТАНЦИЯХ

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Аннотация. В работе представлены основные сведения о технологиях, решениях и устройствах в области автоматизации технологических процессов. Особое внимание уделяется современным автоматизированным системам управления, применяющимся на тепловых электростанциях. Рассматриваются функции, задачи и компонентные элементы АСУ ТП. Перечисляются функции инновационных АСУ электротехническим оборудованием на ТЭС и возможности новых устройств сбора и передачи данных, используемых в АСУ ТП на хозяйствующих предприятиях топливно-энергетического комплекса.

Ключевые слова: энергетика, ТЭС, АТП, АСУ ТП, цифровизация.

It is well known that thermal power plants (TPPs) are the key facilities realizing the processes of generation and production of electric and thermal energy. Reliable, safe, uninterrupted and high-quality operation of TPPs in the present post-industrial time is impossible without the introduction of modern tools, equipment, means,

systems and technologies. Their implementation today is difficult to imagine without the use of innovative solutions, among which a major role is given to process automation (or ATP). These solutions open wide opportunities for optimization of TPP control systems operation. This article is devoted to the consideration of such solutions in the field of ATP.

The literature analysis has shown that traditional solutions in the field of ATP are developed and implemented in TPPs in order to realize their main tasks related to heat and power supply. For this purpose, automated process control systems (APCS) are characterized by the availability of the ability to perform a number of essential functions:

1. Control and measurement of parameters: the APCS continuously monitors and measures the main parameters of equipment operation, such as temperature, pressure, vibration level, fuel consumption, etc. This allows one to promptly identify and eliminate possible malfunctions, as well as optimize the operation of power units.

2. Control of technological processes: the APCS performs automatic control of equipment operation, including starting and stopping of units, regulation of parameters, as well as performance of emergency and protective actions. This ensures stability and reliability of TPP operation.

3. Automatic regulation: the APCS performs automatic regulation of the main parameters of equipment operation to maintain optimum operating conditions and improve fuel utilization efficiency.

4. Diagnostics and forecasting of equipment condition: the APCS performs diagnostics of equipment condition and identifies possible malfunctions at an early stage, which allows timely repair and maintenance. Also, the APCS can predict possible malfunctions and plan preventive maintenance.

5. Data exchange and integration with other systems: the APCS provides data exchange between different elements of the system, as well as integration with other automated systems, such as supervisory control systems, safety systems [1, p. 20].

We can see that the APCS plays a key role in the process of TPP operation, and contributes to the realization of the following tasks:

– ensuring reliable and safe operation of equipment: thanks to parameter control and automatic control of technological processes, the APCS ensures stable and reliable operation of the plant, preventing emergencies and ensuring safety of personnel;

– optimization of equipment operation: the APCS automatically regulates the main operating parameters, which allows one to increase fuel efficiency and reduce power plant operation costs;

– data collection and analysis: the APCS collects and analyzes data on equipment operation, which allows identifying possible problems and making informed decisions to improve plant operation;

– reduction of operating costs: the control system reduces equipment downtime, reduces maintenance and repair costs, and optimizes the use of resources and fuel, which ultimately results in lower plant operating costs [2, p. 158].

A generalized scheme of implementation of control and management systems used today at TPPs is presented in Figure 1.

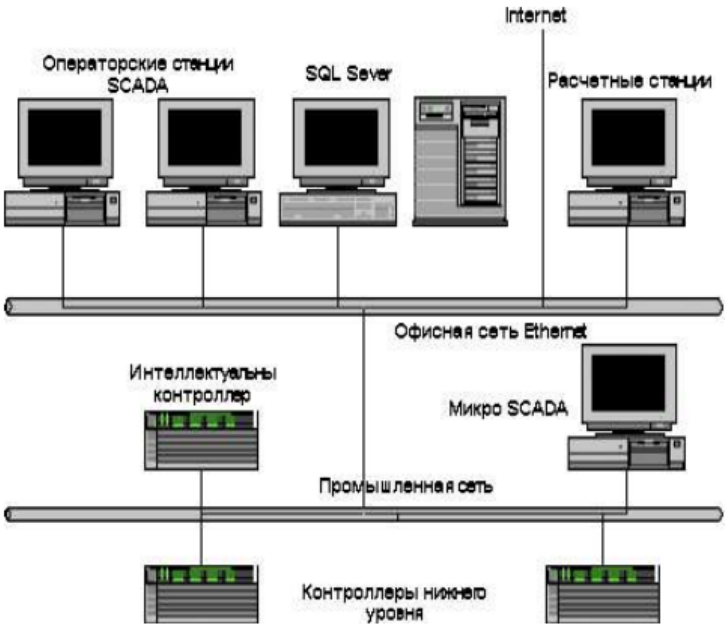


Figure 1. Generalized scheme of implementation of control and management systems

It is important to note that the structural component of the purpose of modern non-traditional APCS is based on a special multilevel concept. This concept includes a clear hierarchy within the use of software and technical tools designed to perform information and control commands and functions [3, p. 69].

Modern control systems are produced in the form of microprocessor-based technical equipment. Special innovative solutions are offered by SIEMENS, Rockwell Automation, WEYTEC, Advantek Engineering Inc. and others. The equipment of APCS of these brands is installed today at many domestic and foreign enterprises of power engineering [4, p. 329].

Main component elements and innovative solutions in the field of APCS designed for efficient operation of equipment in TPP power units are as follows:

1) software and hardware means for integration of automatic control system of gas turbine unit;

2) automatic control system of boiler units, which realizes all control and information functions;

3) software and hardware for integration and modernization of the existing local system of automatic power control of boiler units, including the system of automatic power and frequency control of the power unit;

4) automatic control system of steam turbine unit, which realizes functions of technological protections, interlocks and alarms for steam turbine, which are not included in the local control subsystem of the steam turbine itself;

5) software and hardware means for integration of local steam turbine control subsystems into the power unit APCS, which are supplied together with the turbine generator and the steam turbine itself [5, p. 168].

The next step in considering the innovative solutions that modern automated control systems offer today is to present their functions aimed at controlling electrical equipment. The latter are often used in synchronous generators of power units and their associated electrical circuits.

The functions of innovative APCSs of electrical equipment are:

1) remote control of switching equipment, which includes circuit breakers, disconnectors of various voltage stages from 0.4 kV to 330 kV;

2) remote control of automatic machines of reserve and working excitation, as well as automatic machine of field damping, automatic synchronization of synchronous generator inclusion into the network;

3) information control of technological and electrical parameters of modes of electrical equipment of the synchronous generator of the power unit and its connections, as well as providing information to the operating personnel and shift supervisor of the electric shop;

4) digital oscillography of emergency processes in the electrical circuit (registration of emergency processes);

5) APCS for the electrical equipment of the open switchgear, which realizes control and information functions for the equipment related to the relevant electrical scheme;

6) functions of the local computer network of relay protection and automatics with the receipt of information directly from microprocessor terminals of feeder protection, as well as the realization of remote control of relay protection and automatics setpoints [5, p. 169].

An important role in the realization of the main functions of modern APCSs is played by the new type of data acquisition and transmission devices (DATD). The DATD provides collection and processing of data received from various sensors and devices installed at the plant and transmits this information to the upper level of the control or monitoring system. An example of the external design of the DATD is shown in Figure 2.



Figure 2. Example of a modern DATD for realization of APCS functions

Unlike classical devices, the new type of DATDs have a wider functionality, including the following features:

1. Data collection from various devices

The DATD collects data from a large number of different devices such as temperature, pressure, level, flow, vibration, position sensors, as well as controllers, meters and other equipment. All data are transmitted to the DATD via standard communication protocols such as Modbus, Profibus, CAN and others.

2. Data processing

After receiving data from devices, the DATD performs its primary processing, including filtering, scaling, normalization and conversion into a format convenient for

further processing and analysis. The DATD can also perform simple operations with data, such as summarizing, averaging, determining maximum and minimum values.

3. Data storage

The DATD provides storage of the collected data on its built-in memory or on an external carrier. This allows information on equipment status and technological processes to be stored for a long time and provides an opportunity to analyze trends and anomalies in the system operation.

4. Data transmission to the upper level

The DATD transmits data to the server or control room, where they are processed and visualized for monitoring and control of the technological process. Data transmission is done through various communication channels such as wired and wireless networks including GSM, Wi-Fi, Ethernet, etc.

5. Time synchronization

The DATD is responsible for time synchronization on all devices connected to the system, which is necessary for its correct operation and prevention of errors in data processing.

6. Access control and management

The DATD provides the ability to control user access to data and system settings, which allows one to ensure the security and confidentiality of information.

7. Remote control and monitoring

The DATD provides the possibility of remote control and monitoring of the technological process, which makes the control process more flexible and efficient [6, p. 310].

It can be summarized that modern solutions in the field of APCSs are an integral part of currently existing TPPs supporting innovative approaches within the framework of new international standards. They have a wide range of functionality, providing control and management of technological processes, automatic regulation of parameters, diagnostics and forecasting of equipment condition, as well as data exchange with other systems. All this together makes it possible today to efficiently and safely operate power facilities, reduce production costs and improve the reliability of TPPs. However, one of the main disadvantages of modern APCS is its complexity. Due to the large number of sensors, actuators and controllers, the system becomes very difficult to understand and maintain. This can lead to personnel errors and deterioration of system reliability [7, p. 177].

Thus, having considered modern innovative solutions used in ATP at power plants, we can conclude that there are currently a large number of opportunities for the development of heat and power industries. Relevant technologies are being improved and actively disseminated, which allows solving a wide range of tasks to optimize the operation of power enterprises even today.

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УДК 81

ENRICHING ENGLISH: THE INFLUENCE OF GERMAN AND FRENCH LOANWORDS ON LANGUAGE AND CULTURE

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Abstract. The English language consists of a considerable number of words borrowed from other languages. Native speakers and English learners, while using borrowed words in their speech, often do not consider their origin. This study aims to investigate the influence of German and French borrowed words on the English language. The results will contribute to a deeper understanding of how the vocabulary of the English language has changed and how it interacts with French and German languages.

Keywords: language, borrowings, English, German, French, linguistics, culture, influence, origin.

ОБОГАЩЕНИЕ АНГЛИЙСКОГО: ВЛИЯНИЕ НЕМЕЦКИХ И ФРАНЦУЗСКИХ ЗАИМСТВОВАННЫХ СЛОВ НА ЯЗЫК И КУЛЬТУРУ

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Аннотация. В английском языке содержится достаточно много слов, заимствованных из других языков. Носители языка и люди, изучающие английский язык, используя заимствования в своей речи, даже не задумываются об их происхождении. Целью данного исследования является изучение влияния заимствованных слов из немецкого и французского языков на английский язык. Результаты позволят лучше понять изменения в лексическом составе английского языка и его взаимодействие с другими языками.

Ключевые слова: язык, заимствования, английский, немецкий, французский, лингвистика, культура, влияние, происхождение.

Modern linguistic science recognizes that one of the most important external factors of language changes and development is the contacting of languages, which is one of the most powerful stimuli of language changes. Today, language contacts are regarded as one of the aspects of creative activities in a language.

The research done over the last years testifies to the fact that the language system is complicated in its elementary, structural, functional, and other qualities due to the

evolutionary processes, which certify one of the postulates of the modern linguistics on the development of any language. This development takes place as a struggle of the two differently directed tendencies – to preservation and stabilization of the existing language system, on the one hand, and to its adaptation, reconstruction, improvement, on the other hand [1].

English language has always been open to accepting words from other languages. English is one of the most incredible, flavorfully-complex melting pots of linguistic ingredients from other countries that has been left to simmer for (in some cases) centuries. These linguistic ingredients are called loanwords or borrowings that have been borrowed and incorporated into English. The loanwords are very common now, the foreign flavor has been completely lost on speakers.

There exist many ways of enriching any language by new lexical units and grammatical structures. It is a well-known fact that language lexicon can be broadened through numerous morphological processes, like compounding, affixation, incorporation, conversion, back derivation, an internal modification, or reduplication. Borrowing can be regarded as one of the simplest kinds of word formation. The new word may be needed in English because it describes something not previously known to English speakers. The nouns *lemon, orange, tea, shamrock, paprika, kangaroo* are considered to be loanwords. Many borrowed words are from foreign diets and cuisine (itself a borrowed word from French): *frankfurter*, *pretzel, cinnamon, ginger, yogurt, lasagna, pasta, vodka*. For example, Walter Scott popularised in his novel "Ivanhoe" the realisation that while the names of many animals in their lifetime are English (ox, cow, calf, sheep, swine, boar, deer) they reach the table with French names (*beef, veal, mutton, pork, bacon, brawn, venison*). This is a relic from the time when Norman masters left the care of the living animals to the Anglo-Saxon lower classes, while the superior French cuisine was kept in the hands of Norman cooks and chefs. Many other borrowings testify to this superiority: *sauce*, *boil*, *fry*, *roast, toast, pastry, soup, sausage, jelly, dainty.* And while the humbler breakfast is English, the more sumptuous meals, *dinner* and *supper*, as well as *feasts* generally, are French.

Most of the borrowings that date from the Norman Conquest are no longer perceived to be foreign words. A notorious old borrowing, dating to the Norman Conquest of England in the eleventh and twelfth centuries, is the expression "apple-pie order". It is known that the meaning is "neat and tidy", but what have apple pies to do with neatness and tidiness? The answer is: nothing at all. This borrowing goes back to the French-speaking.

Some of the loanwords are so deeply woven into English that most people don't realise the root of the word is foreign. For example, the words "sky," "husband," "egg," and "knife", are actually Old Norse, introduced to English speakers by the Vikings. Or a well-known and widely used word "husband" comes from two Old Norse words (the language spoken by the Vikings) which mean "house" and "owner". The word originally had nothing to do with marital status, except for the fact that home ownership made these men extremely desirable marriage partners. Old Norse also greatly influenced English grammar and syntax.

Borrowing is a natural process of language development, and no language in the world, except in very rare exceptions, can avoid contacting other languages. The term

“borrowing” is used in modern linguistics in two meanings. In the broad sense, “borrowing” is regarded in connection with the theory of language contact, with the interaction of language systems as one of the ways for an enrichment of the language vocabulary.

The term ‘borrowing” can be used in the narrow sense for indicating the process of an entry and adaptation of the vocabulary borrowed which is transferred from one language to another one as a result of language contacts but not as a result of historical (genetic) development for an improvement of the language as a means of communication and perception.

Direct borrowings are one of the most productive methods of replenishing a language vocabulary. In this case, a direct transfer of phonetic and morphological variants of lexical units occurs from the producer language to the receptor language. There are two types of direct borrowings: complete and partial ones. The linguists have referred to the first type of the lexical units, which emerged in the vocabulary of the language as a result of the process of borrowing both an internal and external form. The second type of direct borrowings is presented by the lexical units that are borrowed if the language contains the notions whose formal and external expression they are.

The lexical-word-formative calques (loan-translation) include the borrowings, which have a consequent and literal translation of all elements in the receptor language from the producer language. The researchers identify as half-calques the words or the word combinations created at the moment of translation of a word or word combination by eliminating or adding a certain element.

English has borrowed its lexicon from more than 84 languages, with French (25%) being the most important donor. Ranking from most influential to least, English is composed of words from Latin, French, Italian, Dutch, Scandinavian, Arabic, Portuguese, Sanskrit, Russian, Maori, Hindi, Hebrew, Persian, Malay, Urdu, Irish, Yiddish, Chinese, Turkish, Norwegian, Zulu, and Swahili. Other influent languages are Japanese, Spanish, African languages, German and Greek [2].

Let us consider German borrowings. The influence of German on the ordinary vocabulary of English is not very considerable. The total number of German borrowings is about 1500 words [3].

Contrary to popular belief, the borrowing of German words in English remains popular. In the early 20th century, approximately 10.6% of foreign words borrowed into English were from German. Some of these words still retain their recognizable German characteristics. Examples include “gesundheit” (used to wish someone good health after they sneeze), “angst” (a feeling of deep anxiety or dread), “kletterschuh” (a type of footwear for rock climbing), and “kitsch” (objects or design considered poor taste).

Scientific evidence supports the notion that not every borrowing is random, and words from different semantic domains may vary in their borrowability. Certain domains, such as those related to the modern world, religion, clothing and grooming, the house, law, social and political relations, agriculture and vegetation, food and drink, warfare and hunting, are more frequently borrowed than others like sense perception, spatial relations, body terms, kinship, motion words, the physical world, emotions, and space and time. This variation exists both within and between languages.

The vocabulary of cooking, food, wine, art, literature, and music includes a significant number of German terms. In the domain of cooking, notable German-origin terms include “Sachertorte” (a chocolate gateau with apricot jam filling and chocolate icing), “stolen” (a rich fruit loaf), “streusel” (a crumbly topping or filling made from fat, flour, cinnamon, and sugar), “bratwurst” (a mild-flavored German pork sausage), and “buckling” (a smoked herring). In the realm of beverages, German terms include “Sekt” (a sparkling white wine), “Beerenauslese” (a white wine made from selected grapes), and “goldwasser” (a liqueur containing particles of gold leaf).

The vocabulary of art, literature, and music also contains numerous German terms. Examples include “Sprechtstimme” (speech voice), “Sprechgesang” (a style of vocalization between speech and song), “Hendentenor” (a powerful tenor voice suited for heroic roles in Wagnerian opera), “Sezession” (a radical art movement related to Art Nouveau), “Jugendstil” (German Art Nouveau), “Bauhaus” (a German school of architecture and design), and “Neue Sachlichkeit” (a movement characterized by realism and rejection of romantic attitudes).

In addition to specific domains, the English language also borrows general foreign words through German, with varying degrees of assimilation. Examples include “krummholz” (stunted windblown trees near the treeline), “wanderlust” (a strong desire to travel), “Sitzfleisch” (the ability to persist or endure an activity), and “loden” (a heavy waterproof woolen cloth).

German words related to sports, known as barbarisms, are universally acclaimed, such as “zugzwang” (a chess position where a player must move but doing so puts them at a disadvantage) and “Langlauf” (cross-country skiing or a cross-country skiing race).

In the field of psychology, certain German terms have become extremely popular worldwide. Examples include “gestalt” (an organized whole perceived as more than the sum of its parts) and “Einfühlung” (empathy) [4].

Overall, the influence of German borrowings on the English language is undeniable. From historical interactions to cultural exchanges and intellectual contributions, German words have woven themselves seamlessly into English vocabulary. Whether it be in the fields of science, cuisine, or everyday expressions, the German influence continues to shape and enrich the English language. This intermingling of languages highlights the ever-evolving nature of language itself and the richness it gains through cross-cultural and linguistic exchanges.

French borrowings played a crucial role in the development of English language and culture. For instance, a well-known word “cab” originated from “cabrioler” is a French word which means “jump like a goat”. The first carriages for public hire bounced up and down so much that they reminded people of goats jumping on a hillside. French loanwords entered the English language primarily during the Middle English period, when England was under Norman rule. This period, spanning from the 11th to the 15th century, played a pivotal role in introducing French vocabulary into English.

The most important influence the French language had on the English language was the introduction of many French words into English. It should be mentioned that one of the characteristics of Old English was to enlarge its vocabulary chiefly by using prefixes and suffixes and combining native elements into self-interpreting compounds.

More than 10,000 French words found their way into English and about three quarters of these words are still used.

One area where French loanwords prominently appear is gastronomy. French culinary terms like “cuisine”, “restaurant”, and “menu” have become integral parts of English vocabulary. The influence of French cuisine extends beyond basic food-related words, with terms like “chef”, “sous chef”, and “sauté” also borrowed from French.

The legal field also embraced many French terms. Words like “attorney”, “de facto”, “voir dire”, and “habeas corpus” are examples of legal terminology derived from French. These words reflect the historical connection between English common law and the French legal system.

In the arts, French has contributed extensively to the vocabulary of literature, music, and fashion. Terms like “genre”, “literature”, “ballet”, “ensemble”, “chic”, and “haute couture” are widely used in English and originally stem from French.

Furthermore, French loanwords have enriched English vocabulary related to government and administration. Words like “parliament”, “government”, “president”, and “mayor” have French origins, reflecting the historical influence of French governance practices.

French loanwords have also impacted everyday language. For example, words like “garage”, “boulevard”, “fiancé”, and “rendezvous” are commonly used by English speakers without realizing their French origins.

Quite a lot of the words of French origin used in English sit alongside native English ones, and in some cases there are words of Latin origin with similar meanings. For example, “a king” (from Old English “cyning”) can be kingly, “royal” (from French “roial”). The pronunciation of English changed to some extent under the influence of French, as did the spelling. English grammar did take on a few French structures, such as putting in adjectives after nouns, for example, “secretary general” [5].

The impact of French borrowings on the English language is far-reaching and profound. From the legal and administrative realms to the world of gastronomy, fashion, literature, and even everyday conversations, French words have integrated seamlessly into English vocabulary. These borrowings reflect historical, cultural, and linguistic connections between the two languages, highlighting the dynamic and ever-evolving nature of language. The incorporation of French terms has not only enriched English lexicon but also added a sense of elegance, sophistication, and international influence. This linguistic exchange serves as a testament to the interconnectedness of societies and the enduring legacy of cultural interactions. As English continues to evolve, it is likely that French borrowings will continue to shape and enrich the language, further solidifying the enduring bond between these two influential linguistic traditions.

Overall, incorporating loanwords into English is a natural process reflecting the dynamic nature of language and the cultural exchange between different groups of people. Loanwords can enrich a language and broaden its vocabulary, providing insight into a language’s history and cultural influences. Being spoken across the world, English is a melting pot of words and phrases from various languages, uniting many cultures into one international language.

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RESOURSE CURSE

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Abstract. This article examines the phenomenon called “the resource curse”, as well as the reasons for its occurrence, its positive and negative consequences. As a result of the work, various methods of overcoming this curse have been identified that contribute to the macroeconomic stability of the exporting country, including the implementation of tax measures that allow withdrawing a significant part of rental income, redistribution of these revenues in favour of priority manufacturing industries, diversification of the economy, competent distribution of the tax burden, as well as investment in human capital.

Keywords: resource curse, resource abundance, rents, exporting countries, oil and gas revenues, macroeconomic stability.

РЕСУРСНОЕ ПРОКЛЯТИЕ

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Аннотация. В данной статье рассматривается такой феномен, как «ресурсное проклятие», причины его возникновения, а также его положительные и отрицательные последствия. В результате работы были выявлены различные методы преодоления данного проклятия, способствующие макроэкономической стабильности страны-экспортера, включающие в себя реализацию налоговых мер, позволяющих изымать значительную часть рентных доходов, перераспределение этих доходов в пользу приоритетных отраслей обрабатывающей промышленности, диверсификацию экономики, грамотное распределение налогового бремени, а также инвестиции в человеческий капитал.

Ключевые слова: ресурсное проклятие, изобилие ресурсов, рента, страны-экспортеры, нефтегазовые доходы, макроэкономическая стабильность.

The resource curse is a concept used to describe the phenomenon in which countries that are rich in natural resources (oil, gas, coal, etc.) face negative consequences of their wealth. Instead of contributing to economic development and the well-being of the population, the availability and accessibility of these resources can

cause economic and political problems. That is, the real development of many countries clearly shows that the provision of natural resources to the economic system of the state does not always lead to sustainable economic growth and improved welfare of the population.

The term was originally introduced by the British economist R. Auty to explain a paradoxical phenomenon: a significant drop in living standards in oil-exporting countries in the 1970s and 1980s. In the two decades since the introduction of the "oil embargo" in 1974, which led to a sharp rise in oil prices, the GDP per capita of OPEC countries fell by an average of 1.3 per cent per year. On the other hand, GDP per capita in the rest of the developing countries has been growing at an average of 2% per year [1, p. 62].

Several reasons may underlie the origin of this phenomenon:

– Dependence of the economy on the resource sector. A country whose economy is heavily dependent on natural resources will be more fragile and sensitive to external shocks that can have a serious negative impact on the economy [2, p. 17].

– Ineffective governance and mistakes in government regulation.

– Insufficient development of institutions. Weak and imperfect institutions were the original cause of the effects of the resource curse. Resource wealth and good institutions are the two main factors that ensure sustainable economic growth in the long run [3, p. 27].

– Lack of developed human capital. Inadequate funding for science, education and innovation can lead to lagging behind in other areas of development and dependence on natural resource exports. The abundance of natural resources, which is an external characteristic of the country, can be an obstacle to the development of manufacturing industries that depend on developed human capital [4, p. 217].

A significant increase in the export of resources is due to a considerable increase in their prices in the world market and is accompanied by an increase in the inflow of foreign currency, which significantly improves the current account of the balance of payments and leads to the strengthening of the national currency against foreign currencies. Conversely, an increase in exports, with all other factors unchanged, will lead to an increase in net exports, which in turn will lead to an increase in GDP and aggregate demand.

Strengthening of the national currency makes local products more expensive in the global market, i.e. uncompetitive. As a consequence, demand decreases as well as the volume of national production. When foreign exchange earnings are high, imported goods become more profitable and useful than domestically produced goods. As a result, as imports of high value-added products increase, the balance of payments deteriorates, which will lead to currency depreciation, or the monetary authorities will be forced to devaluate to maintain the competitiveness of domestic producers. Devaluation of the domestic currency over time can lead to higher inflation, especially if the economy's dependence on imports increases during periods of prolonged and high foreign exchange earnings.

However, it should be noted that increased foreign exchange earnings and additional revenues have provided the government with additional sources of funding for social security, significant infrastructure projects, science and education.

Nevertheless, some governments are not fully exploiting the opportunities they have been given.

However, everything is not so simple and smooth here. In this case, a change in the price of resources, and therefore in the revenues from it, will directly affect the change in government revenues. In periods when resource revenues and demand are high, the state budget will only increase. When there is a period of sharp decrease in resource revenues, non-resource deficits will increase.

Thus, we can say that resource endowment, and with it the "Dutch disease" has both positive and negative consequences in the state [5, p. 2373; 6, p. 34]. The positive ones include:

- acceleration of economic growth rates in the short term;
- growth of employment of the population in the spheres of the economy related to those working for exports;
- growth of the general level and quality of life of the population (employed in the core sector);
- development of scientific and technical potential of the country;
- the emergence of opportunities for the development of infrastructure and leading sectors of the economy.

Despite all the positive aspects, the negative consequences of this phenomenon are many times more numerous:

- slowdown of economic growth in the long term;
- dependence on imports of finished goods;
- dependence on resource exports;
- rising inflation rates;
- increase in social inequality;
- increasing income differentiation;
- monopolisation of resource producing industries;
- export of capital;
- reduction of investments in the manufacturing sector of the economy;
- dependence on world market conditions.

In addition to the above, it can also be stated that when a source of rent becomes available in a country, there is a violent struggle for access to this wealth, which leads to a fundamental restructuring of the internal hierarchy. Internal tensions also rise.

J. Colden, using the example of oil-exporting countries, asserts that countries with abundant natural resources tend to provoke and become targets of military and foreign policy conflicts [7, p. 312]. Despite his assertion, it is impossible to prove this theory in relation to resource-rich countries. Nevertheless, the perennial wars of European countries with each other implicitly confirm it.

Another study conducted in 2021 by G. Blair, A. Rudkin and D. Christensen found that rising oil and extracted mineral prices increase the likelihood of conflict [8, p. 3]. At the same time, a meta-analysis by W. O'Brocht, 2019, showed that there is no obvious relationship between natural resources and the level of violence [9]. Thus, there is no consensus among economists on the impact of the "resource curse" on levels

of tension, crime, violence and brutality. This is likely to depend largely on the quality of the institutional environment and the institutions themselves.

To summarise the intermediate conclusion of the above, although the “resource curse” is not unavoidable for all countries rich in natural resources, it threatens those countries that do not have policies allowing the efficient use of income from production.

To mitigate macroeconomic volatility, governments of resource-rich countries must respond quickly, fiscally precisely and cautiously to conjunctural fluctuations in the prices of their mono-resources.

One of the methods to overcome the “resource curse” is to withdraw part of the rent income. The government implements a number of targeted tax measures that allow to withdraw most of the rent received in the fuel and resource complex and redistribute it through the state budget in favour of priority manufacturing industries suffering from the “resource curse”. The extraction of resource rent by taxing the resource sector seems to be quite an acceptable policy for resource-rich countries [10, p. 588]. This is connected with the fact that due to the peculiarities of natural resource extraction technologies and high profitability of this sector of the economy, taxation is not expected to have a substantial distorting effect and lead to a significant reduction in production. In addition, the nationalisation of rent from subsoil users also contributes to the formation of a structurally balanced economy, as it excludes the “unearned” part of the income of resource industries and puts them on a relatively equal footing with extractive industries. This creates a suitable investment climate for an internally oriented structure of the domestic economy (including equalisation of sectoral profitability through tax measures), which in itself increases the attractiveness of investment in this sector of production activity.

Modern economic theory and practice usually distinguish the following types of built-in stabilisers: fiscal and monetary [11, p. 624]. The fiscal ones include progressive taxation scale, budgetary rules and distribution of the tax burden by sectors of the economy; the monetary ones, in turn, include monetary targeting regimes (exchange rate, money supply and inflation topics) and floating exchange rate regimes. Some of these instruments have become widely demanded in countries whose economies are under the influence of the “resource curse".

In recent decades, budget rules have been the most common way to prevent macroeconomic volatility. One of them is “Fiscal policy constraint, which is expressed in terms of setting limits on budgetary performance”. For developing countries, the use of budget rules is a source of investment to boost economic growth. For developed countries, which do not have investment deficit problems, budget rules are introduced to transfer surplus revenues to finance social programmes such as health insurance and pensions.

Another method for smoothing the results of the “resource curse” in different countries and regions of the world is the creation of special national financial funds to accumulate excess revenues from exports and other income surpluses. Public financial funds, created at the expense of free resources, can be divided into four types depending on their functions and purposes of creation:

– Stabilisation funds (perform a stabilising function by cushioning the effects of price volatility on world markets);

– Budget reserve funds (necessary for use in force majeure or extraordinary circumstances;

– Investment funds (sources of support for innovative economy, development of new industries and spheres of economic activity);

– Future generations funds (solving economic, strategic, demographic and social problems).

In the works that touch upon the problems of public financial funds in one way or another, it is stated that initially they are created at the expense of specific resources, only to alleviate the "resource curse" and related consequences. Over time, though, these funds evolve from stabilisation funds to investment, strategic and social funds. In addition to macroeconomic stabilisation, new objectives have been added.

Firstly, it is the development of the non-resource sector through the creation and implementation of innovations in the non-resource sector, and secondly, it is the maintenance of the social sphere, i.e. human resources, represented in the form of pensions, health care, education and science. As a consequence, the creation of a sovereign wealth fund is a necessary but insufficient condition for overcoming the consequences of the "resource curse". Therefore, to compensate for the negative consequences of the "paradox of abundance", governments of resource-dependent economies create either state special funds or budgetary rules, or competently distribute the tax burden among industries.

The accumulation of foreign exchange reserves is the most important tool for regulating the consequences of the "resource curse". It is a means to achieve the following main objectives:

1. Smoothing the impact of short-term price fluctuations on the world market;
2. Undervaluation of the real exchange rate;
3. Attracting foreign direct investment due to the demonstration effect;
4. Creating funds for future generations with a small number of effective capital investment projects.

As research on this topic shows, under certain conditions the accumulation of currency reserves accelerates growth due to external effects, stimulates exports and protects the national producers [12, p. 7]. In this case, it is said about the external effect of export sector development on the whole economy, or the development of the national industry at the stage of intensive technological borrowing. In addition, a strong demonstration effect, i.e. externalities for foreign investors, will allow investment inflows to increase faster than the accumulation of foreign exchange reserves, and thus stimulate growth. Nevertheless, of course, the accumulation of foreign exchange reserves is only possible with relatively efficient management.

Summarising the results, we can conclude that there are several ways to overcome the "resource curse". They include: implementation of tax measures that allow to withdraw a significant part of rental income, redistribution of these revenues in favour of priority manufacturing industries, diversification of the economy, specifically the development of and contribution to industries other than extractive

industries, creation of national financial funds, competent distribution of the tax burden, ensuring fiscal discipline, as well as investment in human resources.

Having identified the main ways of overcoming the “resource curse”, let us consider real demonstrative examples of some countries getting out of this curse.

According to the International Energy Agency, the largest exporting countries in recent years are Saudi Arabia, the United Arab Emirates, Kuwait, Russia, Venezuela, Iran, Canada, Nigeria, Angola, Norway, Qatar, Algeria, Brazil.

The United Arab Emirates is an example of how to move from the “third world to the first” in a short period of time. In the mid-20th century, the UAE had neither a financial centre nor infrastructure. However, in 1950 it was discovered that they had oil reserves and the country managed to develop not only the oil sector but also other economic sectors such as trade, construction, finance and tourism. This great success was mainly due to good management and the government’s endeavour to make the country less dependent on oil materials.

In the 1950s, oil reserves were discovered, representing almost 8% of the world’s reserves. This fact served as a powerful stimulus for the country’s economic development. The President decided to reorient the country’s development from the raw materials commodity to the development of other sectors of the economy as a priority for the country’s development. In addition, the country’s GDP was growing rapidly. In the structure of GDP almost 50 per cent was occupied by oil export revenues. Due to this fact and the growth of the country’s revenues, a decision was made to redirect and invest oil revenues in the development of other sectors of the economy, primarily trade, in order to avoid dependence on “black gold”. Investments in real estate, construction and tourism accounted for a significant share. Precisely due to the inflow of foreign capital, these sectors of the economy began to develop actively. And as of today, the GDP structure looked like this: the service sector (44 %) exceeds oil revenues (36 %). In addition, the country has a trade surplus and budget surplus, and the inflation rate is about 3 %. Capital inflows are still observed today, as direct investments are going to other sectors of the economy rather than to the oil sector. Since there are no problems with capital inflows and demand for foreign currency, the exchange rate of the national currency does not fall, and there is no need to sacrifice inflation to stabilise the exchange rate [13, p. 595].

Norway is a country that has successfully overcome the “resource curse”. Among oil-exporting countries, Norway has a unique experience in creating public financial funds. Before the accelerated growth of oil prices in the 1970s, the country was an agro-industrial economy, but the inflow of income from oil resources and competent economic policy turned it into a “social state” with the highest human development index in the world.

In the 1970s, due to high revenues from the oil and gas industry, the Development Fund was established. One of the Fund’s objectives was to develop the non-resource industrial sector by financing scientific innovation research and projects, as well as providing support in bringing innovative products to the world market. The Fund’s programme covered both the private sector and public institutions. The priority areas were electronics and information technologies [14, p. 464].

The Petroleum Trust Fund was established in 1990. The fund receives all oil and gas revenues remaining after covering the non-oil deficit in the state budget. The fund is placed outside the Norwegian national economy to prevent overheating and meet stability targets. Whereas at the end of 1999 the fund's total assets were $26 billion, by the end of 2007 they totalled $300 billion. This growth has been fuelled not only by the accumulation of excess returns from natural and mineral resources, but also by sound management of the fund's assets. Almost 50 % of the fund's assets are invested in shares of large companies in Europe, North America, South Africa and Oceania that are not related to mining, while the remaining part is mainly invested in bonds. The Ministry of Finance, the Central Bank and foreign investment companies are jointly responsible for the distribution and management of financial resources [15, p. 32].

Throughout history, the Russian economy has existed largely through rent-seeking behaviour. In the last decades of the USSR's existence as the largest exporter of oil and gas, the negative effects of "resource abundance" permeated the Soviet economy; the external macroeconomic shocks of the mid-1980s destabilised the Soviet system. The state found itself unable to fulfil its obligations to balance the budget, cover domestic and foreign debt, pay for imports, etc. The decline in oil prices in 2008, 2014-15 and 2020 is also leading to an economic downturn, but not as severe and prolonged as in the late 1980s. This is primarily because in the late 1980s and early 1990s, the effects of the "resource curse" culminated in a post-socialist transformational recession associated with rapid changes in the economic and political system.

The example of the Soviet economy is a perfect example of the "resource curse". Modern Russia inherited from the Soviet Union a tendency towards rent-seeking behaviour, including dependence on the "oil needle".

Having studied the experience of other countries in levelling the negative consequences of the "resource curse", the Russian government has created its own ways of overcoming it. One of them is the National Welfare Fund. Originally the Stabilisation Fund was created in 2004, after 2008 it was split into two funds – the National Welfare Fund (NWF) and the Reserve Fund (RF). But in 2018 these two funds were merged again into the National Welfare Fund [16, p. 94]. The revenues of the NWF are formed at the expense of surplus oil and gas revenues to the federal budget and the management of the fund by the Ministry of Finance and the Bank of Russia. For example, in January 2008, the total value of the NWF and the RF amounted to 3.8 trillion rubles (9.3 % of GDP), in January 2021 it will amount to 13.6 trillion rubles (11.7 % of GDP) [17].

Since 2018, new budget rules have been introduced to prevent the "resource curse", when additional oil and gas revenues are used to purchase foreign currency on the open market, which, according to many researchers, weakened the link between oil prices and the exchange rate [18, p. 226]. On the one hand, the depreciation of the national currency leads to an increase in the price competitiveness of domestic products in the world market and is an important source of balancing the state budget, and on the other hand, it is a factor in accelerating the inflationary process, especially provided that various sectors of the national economy are in one way or another dependent on imports of various factors of production. However, although modern studies show that

under the conditions of the inflation targeting regime and simultaneously with it the floating exchange rate regime, the direct impact of exchange rate dynamics on prices is small, but indirect effects persist one way or another.

Thus, to minimise the negative macroeconomic consequences of the “resource curse”, Russia introduced such stabilisers as sectoral distribution of the tax burden, the National Welfare Fund, budget rules, inflation targeting system and free floating currency system. These instruments have reduced the likelihood of the spread of the “resource curse”, and to some extent contributed to the diversification of the economy.

In conclusion, we can summarise. The resource curse is a phenomenon observed in many resource-rich countries where economic and political difficulties arise despite the abundance of resources. “Resource curse” undermines macroeconomic stability. Despite the abundance of resources, the quality of human capital in rent-seeking societies tends to decline.

However, the resource curse is not an inevitable and irreversible process. Many countries are addressing the resource curse by developing effective resource management strategies. They invest in other sectors of the economy, create conditions for the development of local entrepreneurship, and ensure fairness in the distribution of resource revenues. To mitigate the negative effects of the “curse of abundance”, governments of resource-dependent countries create special stabilisers, including special financial funds, budgetary rules, etc.

While conclusions about the resource curse may vary, it is important to recognise that abundant natural resources do not guarantee national prosperity. Good governance and diversified economic development are key to overcoming the resource curse and ensuring sustainable development.

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FAKE NEWS AS A MANIFESTATION OF INFORMATIONAL WARFARE

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Abstract. The article focuses on the urgent issue of fake news in the contemporary context. The author emphasizes the relevance of studying methods for recognizing fake news in the framework of aggressive trends in global politics aimed at destabilizing society, which is, overall, a manifestation of informational warfare. The novelty of the work lies in exploring rapidly evolving technologies for creating fake news, as well as describing the algorithm for its detection and counteraction.

Keywords: fake news, informational warfare, disinformation, social destabilization.

ФЕЙКОВЫЕ НОВОСТИ КАК ПРОЯВЛЕНИЕ ИНФОРМАЦИОННОЙ ВОЙНЫ

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Аннотация. В статье рассматривается злободневная в настоящее время тема фейковых новостей. Автором подчеркивается актуальность изучения методов распознавания фейковых новостей в связи с агрессивными тенденциями мировой политики, направленными на дестабилизацию общества, что в целом является одним из проявлений информационной войны. Новизна работы заключается в исследовании быстро развивающихся технологий создания фейковых новостей, а также в описании алгоритма их определения и противодействия им.

Ключевые слова: фейковые новости, информационная война, дезинформация, дестабилизация общества.

Nowadays, our society faces attempts to rewrite historical truths and mislead public about events more and more often. Therefore, it is extremely important today to be able to navigate the information flow and distinguish fake news from credible sources.

False news has been spread throughout the history of mass media. The term “fake news” was first used in the 1890s when sensational reports in newspapers were quite common. However, it gained particular popularity in January 2017, on the inauguration eve of former U.S. President D. Trump, who boldly criticized American media for distorting information about him [1, p. 141].

Nevertheless, this term lacks a clear definition and is applied to any type of false information. It has also been used by high-ranking individuals or officials to address any news unfavorable to them. Moreover, fake news implies the spread of disinformation with the intention to harm and is sometimes generated and disseminated by hostile foreign entities, especially during elections. Due to the diversity of interpretations and various types of false news, researchers are increasingly leaning towards the term “disinformation” or chaos as a more neutral term. Thus, the analysis of contemporary sources has allowed defining the concept of “fake news”, or deliberately misleading information presented as news, with the goal of influencing people’s consciousness and manipulating their actions. Characteristics of fake news include mass coverage and rapid spread [2, p. 299].

The objectives of fake news can be diverse and depend on the context and situation, but all of them bear a manipulative character. For instance, manipulating public opinion is often realized through news about events and personalities, aimed at shaping a specific image of these events and individuals in the eyes of the public. Additionally, fake news is widely employed for political purposes. It can discredit political opponents, create chaos in society, influence election outcomes, thus shaping a particular political sentiment and even contributing to the escalation of social tensions and conflicts, “rocking” society and creating ideologically different social groups. Currently, the most dangerous fake news aims to increase hostility between entire states and peoples, leading to armed conflicts and economic sanctions. Fake news is a “variety of information warfare with a targeted direction” [3, p. 123]. Such news is an element of informational warfare.

According to M. N. Oreshko, “information warfare is the spread of false or veiled information through various channels of information dissemination to manipulate public opinion or shape a social reality advantageous to the manipulation subject” [4, p. 140]. V. N. Anastasyeva associates this term with more perilous manifestations: “Information warfare is a concept that implies the use and management of information and communication technologies in the battlefield to gain a competitive advantage over the enemy” [5, p. 8]. The technologies involved in creating and disseminating fake news as a manifestation of informational warfare are not stagnant.

Primarily, these involve artificial intelligence, whose capabilities are currently limitless. It can generate text, images, voice, video, and even animate images of political leaders, “making statements” on their behalf. There are numerous examples of such videos on the Internet. There are many neural network-generated video “addressed” from the presidents of the Russian Federation, the United States, and other states.

Sometimes, the creators of fake news push the boundaries of absurdity. Well-known examples include images and videos falsely portraying a special military operation, where footage from the Victory Parade in Moscow was presented as an

attack by Russian forces on Ukraine. According to the research of A. A. Chuyko, “as of March 1, 2022, more than 90,000 false pieces of information about the situation in Ukraine have been recorded on the Internet” [6, p. 5].

However, fake news is sometimes created and spread even without the use of artificial intelligence. Statements by U.S. press secretaries often carried a provocative nature. While initially appearing as harmless remarks, listeners in the audience increasingly began to detect deceptive utterances, such as those from Jen Psaki.

One method of spreading fake news is through social media. In addition to programmed algorithms of news pop-ups for social media users, the primary disseminators of “virus” videos are the users themselves. Allegedly sensational statements by politicians or other influential figures spread across the Internet at the speed of a virus, hence the name. Using “breaking news”, sensational headlines, and intriguing images, fake news also spreads through tabloids and other reading materials. People share these news pieces, sometimes just to keep a conversation going, thus becoming links in a long chain where information undergoes changes – a process known as “gossip” or a “broken telephone”.

Obviously, technologies for fake news generating are advancing. Fake content created by members of various social groups in our society, covering all aspects of our lives, can be quite convincing. Identifying some of them for an ordinary person navigating a turbulent information flow is extremely challenging. However, technologies to stay ahead of these challenges are also developing.

Currently, various strategies to combat different types of fake news are actively being researched, primarily at the state level. Politicians in some autocratic and democratic countries have called for effective self-regulation and legislatively enforced regulation in various forms of social media and search engines. The use of artificial intelligence in governmental institutions is legislatively prohibited. Military organizations, including educational ones, restrict and regulate Internet access significantly. Measures are in place to control and prevent the infiltration of unverified information into the military structures of the Russian Federation. Military agencies play crucial roles in safeguarding national security and protecting state interests, and their representatives must possess a firm civic stance.

Having a civic stance largely determines a person’s level of distrust in fake news. A true citizen possesses developed critical thinking skills and trusts only reliable sources. Reliable sources are those identified by competent authorities in the field of mass media.

Social media platforms, which were numerous not long ago, have also undergone thorough scrutiny at the state level regarding any incitement to aggressive actions. They are considered relatively safe because, unfortunately, fake news still penetrates them, but many services to identify and block its spread have been developed and implemented. Moreover, the dissemination of fake news on these platforms is legally pursued, underscoring the importance of the ability to identify potentially dangerous messages online.

Currently, concepts such as media literacy, digital literacy, and media space ecology are becoming popular. N. V. Ponomarev defines media literacy as “the set of knowledge, skills, and abilities that allow citizens to confidently identify bias and

manipulation in the news" and considers them crucial [7, p. 60]. The combination of these competencies, along with critical thinking, a firm civic stance, and existing in an eco-friendly, i.e., reliable and trustworthy media space, will ensure distrust in fake news and, consequently, prevent informational warfare from unfolding.

Thus, the exploration of the fake news theme has allowed the development of an algorithm for detecting and combating information warfare:

– Checking the news source: Unverified or unknown sources, especially unlicensed as reputable news agencies, may lead to fake news. Use filters, security systems, checks, and blocks for potentially dangerous websites and users to avoid encountering such news on social media or the Internet.

– Fact-checking: Neural network-generated text can sometimes be identified by patterned phrases and a dry, monotonous writing style. Images created with Photoshop are generally of low quality, and manipulations become noticeable when enlarging images. If a news piece still appears convincing, cross-check it on an official information source. If information is only confirmed by one source, it may be a sign of false information.

– Analysis of social media history and accounts: Examine the source's history on social media. If an account has recently been created, it may be a sign of a fake. Avoid clicking on dubious links, even from friends. Make sure that a friend is genuinely asking you something or informing you by phoning him.

– Context verification: Critical thinking will help determine if a call to action is hidden behind the news. True news is informative and enlightening in nature.

– Awareness: Refrain from reposting unverified information, as doing so makes you a link in the chain of spreading fake news.

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CADETS' ENGLISH LANGUAGE PROFICIENCY AT NON-LINGUISTIC MILITARY INSTITUTE: ADVANTAGE OR USELESS KNOWLEDGE?

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Abstract. The aim of the article is to find an answer to the question asked by every cadet of a non-linguistic military institute, if one should learn the English language. In order to answer this question, an anonymous survey of second-year cadets from the commanders' and military-political faculties was conducted. The article provides an observation of sources focused on the foreign language studies, examination of the foreign language development trends and its impact on the Russian language. Analysis of the obtained data leads to the conclusion that the cadets' foreign language study of the military-professional orientation at the Rosgvardiya military institute is not only a beneficial skill for everyday communication but also a necessary requirement for the successful service and combat tasks execution as well as for well-being in the modern world.

Keywords: the English language, non-linguistic military institute, Rosgvardiya cadets.

ВЛАДЕНИЕ АНГЛИЙСКИМ ЯЗЫКОМ ДЛЯ КУРСАНТА НЕЯЗЫКОВОГО ВОЕННОГО ИНСТИТУТА: ПРЕИМУЩЕСТВО ИЛИ НЕНУЖНЫЙ БАГАЖ ЗНАНИЙ?

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Аннотация. Цель статьи – найти ответ на вопрос, которым задается каждый курсант неязыкового военного института: пригодится ли ему английский язык? Чтобы ответить на этот вопрос, был проведен анонимный опрос курсантов 2 курса командного факультета и факультета военно-политической работы, проанализированы источники, посвященные изучению иностранного языка, изучены тенденции развития иностранного языка и его влияния на русский язык. Полученные данные позволили сделать вывод о том, что изучение иностранного языка военно-профессиональной направленности курсантами военного института Росгвардии, – не только полезный навык в сфере

бытового общения, но и необходимое условие для успешного выполнения служебно-боевых задач и гармоничного существования в современном мире.

Ключевые слова: английский язык, неязыковой военный институт, курсанты Росгвардии.

The question of the obligatory foreign languages study is perhaps raised by every cadet in a military institute. Actually, discussions on the importance of this competence take place during foreign language classes, but not every cadet embraces this truth as a dogma until “acquired information turns into his personal knowledge” [1].

Thus, the aim of this work is to answer the question, if a foreign language proficiency in the field of military-professional communication is an advantage or an unnecessary, useless baggage of knowledge. To answer this question, the following tasks were set:

– to carry out opinion polls of the second-year cadets from the commanders and military-political work faculties;

– to analyze sources dedicated to the study of foreign languages, including normative documents;

– to study trends in the foreign languages development and their influence on the native language (Russian);

– to analyze the collected data to answer the set question.

Firstly, we conducted an anonymous survey among the second-year cadets of the Saint Petersburg Military Order of Zhukov Institute of the National Guard Troops of the Russian Federation (hereinafter referred to as SPb MI NG RF). Twenty-five cadets from the commanders’ faculty and twenty-five students from the military-political work faculty participated in the survey. It is worth noting that cadets from the commanders’ faculty study a foreign language in the military-professional and legal terms. Students from the military-political work faculty specialize in military-professional and psycho-pedagogical foreign language communication. The realization of a foreign language educational program at SPb MI NG RF is determined by the requirements of the Federal State Educational Standard for Higher Education and aims to develop Competence UC-4: the ability to apply modern communication technologies, as well as in a foreign language, for academic and professional interaction. The content of the “Foreign Language” discipline reflects aspects relevant to the National Guard Forces. The head of the Department of Foreign Languages at SPb MI NG RF, T. G. Sharukhina, emphasizes that cadets of the National Guard Institute should master “issues related to the military regional studies, the structure of national security in other countries, their armaments, and technology, etc.” [2, p. 117]. Despite the professionally oriented content of the “Foreign Language” discipline, cadet opinions regarding its importance vary.

Content analysis of the arguments led to four main groups identification regarding the content of statements. Statements about the benefits of knowledge of the English language for travelling, communication with foreigners, watching TV series, and international news fall into the general sphere. Statements about the necessity of the English language proficiency as a language of international communication correspond to the global sphere. The intellectual sphere is associated with the erudition

and memory improvement, advancement in education, and personal development by the means of the English language. The arguments in the military-professional sphere reveal the necessity of mastering the English language for performing service and combat tasks, such as maintaining order, interrogating diversionists, etc.

Students from the military-political work faculty are unanimous in their opinion about the benefits of proficiency in the English language (100 %). 16 % of respondents argued for the benefits of knowing English for general purposes, 12 % noted that the language of international communication is necessary because it will be useful everywhere. Another 12 % wrote that this knowledge will be helpful for their personal development and erudition. The majority of respondents from the military-political work faculty (60 %) believe that proficiency in English will be necessary for reading military maps, recognizing NATO weapons, and studying military documents. One respondent stated: “The National Guard Forces carry out service and combat tasks not only on the territory of the Russian Federation but also abroad. Besides, many terrorists-mercenaries speak English.”

Most of commanders’ faculty respondents answered positively to the question of whether knowledge of the English language is an advantage for cadets of the Saint Petersburg Military Institute. However, 8 % answered negatively, justifying it by saying that “they are unlikely to go abroad, and it is hardly ever that they will be taken into reconnaissance”. Regarding other aspects, the percentage distribution of argument content is very similar to the responses of military-political work faculty cadets: 17.5 % believe that knowledge of English is an advantage in travelling and communication with foreigners; 13 % said that English is an integral part of the globalization process, another 13 % believe that studying it enhances erudition and the education level. 56.5 % consider it important for the successful completion of service and combat tasks, for studying captured documents, interrogating diversionists, and for communication with representatives of foreign troops.

Evidently, that total opinion unity of military-political work faculty respondents is caused by the humanitarian nature of their education. They have more foreign language lessons, so their awareness is greater.

An analysis of numerous publications dedicated to the study of foreign languages in the Rosgvardiya military institutes confirms the cadets’ opinion about the benefits of foreign language study. M. R. Vanyagina believes that through the study of a foreign language, Rosgvardiya cadets acquire the competence of intercultural and business communication necessary for the National Guard Troops tasks [3, p. 7]. M. S. Lavreeva considers a foreign language important from the standpoint of forming cadets’ “conscious responsibility, personal and professional development, moral and psychological readiness for impeccable and unconditional solution of educational tasks, and the desire to fulfill their professional duties” [4, p. 87]. According to L. A. Kuznetsova, the meta-subject nature of the foreign language allows cadets not only to improve their communicative competencies but also to form their military and military-pedagogical identity [5].

As for the “other side of the coin”, there were no sources confirming the uselessness of a foreign language proficiency. However, there are publications in the field of philology describing the harmful influence of a foreign language on the native

language (Russian). Words that have entered the native language from English are called “anglicisms”. The penetration of foreign words into the native language is inevitable and is conditioned by historical realities, but some linguists express concern about this growing trend. I. I. Saveliev asserts that “many foreign words penetrate the Russian language through the popularization of the “Western” model of youth culture or subculture. This process is the most dangerous since it is most difficult to block this information flow” [6, p. 166]. M. A. Polyakova tells about negative consequences in Europe, as this trend has almost led to older Germans being unable to understand modern German language. With unregulated penetration of a foreign language into Russian, “we are losing more and more of our uniqueness, including in language” [7, p. 97].

Finally, it is suitable to quote the words of the President of the Russian Federation, Vladimir Putin, who, addressing to the Russian people in January 2023, said: “Language is an area of enlightenment, and repression doesn't work”. In Federal Law No. 52-FZ of February 28, 2023, “On Amending the Federal Law ‘On the State Language of the Russian Federation’ ”, it is written that only those foreign words can be used in speech that do not have commonly used analogs in the Russian language [8]. However, these words do not mean that learning a foreign language is not worth it. The main idea of this statement is that one must approach the study of the English language wisely and use it only adequately to communication goals. Military-professional communication as the skill, which is developed at the Rosgvardiya Military Institute, is a reasonable and methodically designed process.

Thus, it can be concluded that foreign language knowledge is still necessary for cadets of a non-linguistic military institute not only because it is a requirement of the Federal State Educational Standard for Higher Education. This fact is also proved by cadets’ survey responses. Research in the field of foreign languages teaching at the Rosgvardiya military institute is also unanimous in its opinion on the necessity to study this subject. As for the counterarguments, some scientific publications highlight the risks and negative trends of the borrowed words influence on the native language. Cadets study military vocabulary and terminology, which often come from a foreign language, and, fortunately, everyday activities at the military institute do not involve the Internet usage, social networks, and computer games, which are the main penetration channels of foreign words into Russian. Thus, studying the English language for military-professional communication is an advantage for a cadet of the Rosgvardiya Military Institute, the proficiency of which is even encouraged by additional financial allowances.

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TRANSLATION ACTIVITIES WITH THE NUREMBERG TRIBUNAL

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Abstract. The article highlights the relevance of studying the Nuremberg Trials in the context of enhancing the foreign language communication skills of cadets at the Rosgvardia Military Institute. Describing translation activities within the Nuremberg Trials enables cadets to broaden their understanding of translation processes and mechanisms, the evolution in this field over the past 80 years, the automation of synchronous translation processes. The article is aimed at reasoning the necessity of developing language competencies for cadets at the Rosgvardia Military Institute.

Keywords: translation activities, the Nuremberg Trials, Rosgvardia cadets.

ПЕРЕВОДЧЕСКАЯ ДЕЯТЕЛЬНОСТЬ В РАМКАХ НЮРНБЕРГСКОГО ПРОЦЕССА

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Аннотация. В статье раскрывается актуальность изучения Нюрнбергского процесса с позиции совершенствования военно-профессиональной иноязычной коммуникации курсантов военного института Росгвардии. Описание переводческой деятельности в рамках Нюрнбергского процесса позволяет курсантам расширить понимание процессов и механизмов перевода, развития данной сферы за последние 80 лет, автоматизации процессов синхронного перевода, а главное, подчеркивает необходимость формирования иноязычной компетенции для курсантов военного института Росгвардии.

Ключевые слова: переводческая деятельность, Нюрнбергский процесс, курсанты Росгвардии.

The Nuremberg Tribunal is an ever-relevant historical event as it reminds us of the necessity to uphold human rights and international law. According to A. E. Balakhovsky, “current political realities necessitate a rethinking of the past” [1, p. 218]. The urgency of these issues is proved by numerous studies dedicated to the significance of the Nuremberg Trials.

Analysis of sources reveals that a significant part of research is connected with the importance of the Nuremberg Tribunal in the realm of international law, as it became the first international judicial proceeding in history where leaders and state officials were accused of war crimes and crimes against humanity. It established a crucial international precedent emphasizing the inevitability of judicial punishment for such acts. The significance of the Nuremberg Trials, as stated by D. A. Glazkov, "played a tremendous role in the development of the process of criminalizing military public actions" [2, p. 54].

This event became fundamental in establishing a new system of order on Earth. It laid the groundwork for the emergence of a "legal civilization of humanity", where human rights and freedoms became the cornerstone of a new society. The Nuremberg Trials acknowledged that aggression is the gravest crime, documenting: "War, by its very nature, is evil. Its consequences are not confined to the warring parties alone but affect the entire world. Therefore, the initiation of aggressive war is not just a crime of an international character – it is the gravest international crime" [3, p. 75].

Moreover, this judicial process played a significant role in activating interstate relations and international cooperation in humanitarian and legal spheres, laying the foundation for the formation of international humanitarian law. It "made a significant contribution to establishing the basis of state security systems" [4, p. 103]. The Nuremberg Trials contributed to the creation and development of international organizations such as the UN, strengthening their efforts to protect human rights and prevent genocide and war crimes, becoming "a vivid manifestation of international solidarity in the fight against Nazism" [5, p. 117].

The genocide during the period of hostilities from 1939 to 1945 is termed "crimes against humanity" and "crimes against peace" [6-136]. The Nuremberg Tribunal reminded the world of the scale and horrors of Nazi crimes, serving as a warning for future generations. It also helped preserve the memory of the Holocaust victims and crimes against humanity. This is a historical lesson reminding us that "unbridled pursuit of global dominance is a dangerous path: for peace and for the aggressor itself" [7, p. 132].

Thus, publications about the Nuremberg Trials can be found in the fields of legal, sociological, historical, military, and political studies, but the significance of this event is much broader and can be expanded, including philological sciences. In addition to the mentioned significance, the Nuremberg Trials played a tremendous role in the development of translation activities as a means of communication between different countries to address multifaceted issues. The novelty of our research lies in highlighting the relevance of studying foreign languages in the sphere of military-professional communication by cadets of the Rosgvardia Military Institute through an examination of translation activities within the Nuremberg Trials.

The organizers of the Military Tribunal understood that conducting such a large-scale event was impossible without the participation of translators. At that time, consecutive translation was widely used, but its structure was not suitable for such a massive international judicial proceeding. After all, there was a big amount of defendants, witnesses, evidence, documents, and other materials of various kinds. To address this issue, Colonel Leon Dostert, Eisenhower's personal interpreter, proposed

conducting the proceedings using simultaneous translation. Simultaneous translation is a complex mental task that requires utmost concentration, placing an intense and continuous emotional and mental burden on the translator. IBM company specifically developed a new technology, the simultaneous translation setup, which was the first of its kind.

Professional translators used technical devices for their work for the first time in history, such as headphones and microphones. This marked the beginning of the automation and technical advancement of translation activities. Representatives of various nations who participated in the Second World War were also involved in the Nuremberg Trials. In addition to the simultaneous interpreters of the official trial languages, other foreign languages translators, who worked sequentially in written form, were also engaged [8, p. 83].

Four teams of three translators were formed to carry out simultaneous translation into the official trial languages (English, French, German and Russian). Two teams alternated, while the third team listened to the proceedings through headphones in an adjacent room and was ready to replace a colleague in the booth at any moment if gross errors occurred during the translation or if the translator couldn't continue working. On the translator's desk in the booth, two buttons were installed; when pressed, they illuminated colored bulbs. This allowed the translator to signal the speaker to pause, repeat what he said, or speak more slowly.

Simultaneous interpreters were the only participants in the Nuremberg Trials who were constantly present in the courtroom. To reduce psychological stress, they conducted translation only into their native language. Besides ensuring the utmost accuracy in content delivery, translators had to undertake a difficult and responsible mission that not everyone could handle. Simultaneous translators spent nearly fifteen hundred hours at their workstations [9, p. 1261]. While translating witness testimonies and examining physical evidence, they had to objectively distance themselves from events and Nazi war crimes, a task that was sometimes overwhelming due to the colossal psychological burden. Another challenge was translating military terminology, specifically the Third Reich's military ranks, for which there were no equivalents in Russian, English, or French [10, p. 36].

Currently, there are events that are horrific in their cruelty and similar in nature and scale to historical occurrences. Our generation is witnessing global aggression, a provocation reminiscent of Nazi undertones. Cadets and servicemen of the National Guard Troops cannot afford to remain indifferent to these events. Our task is to identify, prevent, and eliminate this evil at the gates of our Homeland and our people.

It is well-known that mercenaries from foreign states are involved on the opposing front in the Special Military Operation. Foreign language proficiency is one of our weapons, and a high level of its mastery and acquisition of skills in military-professional translation enhance its accuracy and power.

The sphere of military-professional translation has undergone significant changes over the past 80 years due to technological advancements and shifts in the nature of military conflicts. With the development of computer technologies and communication tools, new instruments such as machine translation and specialized translation programs have emerged. These systems also integrate speech recognition

and text generation using AI to ensure more efficient and accurate simultaneous translation, especially in military operations where speed and precision can be critical. Nevertheless, despite significant achievements in automation, military-professional translation still requires human intervention and expertise to ensure complete accuracy and contextual adequacy.

Military translation demands specialized knowledge in military terminology, strategy, weaponry, and tactics, as well as thematic modules related to the specialization of the chosen field of study (e.g., legal foreign language for students of the command faculty; psychology and pedagogy for cadets of the military-political faculty). Foreign language classes at the National Guard military institute aim to acquire these precise skills and foster the ability to apply this knowledge in the sphere of military-professional communication.

Foreign language knowledge will be essential for National Guard servicemen in carrying out official and combat tasks, such as maintaining public order and ensuring public safety. Foreign citizens might be present at various public events, requiring verbal interaction. Translation skills from a foreign language to Russian, and vice versa, might be necessary for transporting special cargo abroad. It's important to understand that the "foreign language" discipline is necessary not only for obtaining higher education at the National Guard military institute but also for its use after graduation for its designated purpose.

In conclusion, studying the Nuremberg Trials allows for an expanded understanding of the processes and mechanisms of translation activities, the development in this field over the past 80 years, and the automation of simultaneous translation processes. This topic also helps cadets understand the importance of studying a foreign language in the sphere of military professional communication. Approaching this matter requires complete responsibility, discipline, and dedication.

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SOCIOLINGUISTIC FEATURES OF SPEECH ACTS OF ENCOURAGEMENT IN THE DISCURSIVE SPACE OF THE SHOW "THE VOICE OF ITALY"

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Abstract. This paper touches upon the sociolinguistic features of speech acts of encouragement in the show "The Voice of Italy". Information on various approaches to the definition of the media space is provided. The functions of acts of encouragement in the show are highlighted. Various linguistic and stylistic techniques peculiar to the Italian version of the show are given as examples from the official YouTube channel of "The Voice of Italy".

Keywords: media space, metalinguistic approach, discursive space, speech acts of encouragement, sociolinguistic features.

СОЦИОЛИНГВИСТИЧЕСКИЕ ОСОБЕННОСТИ РЕЧЕВЫХ АКТОВ ПООЩРЕНИЯ В ДИСКУРСИВНОМ ПРОСТРАНСТВЕ ШОУ «ГОЛОС ИТАЛИИ»

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Аннотация. В данной статье рассматриваются социолингвистические особенности речевых актов поощрения в шоу «Голос Италии». Представлена информация о различных подходах к определению медиапространства. Освещены функции речевых актов поощрения в шоу. В качестве примеров приводятся различные лингвистические и стилистические приемы, свойственные итальянской версии шоу с выпусков, найденных на официальном канале «Голоса Италии» на видеохостинге YouTube.

Ключевые слова: медиапространство, медиалингвистический подход, дискурсивное пространство, речевой акт поощрения, социолингвистические особенности.

The media sphere as a phenomenon of cultural and social life of society has firmly entered the category of objects of research in the humanities. It should be noted that the media sphere can be defined as a combinations of topics, ideas, opinions which are illustrated via the media texts that are significant for different groups of audiences and open to numerous interpretations [1, p. 209]. At the same time, it should be pointed out that the term "media space" is often used as a synonym for the concept of "media sphere", that is, a part of the information space where print and electronic

media act as processors, producers, distributors, interpreters of information [2, p. 160]. In our opinion, the relationship between these terminological concepts may be expressed in the idea that “media space” is a broader concept in comparison with the “media sphere”, since the discursive features of media texts, the elements of media sphere, depend on the approach that forms the basis of media space, that is, determines its type.

Currently, areas of research work in the field of media are based on the following classification that reflects certain approaches based on elements of the media space:

1. Political-ideological (resource) approach: media is considered as an instrument of political influence, which aims to spread certain ideas;

2. Communicative approach: it is based on sets of patterns, which make it possible to create a situation of communication;

3. System-structural approach: it is viewed as an institution of public life;

4. Territorial approach: it is considered as a market or information space of a region (city, country);

5. Technological approach: it is seen as a system of information and telecommunication systems and networks that perform an informative function;

6. Media educational approach: media is considered as a tool in the educational process, with the help of which students develop the skills of critical analysis of information received through various channels, and also create their own media product

7. Medialinguistic approach: it is considered as a variety of media texts that create a discursive space [3].

In this article we will consider the media space in accordance with the medialinguistic approach, so that we will observe the sociolinguistic features of the discursive space of the show “The Voice of Italy”. It is important to note that discourse can be defined as a speech act which is expressed by using verbal and nonverbal means of communication and extralinguistic factors that ensure successful interaction. Another interpretation states that this term can be understood as a text in combination with extralinguistic, pragmatic, sociocultural, psycholinguistic and other factors [4, pp. 221-222].

In the idea of the article, it should be pointed out that discourse appears as an area of existence of a speech act, that is, a communicative event, which is represented by a special paradigm of the following structure: “addressee (speaker) – speech act – addressee (listener)”. In the format of the show “The Voice of Italy” the implementation of this pattern may be observed in the process of evaluation of the participants’ competitive performances by the jury members. The distinctive characteristic of the communicative situation in “The Voice” is the publicity of evaluation and asessing. Jury members make their comments for a double addressee – a participant of the show and a mass viewer. While expressing their personal and professional opinion, the jury members need to be sincere and emotional so that the audience in the studio and mass viewer at the TV screens may get a form of entertainment. At the same time, the jury members should be performing the role of fair reasonable critics who can help the participants in their creative growth, thus should demonstrate their knowledge in the professional field. Overall, the importance of these professional judgments is explained in the fact that the statements play

mentoring, psychological, aesthetic role, which determines the specifics of the speech behavior of the jury members [5].

The object of our research interest is the sociolinguistic features of the act of encouragement by Italian jury members. Under the act of encouragement, we will consider a speech act performed for the purpose of expressing approval. We will consider the following functions of speech acts of encouragement:

1. Informative: the subject informs the communicant about his positive position regarding his certain action or quality;

2. Social: receiving a social reflection of his own personality by the addressee in the form of a message;

3. Impactful: the speaker exerts influence on the communicant in order to change his system of values and attitudes, and also tries to achieve changes in the behavior of the communicant and his attitudes;

4. Expressive: the expression of positive emotions of the speaker, the release of his speech from emotional overload;

5. Stimulating: inducing the object of evaluation to actions similar to those already committed [6, p. 32].

In the show "The Voice of Italy", all these functions of speech acts of encouragement are illustrated directly, especially during the stage of blind auditions, when the judges should not only evaluate the participant, but also have to win them so that they will be the members of their team. We are presenting the Table that shows the examples from the analyzed fragments from the blind auditions (season 2019) of the show which was found on the official YouTube channel where the jury members incorporate the acts of encouragement according to the presented classification while discussing the performance.

Table – Illustrations of the functions of the speech acts of encouragement in "The Voice of Italy" [7]

Functions of encouragingspeech acts	*Examples from the discursive space of the show"The Voice of Italy"*
1. Informative	– Hai una voce così forte, così bello! – Sono contentissimo, penso che hai fatto benissimo e sono sicuro che puoi essere molto versatile! – Mi sono girato per primo perché sei intonatissima, canti con naturalezza. La tua voce è la voce della natura.
2. Social	– Questo è un fatto che sei polivalente e molto interessante. – Mi piace vedere questa emozione. – Ho sentito proprio che veniva dal profondo, che veniva proprio dall'anima.
3. Impactful	– Voglio invitarti nel mio team. – La mia casa è aperta per te. – Tu hai voce arriva dritto al cuore ed e per questo che devi scegliere me.

	– Io sono convinto che la tua voce con un pianoforte può fare solo venire i brividi attrici.
4. Expressive	– Bravo! Brava! – Complimenti! – Veramente fortissima!
5. Stimulating	– Vedo comunque l'orizzonte luminoso. – Penso per te una carriera fatta di musica..

Thus, it can be concluded that the speech acts of encouragement in the show "The Voice of Italy" are multifunctional and contain characteristics of elements of the media space. This is expressed in a combination of the style of the show as entertaining, but at the same time aimed at professional open evaluation.

In the presented examples of speech acts, we should pay our attention to their linguistic and sociolinguistic features.

Speaking about the linguistic aspects of the show "The Voice", we highlight the following characteristics:

1) Lexical language tools. These elements of the discourse are characterized by emotivity and positive coloring. They are reflected in approving simple sentences, which often consist of a single word-exclamation.

– "Bravo! Fantastico!"

2) Stylistic means (a number of epithets, metaphors):

– "La mia "casa" è aperta per te" (metaphor). In this case, the jury member compares his team with a cozy house, wanting to evoke emotions in the participant and persuade him to choose the team;

– "La tua voce è la voce della natura" (metaphor). The jury member approvingly compares the participant's voice with something natural and pure.

"... l'orizzonte *luminoso*", "i brividi *attrici*" (*epithets*).

3) Intensification, that is, the use of words-intensifiers – language units of different grammatical levels [8, p. 22].

– Veramente fortissima! Sei intonatissima! (superlative form of adjective).

4) Syntactic means (parallelism, repetitions):

– "Ho sentito proprio che veniva dal profondo, che veniva proprio dall'anima" (parallelism, that is, the same construction of sentences in a text or a segment of speech).

– "C'è passione, c'e intonazione, c'è tecnica, c'è tutto!" (repetition).

We should also pay attention to the generally **informal style of communication** used in the show that does not correspond to the academic version of the Italian language. During the acquaintance with the participants, the jury members instead of the polite address *"Come si chiama?"*, prefer the option *"Come ti chiami?"*. While presenting the comments, the jury members **address** unknownpeople using fairly open variants such as *"Amore!"*, *"Principessina"*. Talking about the **grammatical aspect** of the speech, we should take into the consideration that sometimes the jury avoid using Congiuntivo and Condizionale, so instead of "*vorrei invitarti*" (polite version) the juries tend to use Indicativo Presente "*voglio…*".

Moreover, we have noticed the **frequent usage of English words** in the discourse such as “Voglio invitarti nel mio *team*”, “...perche *girl power*…” due to the process of globalization where the English language as a part of the predominantly English-speaking cultures, mainly American one, plays the important role. These peculiarities can be explained with the orientation of the programme towards mass-viewer and its entertaining format. Furthermore, it is impossible not to notice **the active gesticulation**, the illustrations that the juries do with their hands while giving positive and emotional reaction.

To summarize, after having watched and analyzed the episodes of the show “The Voice of Italy”, we can conclude that speech acts of encouragement are characterized by emotionality and expressiveness. These characteristics are reflected not only in peculiarities of verbal communication (lexical, grammar, syntactical components), but also in non-verbal elements of discourse.

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SOFT SKILLS OF A MODERN SPECIALIST IN THE VIEW OF FUTURE LAWYERS

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Abstract. The article examines the essence and components of soft skills, ideas about soft skills of a modern specialist expressed by future lawyers undergoing retraining at the Institute of Additional Education of the Higher Educational Institution "Francisk Skorina Gomel State University". According to the results of the study, it is concluded that the subjects refer to the components of soft skills as skills related to thinking, communication, organizational skills, personal qualities. All respondents consider necessary the ability to analyze information, think logically and the ability to interact with people, to find an approach to them, because their presence will expand employment opportunities and increase the efficiency of activities.

Keywords: soft skills, components of soft skills, additional education, retraining, soft skills of law students.

SOFT SKILLS СОВРЕМЕННОГО СПЕЦИАЛИСТА В ПРЕДСТАВЛЕНИИ БУДУЩИХ ПРАВОВЕДОВ

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Аннотация. В статье рассматриваются сущность и составляющие soft skills, представления о soft skills современного специалиста из числа будущих правоведов, проходящих переподготовку в Институте дополнительного образования УО «Гомельский государственный университет имени Ф. Скорины». По результатам проведенного исследования делается вывод о том, что к составляющим soft skills испытуемые относят умения, связанные с мышлением, коммуникацией, организаторскими способностями, личностными качествами. Все респонденты считают необходимыми следующие умения: умение анализировать информацию, логически мыслить и умение взаимодействовать с людьми, находить к ним подход, поскольку их наличие позволит расширить возможности трудоустройства, повысит эффективность деятельности.

Ключевые слова: soft skills, составляющие soft skills, дополнительное образование, переподготовка кадров, soft skills слушателей-правоведов.

The effectiveness of the professional activity of a modern specialist largely depends on his ability to interact with people around him, to show flexibility, tolerance, initiative, communicative and organizational skills, leadership qualities, creativity and independent thinking. This set of skills and abilities can be designated as soft skills. The concept was introduced relatively recently, began to be actively used since 2013, first in management studies, and then attracted the attention of representatives of other sciences, in particular, teachers, psychologists, physicians, sociologists (I. G. Borzova, E. F. Zeer, T. A. Platonov, S. R. Sokolov, Yu. V. Sorokopud, E. V. Taptygin, I. I. Cherkasova, O. L. Chulanova, T. A. Yarkova, B. Cimatti, L. H. Lippman, etc.).

Researchers note the importance of soft skills for professional self-realization and career growth. So, according to B. Cimatti, “they are necessary in any position, since they mainly relate to relationships with other people involved in the work of the organization” [1, p. 4]. Soft skills are non-specialized, over-subject skills responsible for successful participation in the workflow, high productivity, “enable people to effectively navigate their environment, work well with others, perform well, and achieve their goals” [2, p. 4].

Summarizing the results of the analysis of various points of view regarding the definition of the essence of soft skills, we came to the conclusion that scientists mainly consider them as a set of skills related to the ability to interact with people, work in a team, show managerial and organizational abilities, flexibility of thinking.

In this regard, it is natural that a number of researchers emphasize the paramount importance of the development of soft skills among representatives of socionomic professions (O. B. Ganpantsurova, N. N. Loktaeva, T. A. Tskvitaria, I. I. Cherkasov, T. A. Yarkova, etc.).

Intersubject and multidimensional consideration of soft skills has led to the emergence of a large number of interpretations of this concept. The most capacious, in our opinion, is the definition proposed by T. N. Anufrieva. In her opinion, soft skills are “a complex of multifunctional skills and abilities that are formed and developed in a specially organized learning process, as well as through self-education, enhanced by the presence of significant personal qualities, correlate with the solution of complex tasks and determine the effectiveness of interaction within communication and cooperation at the professional and social level” [3, p. 129]. The special role of soft kills, as it seems to us, is that future specialists, acquiring them during training and subsequent professionalization, get the opportunity for self-realization in all spheres of life, continuous self-development and self-improvement, both professionally and personally. Soft skills, according to the fair remark of O. V. Igumnova, allow students to “realize themselves both in professional activities and in intercultural and interpersonal communication” [4, p. 34].

E. Y. Amchislavskaya, E. F. Zeer, Yu. V. Sorokopud, L. N. Stepanova and others pointed out the expansion of opportunities for self-realization of the individual thanks to soft skills. In particular, E. F. Zeer and L. N. Stepanova, whose point of view on this issue we share, believe that “basic communicative competencies (realization of communicative and personal potential), self-management skills (motivation for acquiring knowledge, reflexive qualities) and effective thinking (ability to predict, innovativeness) increase psychological the stability of the personality, its willingness

to face difficulties, to solve divergent life tasks, to maintain stability and freedom of behavior. Conscious orientation to personal growth and self-improvement, the use of problem-oriented coping enhances autosympathy and interest in one's own life and personality" [5, p. 83].

There are different opinions regarding the components of soft skills, but, as a rule, researchers include, first of all, communicative and organizational and managerial skills (E. Gaiduchenko, A. Marushev, O. V. Sosnitskaya, V. Shilov, etc.). At the same time, a number of authors attribute to soft skills the skills and abilities related to emotional intelligence (F. Lukyanova, I. Milevsky, D. Tataurshchikova, O. L. Chulanova, etc.). In addition, researchers supplement the list of soft skills with skills related to thinking, in particular, its flexibility, independence, ability to analyze information and make quick decisions in changing conditions (E. F. Zeer, S. Mamaeva, Yu. Portland, L. N. Stepanova, A. V. Yaroslavtseva, etc.). Furthermore, the composition soft skills, from the point of view of O. Abashkina, S. Mamayeva and other scientists, include skills related to the manifestation of personal qualities, such as self-confidence, responsibility, striving for achievements.

In our opinion, the soft skills of students are described quite fully by E. F. Zeer and L. N. Stepanova. These authors distinguish three main groups of soft skills:

1) basic communication skills: public speaking skills; self-presentation skills; information literacy; the ability to convince and listen; the ability to argue; tolerance to uncertainty; the ability to work as a team; effective behavior in uncertain, critical situations;

2) effective thinking skills: flexibility, analyticity, awareness, innovativeness, perspective, evidence-based, prognostic, creativity;

3) self-management skills: goal-setting skills; initiative; self-resource management (self-development, self-education, self-organization); emotion management; planning ability; time management skills; reflection [5].

Thus, it can be concluded that the possession of soft skills implies the ability to interact with people based on developed communication skills and emotional intelligence, plan and organize your individual and team work, show leadership qualities, flexibility, independence and originality of thinking, exercise reflection, self-control and self-development.

Additional education is based on the idea of human development as a person, a subject of activity and communication throughout his life, the principles of humanism, democracy, mobility, advance, openness, continuity (A. P. Vladislavlev, S. G. Vershlovsky, A. B. Darinsky, Y. N. Kulyutkin, V. G. Onushkin, P. V. Khudominsky, etc.). It opens up new opportunities for students to unlock their potential, self-realization. In our opinion, the development of soft skills of retraining trainees in the course of training contributes to the achievement of this goal to a considerable extent.

In this regard, the study of soft skills of retraining students is of particular interest, since students already have or are receiving higher education, some work in the first specialty. These skills and abilities are applicable in various fields of activity, and can be used in the future when working as a specialist of any qualification. Recent

studies have emphasized the importance of creating special soft skills training programs for different categories of employees and trainees, the introduction of which will improve the quality of interaction with the subjects of their professional activities, the success of solving tasks (L. N. Kataeva, S. A. Potutkova, N. N. Terekhova, etc.).

The purpose of our research was to identify the ideas of future lawyers about the soft skills of a modern specialist.

The respondents were students of the Institute of Additional Education of the Educational Institution “Francisk Skorina Gomel State University” of the full-time (evening) forms of education, specializing in jurisprudence.

Research methods included survey and conversation. During the survey, the subjects were asked to list the main soft skills that a modern specialist needs. The purpose of the conversation was to clarify and supplement the information received.

According to the survey results, future lawyers include the following components in the list of soft skills of a modern specialist:

– ability to analyze information, think logically (100 %);
– ability to interact with people, find an approach to them (100 %);
– ability to express their thoughts clearly and competently in oral and written form (91 %);
– ability to plan and allocate your time (91 %);
– public speaking skills (82 %);
– ability to think creatively, to be creative when solving problems (82 %);
– ability to manage people, organize, direct, motivate them (55 %);
– self-regulation skills, ability to manage your emotions (45 %);
– ability to work in a team (45 %);
– ability to make decisions quickly and independently (36 %);
– ability to learn new things, to develop professionally (36 %);
– ability to negotiate (36 %);
– ability to listen and hear (36 %);
– ability to be flexible (27 %);
– ability to resolve conflict situations (27 %);
– ability to show empathy, exercise reflection (27 %);
– ability to defend one’s point of view, to achieve a goal (27 %).

As you can see, among the components of soft skills, respondents name skills related to thinking, communication, organizational skills, personal qualities.

During the conversation, the subjects noted that the most important thing for a modern specialist is to be able to work quickly and efficiently with diverse and numerous information, process it quickly, analyze it, make decisions independently, and be creative. It is no less important, in their opinion, to be able to establish and maintain contacts with people around them, understand them, be able to flexibly and quickly respond to changes in communication conditions, resolve conflict situations, and cooperate. The effectiveness of activity presupposes the ability to plan, organize

one’s time, as well as team members. In addition, stress tolerance, self-confidence, empathy, reflexivity, responsibility, and the desire for self-development are important.

In addition, the majority of law students (64 %) believe that a modern specialist needs communication skills not only in his native language, but also in foreign languages, the ability to apply various information technologies.

The listeners stressed that the possession of soft skills will expand employment opportunities and increase the efficiency of professional activity, because thanks to them, it is easier for an employee to establish contact with colleagues and clients, understand others, adapt to a new team, join a team. He can navigate in various situations of professional interaction faster, offer non-standard solutions and convincingly justify his proposals, skillfully plan and achieve the goal.

Thus, the future lawyers’ ideas about the soft skills of a modern specialist, in general, are consistent with the results of research in recent years. Retraining trainees understand the need for flexible, independent and creative thinking skills, possess effective communication skills, self-management and strive to develop them in the course of training and self-improvement.

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ARTIFICIAL INTELLIGENCE: A HIDDEN DANGER OR A BOON

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Abstract. This article explores the impact of artificial intelligence on society, identifying potential risks and issues, while discussing ways to minimize negative implications. The authors advocate for a balanced approach to AI implementation, considering ethical and security aspects, while striking a balance between innovation and safeguarding human interests.

Keywords: artificial intelligence, data security, innovation, automation, information technology.

ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ: СКРЫТАЯ ОПАСНОСТЬ ИЛИ БЛАГО

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Аннотация. В данной статье рассматривается влияние искусственного интеллекта на общество, выявляются потенциальные риски и проблемы, а также обсуждаются пути минимизации негативного воздействия. Авторы предлагают взвешенный подход к использованию ИИ, учитывающий этические аспекты и аспекты безопасности, соблюдая баланс между инновациями и защитой человеческих интересов.

Ключевые слова: искусственный интеллект, безопасность данных, инновации, автоматизация, информационные технологии.

Introduction

Definition of artificial intelligence in Information Technology

Intelligence is such a qualitative measure of the human psyche that is characterized by the following indicators:

1. Ability to adapt;
2. Ability to learn through accumulated knowledge and experience;
3. Ability to use the acquired skills and knowledge to interact with the world around us.

The modern world is developing more and more rapidly every year. Technologies are being introduced everywhere: at the level of states and corporations, as well as in the lives of ordinary people. As time passes, IT-technologies are becoming more and more important for the world, and humanity is turning into a more interconnected and interdependent community.

It is intelligence that encapsulates each individual's ability to explore the reality in which they live: thinking functions, analyzing new data, and immersing themselves in the environment.

What is artificial intelligence? It is a field of research aimed at studying and producing systems with human intellectual abilities. Among them we can distinguish things such as learnability, logic, and reasoning.

Today, work on the development of artificial intelligence systems is carried out with the help of creating certain software products and components that allow solving "human" tasks without direct human participation.

Artificial intelligence in information technology refers to the field that deals with the development and creation of computer systems and programs that can imitate human intelligence and behavior. AI in information technology includes techniques such as machine learning, neural networks, natural language processing, and many others.

The goal of artificial intelligence in information technology is to create intelligent and autonomous systems capable of solving complex problems and making decisions that previously required human involvement. This can include pattern recognition, processing and analyzing large amounts of data, forecasting, planning, and more.

One of the main characteristics of artificial intelligence in information technology is its ability to learn. Machine learning allows computer systems to independently extract knowledge from data and experience and then use it to make decisions and solve problems.

Artificial intelligence in information technology has applications in many fields such as medicine, finance, manufacturing, automotive industry, and more. It can make processes more efficient, improve the quality of decisions, and reduce time and resources.

Application of artificial intelligence in information technologies

Data analysis

Artificial Intelligence (AI) is one of the fastest growing areas in science and technology, and its impact on modern society is becoming increasingly visible. Artificial intelligence encompasses a wide range of technologies that enable machines and programs to perform tasks that would normally require human intelligence. Today, AI is penetrating all spheres of life and has become an integral part of modern society.

Big data processing has become a key challenge in many industries such as medicine, banking, manufacturing, marketing, etc. With the increasing amount of data

that companies collect, there is a need to process and analyze it. However, traditional data processing methods based on manual work and the use of statistical methods are limited in their effectiveness and may become inapplicable when dealing with large amounts of information.

Thus, the use of artificial intelligence (AI) in big data processing is becoming increasingly relevant. AI can process large amounts of data faster and more efficiently than humans, as well as find hidden dependencies and patterns in data. This allows companies to make more informed decisions, reduce costs, and improve the quality of products and services. Many studies support the effectiveness of AI in big data processing [1, pp. 345-374].

Cybersecurity

One of the main reasons for using AI in cybersecurity is the ability to quickly analyze large amounts of data.

The use of AI also helps automate the processes of detecting and responding to cyberattacks. AI can continuously monitor the network and detect anomalous behavior that may indicate a cyberattack. In addition, AI can automatically respond to threats by blocking hackers' access and preventing data leakage.

Another important aspect of using AI in cybersecurity is its ability to learn from experience. AI can use data from previous cyberattacks to improve its algorithms and provide more accurate threat detection in the future.

Trends and prospects for AI development

In what areas is artificial intelligence evolving in 2023

Generative AI

ChatGPT reached one million users in just one week. In comparison, Facebook* took 10 months and Instagram* took 2.5 months to arrive at this result. According to OpenAI, about 1.5 million users use the DALL-E neural network to create 2 million images per day. Stable Diffusion has over 10 million users and MidJourney has 2 million (* – social networks banned in Russia).

Knives and Paintbrushes Open Research Group member Mike Cook believes that generative AI will continue to be a major driver of change. Its appeal lies in its ability to generate new content: pictures, news, poems, snippets of machine code. Neural networks can generate text that looks and reads like it was written by a human.

It is expected that in 2023 generative AI will learn to create email newsletters, help develop marketing concepts, slogans and brands, create drawings, concepts of industrial models, and advertising materials. This will allow people to create and not spend years acquiring the necessary skills [2, pp. 12-16].

Voice and Language Artificial Intelligence

According to a new report by Grand View Research, Inc. the global dialog AI market size will reach USD 41.39 billion by 2030. It is expected to grow at a compound annual growth rate of 23.6 % from 2022 to 2030. The market growth is primarily influenced by the increasing adoption of advanced AI technologies and consumer interaction across multiple platforms. This tells us that enterprises and their customers see technology as one of the major ways to expand and improve their business.

The focus of businesses has now shifted from providing customer support services through messages or emails to AI-enhanced chatbots. They help companies

improve customer interactions: in addition to responding and advising instantly on the services provided, bots analyze context, understand customer intentions, and generally provide human interaction.

The shift from traditional bots to advanced conversational platforms is a necessary evolution for consumer-facing organizations.

Today, it is hard to imagine a line of customers on a customer service call. Instead of waiting for hours, a chatbot immediately picks up the customer's question and takes care of the first interaction.

Benefits of AI

1. Supporting multiple sectors and industries

With the continuous advancement of Artificial Intelligence (AI) technology, there are more and more opportunities for its application in various fields of endeavor. Artificial Intelligence (AI) can significantly improve the quality of work in various fields:

Medicine: AI can help diagnose diseases and suggest the most effective treatment based on millions of medical data and studies. It can also automate physician documentation processes and analyze medical images.

Industry: Using AI in manufacturing can help optimize production processes and increase productivity. For example, AI can predict the lifespan of equipment and suggest the optimal replacement schedule to avoid free downtime.

Finance: AI can analyze large amounts of data about markets, trends and consumer behavior to predict changes and help make informed financial decisions. It can also help automate processes in the financial sector, such as loan application processing and risk assessment.

Transportation: AI can help improve road safety by predicting accidents and suggesting actions to prevent them. It can also help optimize logistics and transportation routes to reduce costs.

Education: AI can personalize the educational experience by tailoring curricula to each student's needs. It can also help teachers assess students and suggest supplemental instructional materials.

These are just a few examples of how AI can be applied to improve efficiency and accuracy in various fields. As AI technology advances, its potential is only expected to grow.

2. Processing and analyzing large amounts of data

AI has the ability to process and analyze large amounts of data quickly and efficiently. It can highlight important trends and patterns in the data, which facilitates decision making.

AI can be used to make automated decisions based on predefined rules and algorithms. For example, in the financial industry, AI can be used to make investment decisions based on market and data analysis.

3. Improving forecasting accuracy

AI can be used to develop forecasting models that help predict future trends and events with higher accuracy. For example, AI can be used to predict demand for goods or prevent equipment failure.

4. Improving customer experience

AI can be used to improve customer experience by offering personalized recommendations or adaptive support based on previous customer behavior. For example, AI can offer product recommendations based on a user's purchase history.

Overall, AI offers many opportunities to improve efficiency and accuracy across multiple domains.

Potential threats of AI

1. Risk of replacing human labor and high unemployment

The risk of replacing human labor and high unemployment is one of the potential threats associated with the development and application of artificial intelligence.

The realization of AI may lead to the disappearance of a number of classical professions. For example, the development of autonomous vehicles could reduce the demand for drivers and related professions. This could lead to people working in these industries losing their jobs. If AI replaces workers in low-wage and unskilled jobs, it could lead to increased income inequality and a two-layered society where a small number of people have access to high-paying and smart jobs while the masses are unemployed or underpaid [3, 4].

As a result of automation and AI, some people may lose the necessary skills and competencies to compete in the labor market. This can lead to technical unemployment when people find that their skills are no longer in demand in the labor market.

If jobs that were previously done by people are done automatically, this can have negative consequences for the economy. For example, a shrinking labor force may reduce demand for goods and services, while rising unemployment may have a negative impact on tax revenues and social expenditures of the state.

It should be noted that at the same time, the application of AI can create new jobs and contribute to the development of new industries. However, the risk of replacing human labor and high unemployment remains relevant and requires the development of appropriate strategies, such as re-skilling and training.

2. The risk of misuse of artificial intelligence

One of the main dangers is the possibility of AI being used for illegal or malicious purposes. For example, attackers can create AI-based malware that can infiltrate computer networks and cause significant damage. The use of AI in cybercrime could also lead to the development of new and more sophisticated attack methods, creating serious challenges to the security of people’s information and privacy. In addition, it is possible that AI could be used to suppress or manipulate certain groups of people, which could threaten democracy and human rights. Therefore, it is important to develop effective protection and control measures to prevent the possible misuse of AI and to ensure its safe and ethical use.

The risk of AI misuse can lead to the following global problems:

Weapons: Military applications of AI could lead to the development of autonomous weapon systems that could be used to attack or destroy targets without human control. If such systems fall into the wrong hands or are susceptible to hacking attacks, it could cause serious threats to the world.

Surveillance and control: The use of AI for mass surveillance and control could lead to violations of human rights and privacy. For example, facial recognition systems can be used to track citizens or violate their privacy [5, 6].

Manipulation and misinformation: AI can be used to create and disseminate fake information, fake video and audio recordings, or create bots to manipulate mass consciousness. This could affect political processes or create public controversy.

Autonomy without ethical principles: If AI is developed without the parameters of ethics, it may lead to wrong or immoral decisions. For example, if an AI autonomous car is faced with the choice of saving a driver or a pedestrian, what decision will be made?

To prevent these threats and guarantee the safe use of AI, it is important to develop effective safeguards and controls to prevent possible misuse of AI and ensure its safe and ethical use [7, pp. 22-25].

Conclusion

Overall, artificial intelligence has great potential to improve various areas of our lives and has a number of benefits and advantages for society. One of the main arguments in favor of using artificial intelligence is the increase in productivity and efficiency. AI is able to perform tasks much faster and more accurately than humans, which can significantly improve the productivity and efficiency of business processes.

Another argument in favor of artificial intelligence is its ability to analyze huge amounts of data. This makes it possible to find hidden patterns, extract valuable information and make predictions. This approach can be useful in fields such as medicine, finance, marketing and scientific research.

Also, artificial intelligence can significantly improve security and data protection. AI can be used to detect and prevent cyberattacks, analyze video surveillance to identify suspicious activity, or improve transportation security. This helps society to stay safe and prevent possible threats.

Arguments against artificial intelligence are usually related to the fears and negative effects it may cause.

First, it is believed that AI could replace human labor, leading to massive unemployment and social problems. Secondly, there is a concern about losing control over AI, which could develop its own goals and interests, jeopardizing the safety of humanity. The third argument against AI is its lack of ethics and moralization, which could lead to making wrong or unjust decisions. In addition, there is the danger of AI being used for military purposes, which could lead to devastating consequences.

In general, critics of artificial intelligence emphasize the importance of a cautious and balanced approach to its development and application in order to minimize potential risks and negative consequences.

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DEVELOPMENT OF HUMAN RESOURCES POTENTIAL OF WORKERS OF THE ORGANIZATIONS OF INDUSTRIAL AND AGRARIAN SECTOR OF ECONOMY

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Abstract. Rapid changes in an external environment define a need in a continuous employee knowledge update, activation of employee involvement in internal organizational changes. The development of new programs, use of up-to-date training modes and methods for the subsystem of personnel development facilitate the achievement of strategic goals of a company.

Keywords: personnel development, human resources potential, real economy.

РАЗВИТИЕ КАДРОВОГО ПОТЕНЦИАЛА РАБОТНИКОВ ОРГАНИЗАЦИЙ ПРОМЫШЛЕННОГО И АГРАРНОГО СЕКТОРА ЭКОНОМИКИ

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Аннотация. Стремительные изменения во внешней среде диктуют необходимость непрерывного обновления знаний работников организации, активизации их вовлеченности во внутриорганизационные изменения. Разработка новых программ, использование актуальных форм и методов обучения для подсистемы развития персонала способствуют достижению стратегических целей компании.

Ключевые слова: развитие персонала, кадровый потенциал, реальный сектор экономики.

A difficult economic situation in the country caused by the sanctions policy of the “collective West” initiates a development of new approaches to enterprise and labor management. A rapidly changing market environment defines a need in a constant knowledge update, revision of internal organizational standards and activation of

personnel involvement into internal organizational changes. In this regard, a personnel development system faces quite serious tasks in a field of increasing human resources potential, improving a corporate culture of an organization, and activating an employee involvement in improvement processes at each workplace [1, p. 197].

Organization of training at an enterprise is carried out according to a certain algorithm based on training objectives. Training programs are created based on personnel categories who require training. These may be personnel who have been hired, skilled persons enrolled in a personnel reserve, workers, skilled persons and managers who are upgrading their qualification level. A demand for creating new training programs may also be associated with changes in a company strategic guidelines and personnel strategy. Based on the above, many business processes of personnel management, such as a subsystem of recruitment and selection, assessment and development, may be revised. Therefore, a basis for training programs lies in future organization needs for highly qualified employees, amount of funds required for training programs and strategic goals of the organization [2, p. 304].

Enterprises themselves select a training organization providing refresher or retraining courses, as well as training modes and methods. When selecting a training organization, it is worth paying attention to the licensing and accreditation documents of the organization, its partners and the time of its presence on the market. Serious requirements are imposed on the teaching staff of the training organization. It is preferable that the trainer has an academic degree, possesses competencies on the subject of training, has practical experience of work in the real sector of the economy, and also possesses modern technologies of training of listeners [3, p. 147].

In recent years, more and more often traditional lectures and practical classes are replaced by interactive forms of training allowing students to immediately test obtained knowledge in a group and individual work. Training technologies, case studies, business games have become the most popular methods of training.

It is also worth paying attention to the transformation of an in-house training. Tutoring, coaching, projective methods and shadowing have been widely used along with traditional methods of training, such as mentoring, rotation and instructing. A combination of internal and external training allows one to get better results and increases an employee human resource potential.

Highly qualified personnel exhibit higher performance indexes facilitating a growth of labor productivity.

Labor productivity is a quantitative indicator reflecting an amount of products having a required quality produced per unit of time of the required quality level and reflecting a productive work of skilled persons, employees and managers. Labor productivity can be calculated both for an individual employee and as a whole for a company, industry and even a state. Such factors as the production level of development and development of fixed production assets, the qualitative list of employees, the quality and set of raw materials and semi-finished products, the production process organization, the level of wear of fixed production assets, the level of corporate culture in the organization and an employee motivation influence labor

productivity. The personnel who are motivated and loyal to the organization exhibit higher results of labor activity.

The “Lean Concept” employee training program is one of the effective labor productivity increasing methods. Lean concept found its origin in the works of domestic scientists A. K. Gastev, P. M. Kerzhentsev in a field of scientific organization of labor. An advanced experience of our domestic scientists was studied, supplemented and adapted to market economy by Japanese specialists Taiichi Ohno and Masaaki Imai. It is Taiichi Ohno who owns the idea of the name of the technology “Lean Production” [4, p. 159]. This concept allows an organization to improve the production process thereof without large expenses, increase labor productivity. The reduction of production losses level, which do not create value and consume scarce resources, makes it possible to achieve high results. This is achieved by mapping a value creation flow process and analyzing productive and non-productive time. Productive time includes the direct production of the product, i.e. the creation of value. Non-productive time is categorized into losses that are unavoidable and do not produce value, i.e. “Muda Type 1” and actions that do not create value and are not unavoidable, i.e. “Muda Type 2”. “Muda” refers to losses that consume resources, but do not create value. Losses may represent an excessive processing, inappropriate movement of goods and people, production downtime and waiting, errors, and neglecting an employee talent. Muda Type 1 is difficult to correct in short term, it is a systemic loss and requires financial investments and organizational changes. But Muda Type 2 can be withdrawn by improving the employee work organization. Implementation and maintenance of the lean concept allows the organization to increase the level of involvement of all employees in a continuous improvement (“kaidzen”), organize working groups on process improvement, activate the competitive spirit between working teams, improve the socio-psychological climate in a team. This technology is very relevant at Russian enterprises of an agricultural and industrial sector.

Creating working teams to improve production processes increases an employee involvement. Involved and motivated personnel is a source of ideas for continuous improvement. Employees directly involved in work processes have an understanding of all its elements and can propose real measures for its improvement in the form of rationalization proposals and improvement activities.

The level of involvement also depends on a company’s corporate culture. An increase in labor efficiency lies within the understanding and sharing by employees of the strategic guidelines of the organization, its goals and values. Main elements, basic principles of the organization’s corporate culture are reflected in training and adaptation programs for new employees.

Thus, organization personnel is an important strategic resource of the organization of the agricultural and industrial sector of economy. In the period of crisis affairs in economy and complex international environment, it is an employee who is the main driving force of internal organizational changes aimed at improving work processes through the creation of work teams and project management, productivity growth and quality of labor.

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RESEARCH OF APPROACHES TO THE SELECTION OF EQUIPMENT FOR AUTOMATED CONTROL SYSTEMS

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Abstract. This article examines the main methods of evaluation and selection of equipment for automated control systems (ACS), which play an important role in the efficiency and safety of production processes. The choice of equipment is a key stage in the design and implementation of automated control systems, and the methods presented in the article allow for the optimal functioning of the control system.

Keywords: control system, equipment selection, method, selection criteria, equipment evaluation.

ИССЛЕДОВАНИЕ ПОДХОДОВ К ВЫБОРУ ОБОРУДОВАНИЯ ДЛЯ АВТОМАТИЗИРОВАННЫХ СИСТЕМ УПРАВЛЕНИЯ

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Аннотация. В данной статье исследуются основные методы оценки и выбора оборудования для автоматизированных систем управления (АСУ), которые играют важную роль в эффективности и безопасности производственных процессов. Выбор оборудования является ключевым этапом проектирования и реализации АСУ, и представленные в статье методы позволяют обеспечить оптимальное функционирование системы управления.

Ключевые слова: система управления, выбор оборудования, метод, критерии подбора, оценка оборудования.

The development of automated control systems (ACS) is accompanied by a constant expansion of the range of available equipment, which creates difficulties in choosing the most suitable solution. Analysis of methods for selecting equipment for automated control systems plays an important role in the design and implementation of the system, since it allows you to determine the optimal technical characteristics that meet the goals and needs of the organization [1].

Determining the criteria for selecting equipment for automated control systems is based on the requirements related to ensuring the normal flow of the technological process. We list the main selection criteria that are relevant for any type of process:

1. Equipment reliability is its ability to maintain operational characteristics over a certain period of time.

2. Accuracy and stability of operation are parameters that determine the degree of deviation of real parameters from the specified values.

3. Ease of installation and maintenance is the ability to connect and replace equipment with minimal time.

4. Cost of equipment implies the costs of its acquisition, installation and operation.

5. Compatibility with other components of the automated control system is the ability to work together with other elements of the system.

Let us consider the most high-quality methods for assessing equipment characteristics:

1. Method of expert assessments. This method is based on the opinion of experts in the field. They evaluate equipment according to various criteria, such as reliability, accuracy, ease of installation, etc. The main processes of this method are described in Figure 1.

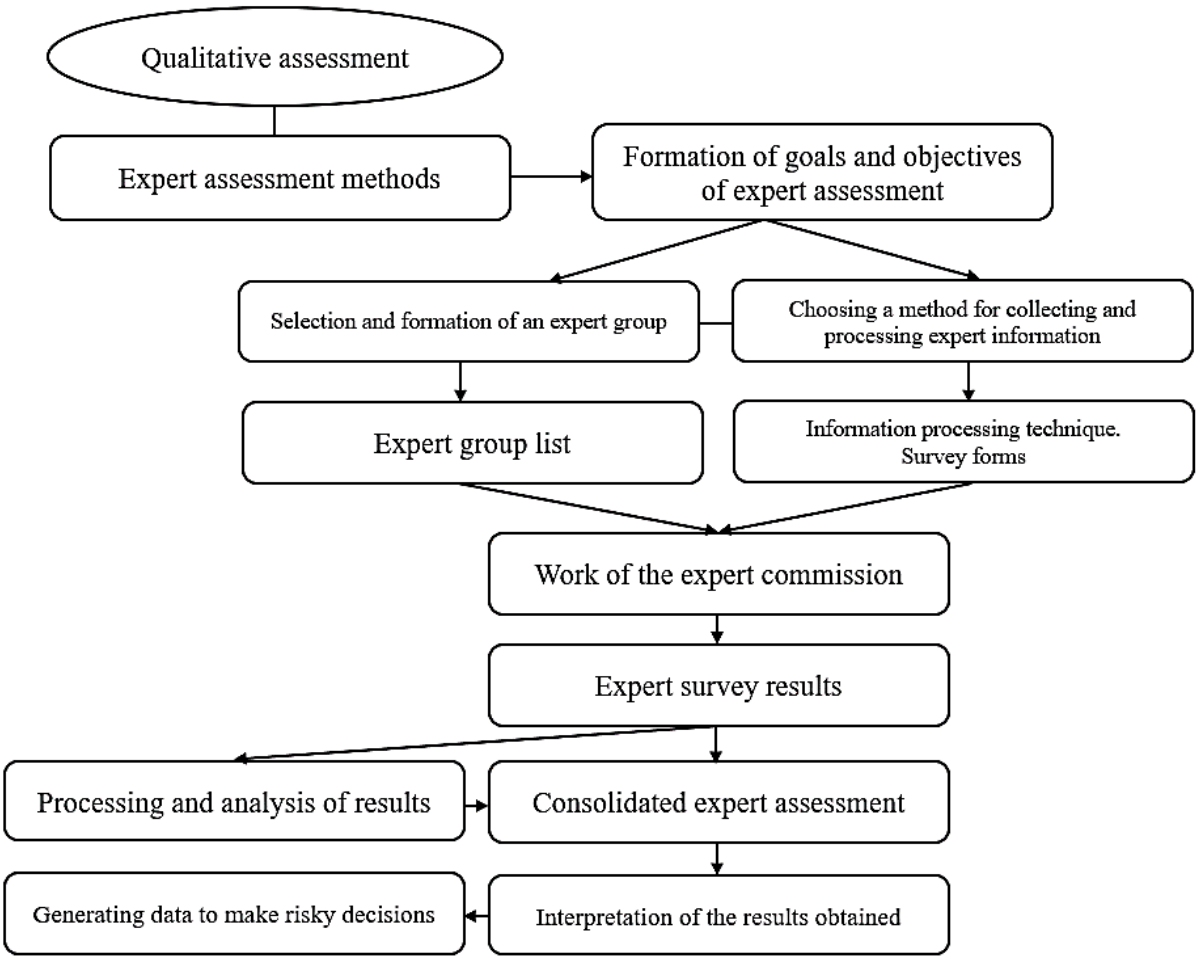


Figure 1. Basic processes of the expert assessment method

The method of expert assessments is a multilateral approach that can be used either independently or in symbiosis with various techniques. With its help, it is possible to obtain a more accurate and objective assessment of equipment, since it is based on the wealth of experience and unique knowledge of highly qualified professionals.

However, it should be noted that the expert assessment method has its own disadvantages that must be taken into account. First of all, this approach may be subjective, since the assessment depends on the individual opinion of experts. Secondly, carrying out such an assessment requires significant financial and time expenditures. Thirdly, the results obtained may not be accurate enough if the experts do not have a sufficient level of experience and competence in a particular field.

It should be noted that, despite some disadvantages of this method, it remains one of the most commonly used approaches when selecting equipment for automated control systems [2].

2. Hierarchy analysis method. The hierarchy analysis method can also be used to select ICS equipment. It is based on constructing a hierarchy of criteria and assessing their importance.

First, an analysis is made of the main factors for choosing equipment, such as reliability, cost, ease of installation and others. Each of these factors is then evaluated based on their importance to achieving the goal, and several possible equipment options are selected and evaluated. Figure 2 shows a diagram of the hierarchical structure.

After this, each criterion is analyzed and compared with other criteria. Various methods are used for this, such as pair comparison, ranking and weighting.

The result of the analysis is the determination of the most important criterion and the selection of equipment based on it [3].

Advantages of the hierarchy analysis method:

— Possibility of taking into account various criteria when choosing equipment.
— Possibility of comparing equipment according to various parameters.
— The method is easy to use.

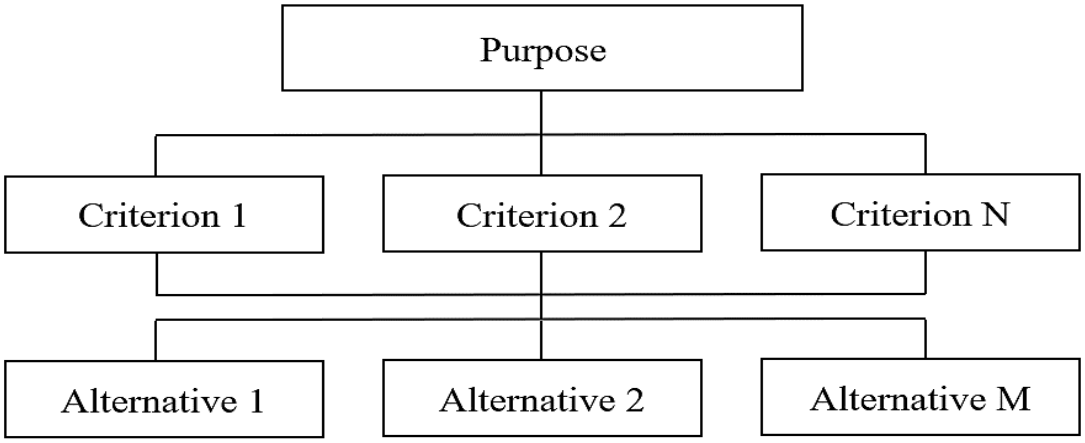


Figure 2. Structure of the hierarchy analysis method

Disadvantages of the hierarchy analysis method:

— Subjectivity of assessments.

— Difficulty in determining the weighting coefficients of the criteria.

— The need for a large amount of information to carry out the analysis.

3. The cost estimation method is one of the methods for selecting equipment for automated control systems, which consists of determining the costs of purchasing, installing and operating the equipment.

The steps of the automated control system equipment valuation method may include:

1) Study of the requirements and tasks of an automated control system. This allows you to determine the required functions and characteristics of the equipment.

2) Drawing up a list of possible equipment options that meet the requirements. This can be done based on market analysis and consultation with manufacturers.

3) Estimation of the cost of each equipment option, including the cost of the equipment itself, its installation and support.

4) Comparison of the cost and quality of each equipment option. This allows you to determine the most optimal option in terms of price-quality ratio.

5) Making a decision on the choice of equipment based on the assessments. It is important to consider not only the cost, but also the practicality, reliability and development capabilities of the selected equipment.

This method can be useful when comparing different equipment options, as it allows you to choose the most economical option. However, it should be taken into account that the cost estimate may not take into account other important factors such as equipment reliability, performance and service life. Unforeseen costs may also arise that are not taken into account when using cost estimates alone [4].

4. The performance indicator method is an important tool for selecting optimal equipment in automated control systems (ACS). Its purpose is to comparatively evaluate different options based on certain criteria.

The first step in applying the method is to determine criteria for assessing the effectiveness of equipment for automated control systems. These criteria may include cost, performance, reliability, usability, and other factors considered important to the successful operation of the system.

Next, each equipment option is evaluated according to each criterion. For this purpose, both quantitative and qualitative indicators can be used. For example, cost can be measured in monetary units, and performance can be assessed based on system performance indicators.

To apply the performance indicator method, it is necessary to conduct a comprehensive study and analysis of each equipment option. Based on the results obtained, you can make an informed choice and select the most suitable option that meets the specified criteria and requirements.

The advantage of the performance indicators method is its objectivity and consistency. It allows you to take into account various factors and parameters when choosing equipment, which helps to increase the efficiency of the automated control

system. This method also makes it possible to compare different options and select the most optimal one in terms of the requirements and goals of the control system [5].

5. The technical expert method is an indispensable tool for conducting technical examination of equipment. This method involves conducting a thorough investigation of the technical characteristics, condition and resource efficiency of equipment using various analytical and verification methods. The examination allows you to evaluate the performance, reliability and other parameters of the equipment.

The process of selecting an automated control system through technical expertise includes several stages. First, an analysis of the source material is carried out, including a study of the requirements for automation systems and a study of operating conditions and parameters. Then the design and selection of equipment occurs, which includes determining the required characteristics of the equipment, calculating parameters and selecting a supplier. After this, testing of the equipment is carried out, both in laboratory conditions and in real operating conditions. Test results and analysis are compared to select the most optimal equipment. A decision is then made and the results and recommendations are documented. The final stages of the process are the implementation of equipment and control of its operation in real process mode [6].

This integrated approach allows you to conduct a comprehensive technical study of the equipment, compare different options and select the most optimal solution for specific tasks [7].

The selection of equipment for automated control systems can be carried out by one of the methods proposed above, or by several ones. To select the correct method, it is important to determine the most important criteria for yourself.

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COMMUNICATION OF YOUTH BETWEEN CULTURES AND ITS VARIOUS WAYS OF INTERACTING

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Abstract. The paper examines the ways of intercultural communication among young people. The article provides examples of face-to-face and online interaction with people from different cultural groups, identifies the benefits and considers options for interaction in connection with the development of modern technologies and the support of the state of the Russian Federation.

Keywords: youth, communication, Rosmolodezh, government, forums, education, Internet.

КОММУНИКАЦИЯ МОЛОДЕЖИ МЕЖДУ КУЛЬТУРАМИ И ЕЕ РАЗЛИЧНЫЕ СПОСОБЫ ВЗАИМОДЕЙСТВИЯ

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Аннотация. В работе рассматриваются способы межкультурной коммуникации среди молодежи. В статье приведены примеры очного и онлайн взаимодействия с людьми из разных культурных групп, выявлена польза и рассмотрены варианты взаимодействия в связи с развитием современных технологий и поддержкой государства Российской Федерации.

Ключевые слова: молодежь, коммуникация, Росмолодежь, государство, форумы, образование, интернет.

The twenty-first century is the beginning of a period when information technology becomes an integral part of the daily life of every adapted person. Every day the development of the Internet industry is becoming more important and influential, transforming the ways, with which people communicate, work, study and develop. This age of progressivity opens up endless possibilities, changing the perception of the world and providing tools for solving the most difficult tasks. So it happened in working with young people, or rather with their involvement in active life. Previously, they called on educational institutions to be pioneers, attend actions, subbotniks and city holidays, but now everything has become different. Young people

are persons from 14 to 35 years old inclusive, they can organize their own leisure time, make a choice in favor of suitable leisure activities, undergo basic or additional training through Internet resources [1]. Modern youth are becoming more and more actively involved in the use of Internet technologies in their daily lives. This is a powerful tool for active development which has significant potential and offers many opportunities.

In the modern world, intercultural communication is becoming a natural part of society. Interaction with people of different cultural groups implies the concept of intercultural communication. It serves for communication, transmission and exchange of information between different peoples. It is impossible to imagine a lack of communication in the modern world among hundreds of cultures, but naturally, there are different barriers. One of the main barriers one can single out is ignorance of languages, not only those of small peoples (which is impossible in principle taking into account their number), but also those that are considered international (according to the UN, such languages are English, Arabic, Spanish, Chinese, Russian and French).

Young people, especially in the context of globalization, face the need to interact with representatives of other cultures, both in real and virtual space. The development of technological processes, the number of communication sites and translators allows you to establish communication with people from different cities of the country. Understanding and the ability to communicate effectively with representatives of different cultures is becoming an important skill for young people who will actively participate in global processes, develop the future, and so on. Young people in our country have such an opportunity to interact. The State participates in and organizes international forums among those who are considered to be young people. The age limit of this category has been determined – these are people from 16 to 35 years old [1].

In 2023 five international forums were held, in which the state called for participation, and helped with the allocation of the budget for accommodation, meals and travel to and from the venue.

The first forum was called “Balkan Dialogue – 2023”. This event is held every year. In 2023 it was held in Republika Srpska (Bosnia and Herzegovina) from October 23 to 27 [2]. Despite the fact that the venue was in another country, the participants had the opportunity to get there, and knowledge of Serbian and English allowed them to have an advantage in passing the competitive selection. Russian was also the working language at the forum. An important part of the program was the intensification of cooperation between Russia and the states of the Balkan Peninsula in modern conditions.

Another forum held in 2023 in the first academic month was already held within the Russian Federation in Moscow. “BRICS+ International Youth Forum ‘Sports Diplomacy: Search for New solutions for new opportunities’” [3]. The organizers identified the main goals as uniting active youth and officials in the field of sports with the task of preserving the true values of sports, historical truth and diplomacy, as well as determining the place and opportunities for future dialogues between world leaders in the sports industry.

The other three forums were held thanks to the Rosmolodezh project. It is a federal executive authority in Russia, which is engaged in the provision of public services and the management of state property in the field of state youth policy. It also

implements activities aimed at supporting a healthy lifestyle of young people, their moral and patriotic education, as well as encouraging young people to realize their professional opportunities. In 2023, thanks to its work, 35 educational forums were held in different parts of the country.

One of these events was an intercultural forum “Russian-Armenian Youth Forum”, which was held in Stavropol and brought together people from Russia and Armenia who are interested in the culture of this nationality [4].

Intercultural communication is an integral part of the modern world, especially in the context of globalization and international contacts. The opportunities that open up for young people in our country allow them to accumulate experience and share successe with people from different nations, which, in turn, contributes to the development of achievements and the establishment of ties between peoples.

Intercultural communication among young people is of great importance for the development of tolerance, respect for diversity and overcoming stereotypes. Interaction with representatives of other cultures allows young people to expand their horizons, realize and appreciate differences, as well as find common ground. In the future, having this experience helps many students feel confident when traveling abroad, allows them to participate in exchange trips among students, develop and invent various joint projects, study and work in a wider list of professions than people without the knowledge of languages and experience in communication with different nationalities. All this contributes to the formation of civic consciousness and the ability for constructive dialogue, which is an important factor for the development of society as a whole. If we take the field of science, then intercultural communication allows us to develop in scientific fields, share experience, data, which leads to successful achievement in the relevant areas.

For consideration, let us take the most accessible way of interethnic communication among young people – social networks. Modern technologies and social networks have significantly changed the ways young people communicate. Now there are international messengers for communication with relatives from different parts of the world, as well as for creating chats and joint communication with people of different nationalities. Nowadays, young people actively communicate with people from other countries and nations through various messengers and social networks. Some of the popular platforms include WhatsApp, Snapchat, Telegram, Discord and WeChat (these sites are allowed to be used at the time of writing on the 25th of October 2023). These applications provide the ability to exchange messages, photos, videos and audio recordings, as well as conduct video calls. Thanks to them, young people can easily establish contact and keep in touch with people from different cultures and countries, exchange experiences, learn about differences and similarities in cultural values and traditions. This opens up new horizons for intercultural communication. Young people are faced with the need to adapt to different communication styles, cultural norms and values, as the presence of slang, abbreviations of words and spoken language in general is very different from what is studied in textbooks or dictionaries.

Now I would like to highlight the factors that can hinder the effective interaction of young people from different cultures. Young people, entering into intercultural interactions, face some obstacles that can make it difficult to understand and communicate effectively. As mentioned earlier, these are language barriers.

Strengthening the study of foreign languages will help to reduce problems in understanding and facilitate communication.

Cultural differences are also considered an important factor. They arise in divergences of values, norms and customs and lead to misunderstandings and conflicts. Preparing young people to interact with representatives of other cultures, including the study of history, traditions and customs, will help overcome cultural differences, especially when sending young people to international participation forums. Stereotypical judgment and prejudice often collide when forming opinions about different peoples. Preconceived notions hinder the establishment of trusting relationships and effective commuication. There are many such examples: the attitude towards Jews or the post-war years, many still perceive Germans as those who can kill people, or Circassians as a poor ill-mannered people.

All this is caused by a lack of cultural competence. Insufficient knowledge and understanding of the cultural characteristics of other people leads to misinterpretation and misunderstanding. Conducting educational programs and intercultural events aimed at this area will allow dispelling myths or confirming unknown aspects from the life of a particular people.

One cannot help mentioning technological barriers, a factor that causes some difficulties in different periods of time. Restrictions on access to modern communication technologies can make virtual communication and information exchange difficult.

Intercultural communication of young people is a complex process, but with the application of appropriate approaches and recommendations, obstacles can be overcome, which contributes to the development of tolerance, mutual understanding and harmonious relations between different cultures.

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ENHANCING ITALIAN LANGUAGE LEARNERS' INTERCULTURAL AWARENESS THROUGH HISTORY IN CLIL CONTEXTS

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Abstract. The article reveals the key advantages of CLIL methodology in enhancing intercultural awareness of Italian language students. The purpose of the article is to substantiate the role of history in fostering learners' intercultural awareness in the framework of SOFT CLIL methodology. The authors advocate that Italian language teaching should involve exposing language learners to the materials reflecting the connection between historical events and cultural peculiarities. The authors focus on how Italian history can be integrated into the Italian language curriculum.

Keywords: CLIL, the Italian language, intercultural awareness, national dominants, history, Italian language learners, integration.

СОИЗУЧЕНИЕ ИСТОРИИ И ИТАЛЬЯНСКОГО ЯЗЫКА С ЦЕЛЬЮ РАЗВИТИЯ МЕЖКУЛЬТУРНОЙ ОСВЕДОМЛЕННОСТИ СТУДЕНТОВ В УСЛОВИЯХ ПРЕДМЕТНО-ЯЗЫКОВОГО ИНТЕГРИРОВАННОГО ОБУЧЕНИЯ

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Аннотация. В статье раскрываются основные преимущества методики CLIL в повышении межкультурной коммуникации студентов, изучающих итальянский язык. Целью статьи является обоснование роли истории в формировании межкультурной осведомленности в рамках методики SOFT CLIL. Авторы статьи выступают за то, чтобы преподавание итальянского языка включало в себя ознакомление учащихся с материалами, отражающими связь между историческими событиями и культурными особенностями. Авторы сосредоточены на том, как история Италии может быть интегрирована в учебную программу по итальянскому языку.

Ключевые слова: CLIL, итальянский язык, межкультурная осведомленность, национальные доминанты, история, интеграция.

It is well-known that each stage of social development evokes certain requirements to the university curricula and the set of skills that future graduates should acquire [1]. Intercultural problems might arise when we either communicate based only on the national cultural views ignoring the rules and values of the interlocutor's culture or are unable to express our attitude to a foreign partner according to their expectations [2, 3].

Intercultural communication is a vast, multifaceted and complex subfield in the realm of communication studies. If we want to improve the effectiveness of communication we engage in whenever we encounter folks from another cultural standpoint, we should be aware of cultural differences [2, 3, 4, 5].

In the contemporary world, a wide range of requirements are imposed on young people. They need to have a broad outlook, knowledge of history, literature and the arts, but they also need to be technically savvy and understand basic anatomy, physics and chemistry. Due to the constant change of events and the rapid development of technology, students become increasingly aware of the importance of comprehensive knowledge and the ability to perform any given task. They realize that in the near future they will have to compete with artificial intelligence for jobs, which is why they consider it important to improve their knowledge in various spheres and to be well-rounded individuals. In turn, education should help students to do this, adapt to their needs and take into account their wishes in creating conditions for the acquisition of universal knowledge.

Scientific studies have discovered that a lot of Italian language learners do not see any connection between the content input in the framework of Italian language courses and peculiarities of the target culture members' communicative behavior [3, 4, 6, 7]. Therefore, Italian language teachers face the challenge of helping their students to avoid the above-mentioned disconnection. It is generally recognised that experiencing a target culture encourages foreign language learners to understand their own culture [8, 9]. It is of crucial importance to stress the fact that in the framework of the current paper the authors focus on the foreign culture.

In order to bridge this gap Italian language teachers need not only to integrate content learning and Italian language learning across the curriculum, but also demonstrate the connection between the content discipline and cultural peculiarities in the framework of the aforementioned curriculum. In this case authentic historical texts are viewed as sources that unveil the cultural peculiarities and enable Italian language learners to enhance their intercultural awareness of the target culture. Thus, it is of primary importance to find the possible ways of incorporating history in the Italian language curricula. In this respect, CLIL methodology seems to be the one that could solve the challenge of linking history and Italian language learning.

Let us consider the theoretical background that justifies the pedagogical technology of CLIL. In the human cognitive system linguistic concepts are not separated but interact and undergo transference. For example, when lessons are taught in English, this does not necessarily mean that only the part of the brain responsible for this language develops during the learning process. Definitions and concepts learned in one language are transferred to another language [10, 11, 12].

As it was already mentioned, researchers consider mastering a foreign language

as a key skill, the possession of which at an advanced level enables students to develop their communication skills. Such an understanding of the abovementioned approach is of paramount importance in the framework of the changes taking place in the sphere of foreign language teaching methodology [6, 13]. In addition to this fact, the understanding of the need to study the content of the academic discipline can motivate foreign language students to enhance their level of proficiency in a foreign language.

Scholars assume that due to these facts students' motivation develops, increases; fluency is considered much more important than correctness of speech. The critical analysis of scientific literature has shown that CLIL approach has the following advantages: the use of cultural content; training students for the real intercultural communication, including intercultural professional environment; learning of a vast range of different disciplines, building and development of foreign communicative competence, the content subject defines what language structures are necessary to study. Regarding the studies devoted to CLIL methodology, we should mention that this approach is based on four interrelated fundamental components, the so-called "4C": content, cognition, communication, and culture [13].

Scholars point out that due to these four components, learning goals and results can be described and divided in a more efficient and accurate way [1, 6, 9 10, 11, 12, 13]. It seems necessary to examine these components: the first is responsible for the content of the discipline. Subjects such as history, maths, economics, art, literature, geography, communication technologies, computer science, subjects of the natural science cycle, philosophy, etc. can be taught in the target language.

It has been stated that the basis of the following component is the determination of the status of a foreign language, which is the following triad within in the light of the application of CLIL methodology: language as a means of cognition (language of learning), language as a discipline (language through learning) and language as a communication tool (language for learning). It is of vital importance to highlight that in the framework of this approach as well as in the light of communicative approach, the amount of time dedicated to students' activities should also exceed teacher's talking time to provide students with more opportunities to practice a foreign language. In other words, students' talking time should exceed teachers' talking time. In addition to this fact, content-language integrated learning is designed to implement self-control, cross-control and group feedback forms.

The third, cognitive component of this methodology is aimed at developing the cognitive skills of students. The use of inductive and deductive techniques by students, the development of critical and creative thinking, as well as the ability to evaluate, analyse, and synthesize various information will certainly contribute to a more effective learning process [9].

The final element of the methodology we consider is culture, which plays a huge role in understanding ourselves and representatives of other cultures. Culture is the essence and key concept of this methodology [13]. Researchers in the field of CLIL advocate that content of the discipline is rather easy to select, but the problem in the framework of this approach is how to teach this content. Content learning is considered more effective when students' cognitive skills are well developed. Therefore, CLIL teachers should involve students in the studying process more actively, helping them

realize the content of the discipline and see the benefits they acquire from studying the content [1, 6, 8, 9, 10, 11, 12, 13, 14].

The crucial importance of integration of the intercultural component into the learning process has been widely recognised by numerous scholars. The use of the intercultural aspect of the content in the framework of CLIL makes it possible to consider and analyse topics from different cultural perspectives, taking into account the cultural differences and similarities. The great advantage of CLIL is the opportunity to assess the uniqueness of values and worldviews of different societies. Besides fostering the development of versatile individuals, CLIL has several other advantages. By acquiring universal knowledge of the culture of the target language, learners have a better chance of building effective intercultural communication. In times of globalization, when many countries seek to cooperate, share experiences and achievements, professionals need to connect with each other and organize productive interactions. Knowledge of countries, culture and general social context helps to increase the effectiveness of communication with people from other countries.

Studies have discovered that in the CLIL curriculum, it is not rare when the learning of a subject is not culturally related, for instance, in science, maths or PE. However, as it has been stated, the cultural aspect can be integrated in the framework of foreign language courses with the help of SOFT CLIL [6, 9, 10, 11, 12]. Understanding the subject of the discipline, development of critical thinking, cognitive activity, and a foreign language learning cannot be developed by themselves [13].

According to scholars, the following structure can be applied that encompasses: Input (authentic, meaningful and challenging materials; tasks, aimed at higher order thinking, student interaction, authentic communication, subject specific study skills); Output (intercultural communication, accuracy, fluency, CALP) and Scaffolding [1, 6, 9, 10, 11, 12, 13]. It is necessary to mention that in the framework of the current research the authors discuss the issue related to integration of history and humanities with the purpose of fostering and developing cultural awareness of Italian language students.

Let us focus on the first component of this structure. Studies highlight that the aforementioned characteristics defined for Input, should be taken into consideration while selecting materials [6, 13, 14]. These are viewed as the main criteria for materials. Scholars are deeply convinced that meaningful and challenging input is one of the cornerstones of foreign language acquisition.

However, it is worth noting that there are two types of CLIL: hard and soft. The hard option means studying any subject in a foreign language, while the soft option allows you to study the language taking into account topics from other subjects. Soft CLIL is more based on the study of lexical material by reading texts. Different topics of texts allow you to study specific, academic vocabulary and collocations at the same time. Nevertheless, CLIL technology increases the possibilities of the teacher, different forms and methods of teaching can be used during the lessons.

The most common forms are:

– Scaffolding: solving a complex problem in which a student needs the help of a teacher, with further consideration of such tasks, the student acquires the necessary knowledge and skills, and he needs less and less teachers' tips [15].

– Role plays: help in the development of speaking, and they are also best suited when passing the history, literature of the country, as students can stage skits on given topics and consolidate their knowledge.

– Mind-maps: when working with lexical units they help to structure the material and systematize knowledge [10, 11, 12, 14].

Content in the light of CLIL approach should be meaningful in a sense that it is connected not only with global problems, but also with the lives of the learners and their spheres of interests. It is of paramount importance to mention that, according to numerous studies comparing different CLIL-textbooks, the cultural component has not been properly exploited yet [1, 6, 9, 14, 16, 17]. In light of the dearth of intercultural components included in various CLIL textbooks, the authors of the current paper are deeply convinced that a source of the mentioned component could be historical texts in Italian.

It was discovered that people's desire to interact with foreign interlocutors significantly increases the better they know each other. Scientists firmly believe that history defines cultural peculiarities and differences. Let us give an example. Language, being the carrier of cultural traditions, is intrinsically linked to culture. Scientists firmly believe that Italian culture has rich traditions in arts, literature, and food [2, 3, 4, 18]. Italians are very proud of their food and cuisine. The author would like to highlight the fact that if foreign interlocutors would like to cooperate with Italians in an effective way, they should be aware of Italian culinary traditions. It has been proved that Italian cuisine is considered a complex and diverse collection of regional cuisines, influenced by the historical events. Each region has its own characteristics that make it unique. Being from the same country, dishes differ drastically in their specialities that are embedded in the Italian language. Foreign invasions impacted a lot on the traditional Italian cuisine. Being firmly connected with the culture, Italian regional food traditions were shaped and determined by the foreign dominance. When learning Italian and food-related words, students discover that southern Italy is famous for such desserts as torrone, cannoli, cubbaita, and cassata brought by the Arabs into Sicily [18]. Additionally, it is necessary to stress the importance of the fact that the Arabs introduced sweets from almonds, the art of making sherbet and ice cream.

Moreover, the Arabs brought cinnamon, nutmeg, cloves, saffron, sesame seed, couscous, apricots, marzipan. Except for it, the Arabs introduced such new cash crops as rice, cotton, and new irrigation systems enhanced intensive farming. These peculiarities can be found when learning and exploring Italian words.

Let us give some other examples concerning traditional cuisine. Scholars state that the northern part of Italy is characterised by hearty dishes. Friuli Venezia Giulia, being the most northeastern Italian region, is influenced by the historical events connected with the reign of Austria. For instance, Friulian dishes include different stews and soups.

Scholars in the area of history, foreign language education and intercultural communication have collected considerable data to verify that culture can be manifested at different levels of communication and encompass diverse aspects to investigate [1, 5, 8, 9]. Culture, being the ongoing negotiation of learned and patterned

beliefs, attitudes, values, and behaviors, has deep roots in history and language [2, 13, 18]. Researchers advocate that representatives of different countries not only speak different languages, but the ways of their communicative behavior differ drastically from one country to another one. It is of paramount importance to highlight the fact that history determined and influenced a lot the communicative behavior of representatives of every country [3, 7, 9, 18]. The undebatable connection between history and communicative behavior has been investigated in many scientific works [8, 9, 16, 18].

Being divided in twenty regions, Italian regions differ from each other drastically. Each Italian region has its own characteristics to explore and discover. Therefore, citizens of every region are different from members of a neighboring region a lot. It has been widely recognized that one of the dominants of the Italian national character is theatricality [6, 18], being defined by the scholars as a serious and sincere attitude towards their social status, and their wish to behave according to expected stereotype patterns.

It is worth pointing out that Italy was divided into many small principalities. This fact refers to their patriotic feeling, focused primarily on their native village. It has been proved that Italians are folks of the small motherland. Many scholars are deeply convinced that this fact should be taken into consideration when teaching the Italian language. It is rather difficult to say what exactly played the decisive role in Italians' attitude towards the small homeland. The scientists argue that foreign dominance or national disunity could be of crucial importance to Italians' being people of the small homeland. It is of vital importance to highlight the fact that the Italians are viewed as very patriotic people. It is worth mentioning that this patriotism is manifested in their love for cultural achievements, a particular region, a city or a town. It is crucial to emphasize that the Italians are focused on themselves, their intimate family and personal goals. Taking into account the above-mentioned cultural peculiarities, the scholars advocate that Italian culture is an individualistic culture [2, 18]. The above-mentioned peculiarities impact on the national character of Italians. They put emphasis on prioritizing personal needs and needs of their immediate families.

Scholars state that Italian culture belongs to the individualistic culture, especially its northern part. The value of equality, which is characteristic of the West, governs the choice of different polite devices and makes the style of communication egalitarian and person-oriented, implies keeping of the negative face without impeding the hearer's autonomy [3, 4, 7, 18].

From a cognitive linguistics point of view, it has been stated that cultural values are manifested in the language. Being polite in the Italian language means respect for the addressee's autonomy and his choice to fulfill the desired actions. In order to exercise negative politeness, native Italian speakers use certain linguistic means aiming at mitigating the possible communicative imposition on a hearer [3, 4, 7].

It is necessary to stress that this fact determines the type of Italian culture. Individualistic culture is based on the value of individual autonomy, personal responsibility for the consequences of decisions, respect for personal space, respect for the personal space of the interlocutor; the main unit of society is a person, any decisions are made exclusively individually, personal initiative is always a priority, personal

achievements are always highly valued, competition is approved, personal goals are put at the forefront, the child is an independent member of the society, and independence and equality are key characteristics.

It is of vital importance to highlight the fact that the Italians appreciate the impeccable professionalism, and try to build a very good professional reputation. They always try to do their best. This fact refers either to profession, or a trade.

To identify the need for applying CLIL methodology among undergraduate students studying Italian as a foreign language, we conducted a survey. The respondents were given a set of open questions Seventeen Italian language students took part in the survey. We found out that 82.4 % of respondents would like to study other subjects in a foreign language. This result indicates that there is a need to introduce CLIL technology into the learning process (Figure 1)

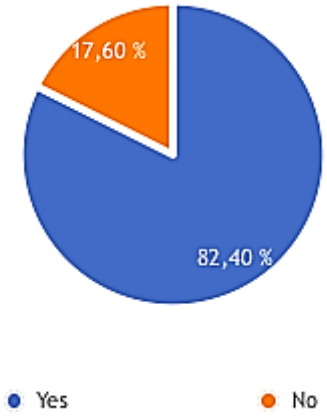


Figure 1. Need of integrating CLIL methodology

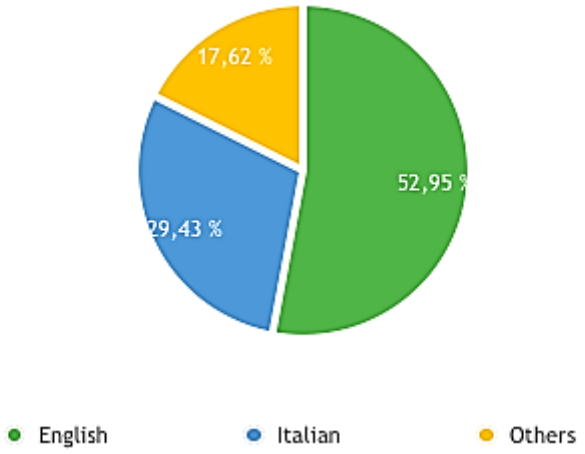


Figure 2. Preferable languages to study a subject in

It is worth noting that students would like to study other subjects predominantly in English: 52.9 % of respondents chose this option, but Italian is the second most popular, represented by 29.4 % of respondents (Figure 2).

The key indicator for us was the answer to the question: whether the students have enough hours allocated to Italian to be fluent in the language, since 88.2 % answered “no”. Consequently, we can assume that learners need more practice of the

language, so the methodology we are considering in the framework of the current paper could significantly increase the possibility of developing and increasing the level of Italian to B2-C1, which allows them to become fluent in the target language. It has been acknowledged that foreign language classes are becoming more and more scarce at universities. Despite this fact, there is a great demand for language learning among foreign language learners. Italian language students stressed that they would like to have more Italian language classes (Figure 3).

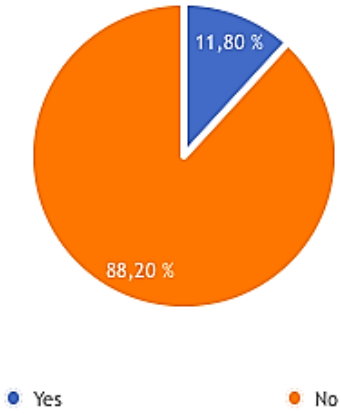


Figure 3. Current concern about scarce Italian language classes

Moreover, 60 % of the respondents, when answering the question “What would you like to change in the Italian language curriculum?” indicated that they would like more conversational practice of the Italian language. 26.7 % of respondents noted that it is necessary to systematise the Italian course, students suggested choosing one teaching-methodical complex and following it, to divide the course into the study of separate aspects of the language, to clearly distinguish the topics. It is also important for students to pay more attention to learning and practicing foreign vocabulary. One student suggested expanding the course and adding separate disciplines: literature, history, geography of the country (Figure 4).

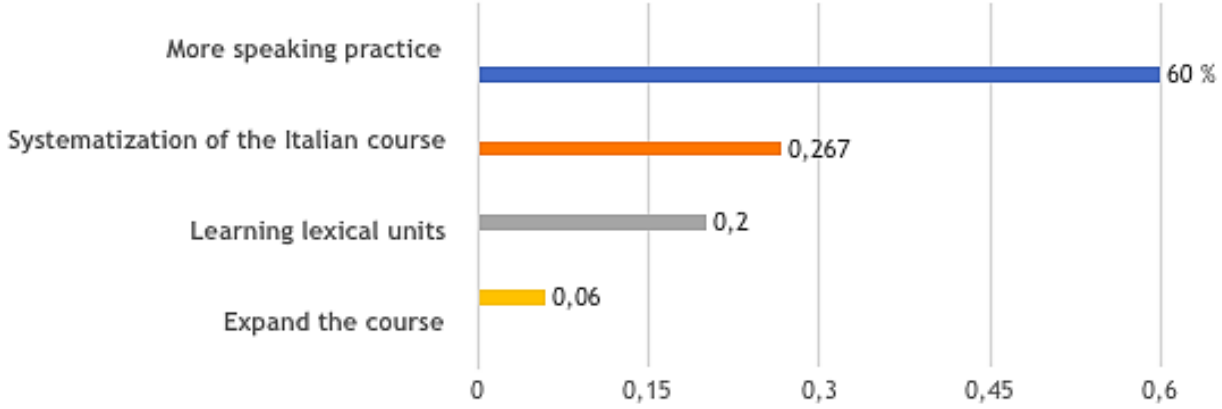


Figure 4. Desired curriculum changes among Italian language university learners

The obtained data allowed us to find out that students most of all want to study Italian culture and history in Italian. Some of the respondents cited literature,

geography and art history. And one student would like to take a course in Italian on teaching methodology: modern teaching technologies.

We asked students what topics they would like to be covered in Italian language classes. We found that Italian language students are most interested in art, literature, history, and the culture of Italy. In addition, the respondents indicated that they would like to know more about music, food, sports, cinema, fashion and traveling. Several students indicated economics, politics, and modern society in Italy.

Thus, we can see that there is a high demand among the students for more language learning, namely more attention to speaking and learning lexical units. Moreover, students see the need to study other subjects in the target language, and they would like to add some subjects or topics to the Italian language course such as literature, art, history and geography of Italy. This is why we find CLIL technology extremely important and useful in its application, it allows us to meet the requirements of learners and it can be used to improve language proficiency among undergraduate students.

The main conclusion that can be drawn is that teaching history with the purpose of enhancing Italian language students' intercultural awareness is possible due to the SOFT CLIL approach aiming at simultaneously learning the Italian language and a subject. The conducted research enables the authors to conclude that advantages of the aforementioned approach encourage foreign language learners to develop their communication skills, cognitive skills, learn a new subject content, discover the cultural aspect and the connection between history and the national character of Italians. The available evidence suggests that intercultural awareness is an indispensable and crucial aspect of intercultural communication, including professional settings. The conducted analysis unveiled the benefits of learning history in fostering intercultural awareness among Italian language learners and yielded the paramount importance of integrating this discipline into the Italian language curriculum. The authors assume that viewing the connection between history and cultural peculiarities that shape human behavior will not seem abstract to Italian language students due to the evidence that the content and language value of the selected historical texts will not lie outside practical application.

The authors assume that the results obtained are consistent with the contemporary demands that the specialists of every professional sphere cope with. The findings are considered the initial stage of the future research that could fruitfully explore the above-mentioned issues further by practical application of the activities designed and based on the historical texts among Italian language students with the purpose of enhancing their intercultural awareness.

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DEVELOPMENT AND USE OF TELEGRAM BOTS IN MODERN COMMERCE

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Abstract. The article considers the role, importance and application of Telegram-bots in modern commercial activity. The main directions of application of bots for automation of sales, marketing, data analysis, customer support, order and payment processing are analysed. The prospects of Telegram-bots development and their influence on business process optimisation are also discussed.

Keywords: Telegram bots, business processes, marketing, automation, artificial intelligence, data analysis, machine learning, customers.

РАЗВИТИЕ И ИСПОЛЬЗОВАНИЕ ТЕЛЕГРАМ-БОТОВ В СОВРЕМЕННОЙ КОММЕРЦИИ

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Аннотация. В статье представлены роль, значение и применение Telegram-ботов в современной коммерческой деятельности. Анализируются основные направления применения ботов для автоматизации продаж, маркетинга, анализа данных, поддержки клиентов, обработки заказов и платежей. Также рассматриваются перспективы развития Telegram-ботов и их влияние на оптимизацию бизнес-процессов.

Ключевые слова: телеграм-боты, бизнес-процессы, маркетинг, автоматизация, искусственный интеллект, анализ данных, машинное обучение, клиенты.

In today’s world of information technology and digital transformation of business, the use of new technologies and tools to optimise business processes and improve the efficiency of commercial activities is of particular importance. Among the many tools and platforms available, one of the most popular and widely used is the

Telegram messenger. The advantages of this messenger are a high level of security, as it uses advanced encryption measures to protect user data, cross-platform, so people can use the application on different devices, and high speed data transfer and the ability to exchange files of different formats. A huge plus is the fact that in one application the user gets the opportunity to combine communication, viewing news channels, the ability to undergo various online training, and also the possibility to maintain and monetise one's own channel, where the author shares information with the subscribers. An important component of Telegram are bots – automated software agents that perform certain functions and help users quickly and efficiently cope with various tasks. This article will consider one of the topical and promising issues related to the use of Telegram bots in the modern commercial sector.

This topic is relevant due to a number of factors. Firstly, the use of Telegram bots can significantly simplify and speed up a number of tasks related to sales, marketing, customer support and order processing. Secondly, the integration of bots into business processes makes it possible to reduce the cost of routine operations and increase the efficiency of work [1]. Third, due to their functionality, Telegram bots can be used as a tool to analyse and monitor user behaviour, allowing to optimise marketing campaigns and improve customer service. Finally, the constant development of technology and the emergence of new opportunities in the field of artificial intelligence and machine learning opens up new prospects for improving and expanding the functionality of Telegram bots.

A Telegram bot is a programme designed to automate user communication using the Telegram messenger. They are created using Telegram API and provide users with various functions such as receiving information, sending notifications, performing tasks, etc. [2].

The specificity of Telegram bots lies in their ability to interact with users through Telegram chats. They can reply to messages, process commands, send notifications, and more [3]. Telegram bots can also use multimedia files such as images, audio and videos to provide information and entertainment to users.

In addition, Telegram bots can be programmable, which means that their functionality can be extended and customised to meet the specific needs of users. They can also integrate with other services and applications such as online shopping, banking systems, news feeds, etc.

Creating Telegram bots allows businesses to significantly reduce manual labour costs and improve communication with customers. Bots are able to process queries, answer questions and solve tasks faster than humans. In addition, Telegram bots can work around the clock, allowing businesses to improve customer service and support.

The main uses of Telegram bots in commerce are as follows:

– Sales: Bots can automate sales by helping with alerts about new products and promotions, answering customers' questions and advising them on products and services. They can also process orders and accept payment.

– Marketing: Bots are used to analyse user behaviour, gather information about customer preferences and optimise advertising campaigns, as well as send notifications about new products and promotions.

– Customer Support: Bots process user requests and provide information about the company's products and services, solve technical issues and help resolve problems that arise.

– Content Management: Bots manage corporate content, publish news on the corporate website and social media, send notifications about new articles.

– Analytics and Monitoring: Bots analyse user behaviour and interests, collecting data to optimise marketing activities and improve service.

– Integration with other platforms: Bots integrate with other platforms and services, such as payment systems, to improve functionality and usability.

Training and Development: Bots provide training materials and resources for company employees to help them develop and enhance their skills.

Let us consider some examples of Telegram bots.

Shop bots. With the help of a bot you can create an online shop (Figure 1). Bot constructors allow you to make a catalogue, a shopping cart and set up online payment. The bot can be connected to a CRM system and track statistics.

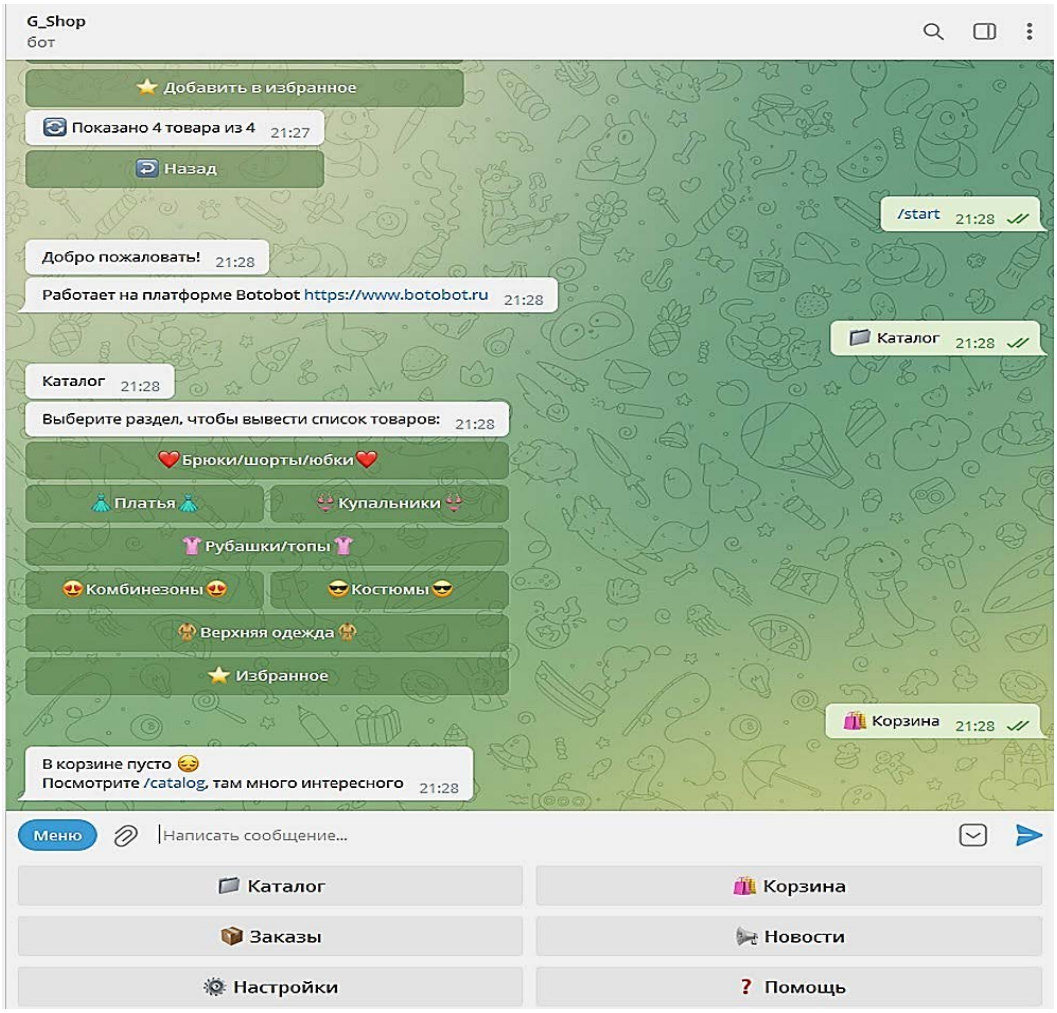


Figure 1. Telegram-bot of "G_Shop"

Chatbots. These are algorithms that answer customers' questions and help them solve tasks – for example, placing orders.

Assistant bots that communicate with customers in messages are a ubiquitous trend. According to Oracle surveys, more than 50 per cent of customers expect businesses to be available around the clock. For large companies, bots in mobile apps, social media and messengers have become almost mandatory.

A company's chatbot in Telegram (Figure 2) is a convenient and inexpensive way to stay in touch with a customer around the clock. Many brands communicate with customers in the messenger [2].

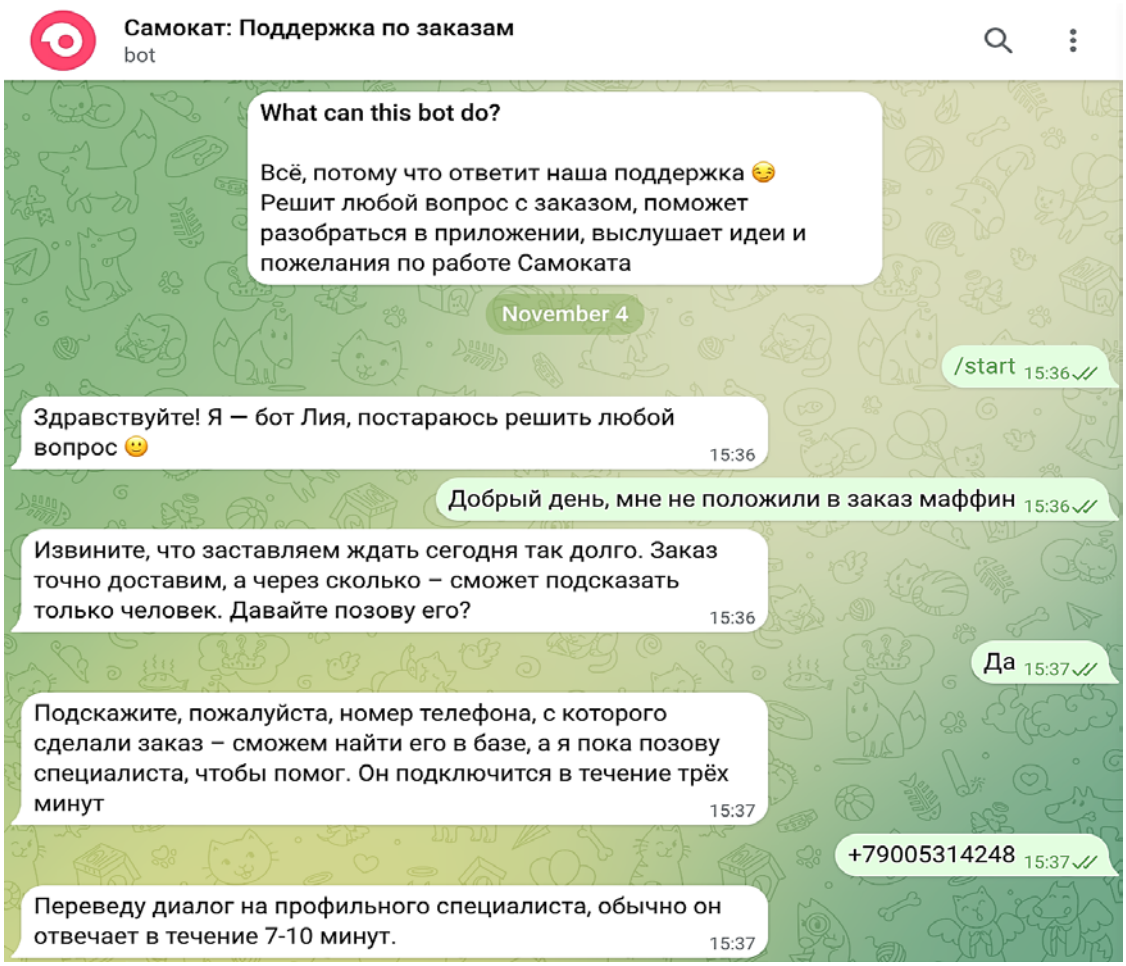


Figure 2. Telegram-bot of the "Samokat" delivery service

Chatbots are relevant for the restaurant business as well, as they can be set up to book seats, making the work of employees easier and offering customers a faster and more convenient way of booking.

Entertainment bots and bots with useful information.

Many such bots are designed to make money from advertising – but not all. For example, "Sber" launched a bot that generates pictures based on user requests. The bot is based on the ruDALL-E neural network for generating images (Figure 3). For users, such a bot is entertainment, but for the corporation it is PR and testing of the AI system.

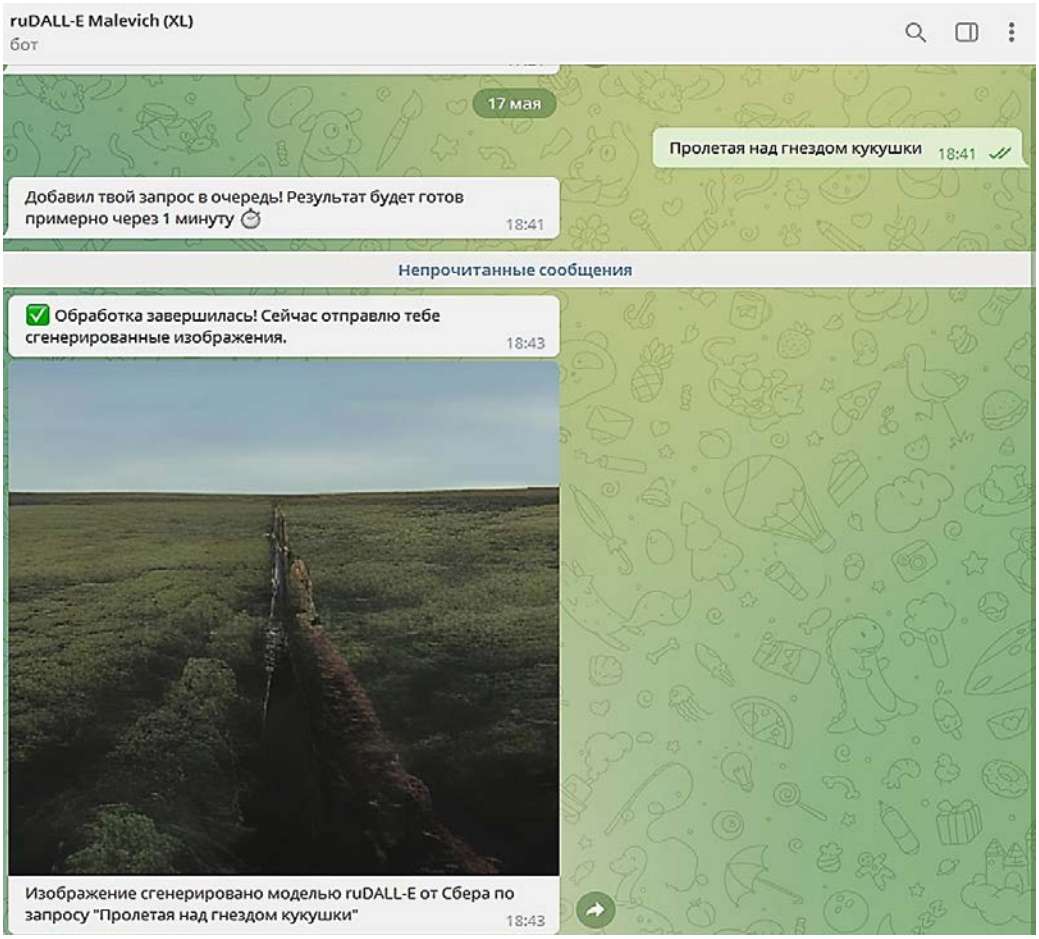


Figure 3. Sber’s Telegram bot

Such bots allow companies to increase brand awareness, gain audience loyalty, earn money from advertising sales, and promote the channels of their other projects.

With the development of technology and the expansion of functionality, Telegram bots will play an increasingly important role in commercial activities, providing greater efficiency, automation and optimisation of business processes. The prospects for Telegram bots are linked to the development of technologies such as artificial intelligence, machine learning, data analysis and others. This will allow bots to become more intelligent, perform more complex tasks and analyse large amounts of data. In addition, the growing popularity of Telegram will lead to an increase in the number of users and bots, which will contribute to the development of the bot market and create new business opportunities [4].

Companies will be able to create bots to automate business processes, provide additional services and improve service quality. In general, the use of Telegram bots can significantly affect the optimisation of business processes and improve interaction between customers and companies.

The prospects for the development of bots include:

– expanding the functionality of bots;
– improvement of algorithms for processing requests;
– integration with other services and platforms;

– use of artificial intelligence and machine learning for more accurate analytics and optimisation of processes;

– development of new bot models adapted to different types of business [5].

The use of Telegram bots is a relevant and promising trend in modern commercial activity. Bots make it possible to automate a number of tasks, such as sales, marketing, customer support, order and payment processing, content management and data analysis. This helps to optimise business processes, reduce costs and increase the efficiency of companies.

With the development of technology and the emergence of new opportunities in the field of artificial intelligence and machine learning, the functionality of Telegram bots will be constantly expanded and improved. This opens up new opportunities for businesses and allows them to improve customer service, optimise marketing campaigns and analyse user behaviour.

Thus, the use of Telegram bots is becoming an integral part of modern commerce and will continue to develop in the future.

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УДК 620.9

ON THE ISSUE OF IMPROVING THE ENERGY EFFICIENCY CLASS OF OLD BUILDINGS

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Abstract. This work is devoted to an urgent problem: improving the energy efficiency of old buildings. The article presents various methods, their comparison and application possibilities. The analysis of information sources and regulatory documents on energy efficiency of buildings and modernization of engineering systems is carried out. An overview of the impact of modernization on the energy efficiency of old buildings was also done.

Keywords: energy efficiency, renovation, glazing, lighting, thermal insulation.

К ВОПРОСУ ПОВЫШЕНИЯ КЛАССА ЭНЕРГОЭФФЕКТИВНОСТИ ЗДАНИЙ СТАРОЙ ЗАСТРОЙКИ

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Аннотация. Данная работа посвящена актуальной проблеме – повышению энергоэффективности зданий старой застройки. В статье представлены различные методы, их сравнение и возможности применения. Проведен анализ информационных источников и нормативных документов по энергоэффективности зданий и модернизации инженерных систем. Также был произведен обзор влияния модернизации на энергоэффективность зданий старой застройки.

Ключевые слова: энергоэффективность, реконструкция, остекление, освещение, теплоизоляция.

There is an urgent problem of inefficient use of energy in the design and operation of buildings. This leads to excessive expenditure of resources and an increase in the environmental burden on the environment. Old buildings built before the introduction of modern energy efficiency norms and standards are particularly vulnerable in this regard. Energy efficiency classes of apartment buildings are determined based on energy consumption and thermal characteristics of the building.

Energy efficiency classes are usually indicated by letters from A to G, where Class A means the most energy efficient building and class G means the least energy efficient. The purpose of classifying the energy efficiency of apartment buildings is to help building owners and tenants make decisions related to the energy efficiency of the building, as well as to help government agencies and energy experts develop policies and regulations in this area [1].

The problem of low energy efficiency in old buildings is due to the low level of insulation, inefficient heating and air conditioning systems, outdated windows and doors that let in heat and cold. Moreover, such buildings often have a low level of automation and control, which leads to excessive energy consumption. To improve the energy efficiency of old buildings, their reconstruction is necessary: modernization of insulation, windows, heating and lighting systems. However, reconstruction is a difficult task, as this process requires significant financial costs and time. At the same time, it is necessary to take into account the preservation of the historical appearance and architecture of the building.

Energy saving measures aimed at heating play an important role in improving the energy efficiency of buildings (Figure). They help to reduce heating costs and improve indoor comfort.

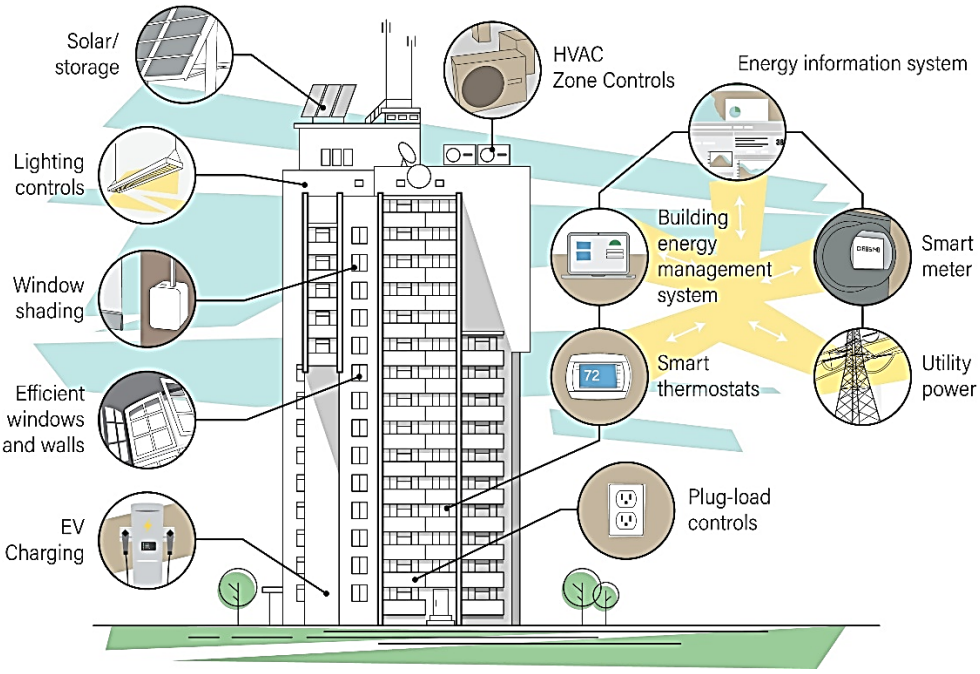


Figure. Energy efficient building

Building thermal insulation is the process of creating a barrier between the internal and external environment of a building in order to reduce heat loss and increase thermal comfort indoors. Thermal insulation can be carried out on all elements of the building, including walls, roof, windows, doors, floors and pipelines.

The main principle of thermal insulation is the use of materials with low thermal conductivity, which reduce the amount of heat transmitted through the material. These can be materials such as mineral wool, expanded polystyrene, polyurethane foam and others.

Wall insulation includes the use of insulation materials and waterproofing materials that help keep the heat inside the building and protect the walls from moisture and water.

Thermal insulation of the roof is carried out by using insulation materials and waterproofing materials that help keep the building warm and protect the roof from moisture and water.

Thermal insulation of windows includes the use of double or triple glazing with a low coefficient of thermal conductivity and seals. Glazing helps to minimize heat loss from old buildings, increasing energy efficiency, provides better insulation, reducing the need for excessive heating. The improved glazing design maximizes natural lighting, reducing the need for artificial lighting and energy consumption. Selective glazing can control the influx of solar heat, improving the temperature control inside the building. Modern glazing also prevents condensation, reducing potential damage and the need for additional heating [2].

Floor insulation is carried out by installing insulation materials and waterproofing materials that help keep the building warm and prevent cold air from penetrating through the floor.

The installation of thermal insulation in a building can lead to a significant economic effect, as this reduces the consumption of thermal energy for heating. In percentage terms, savings can range from 20 % to 50 %, depending on many factors such as the condition of the building, the presence of leaks, etc. [3] .

Electricity in apartment buildings is used to illuminate common areas (corridors, stairwells, basements), the operation of elevators, the operation of pumps of the water supply and sanitation system, ventilation, as well as to power general household appliances and meters for resource consumption. In addition, residents can use electricity for their personal needs (household appliances, apartment lighting). Replacing incandescent lamps with more efficient fluorescent and LED lamps is one of the simplest and most effective ways to reduce energy costs in homes.

Incandescent lamps, despite their cheapness, are the most inefficient light source. Most of the energy spent on their work is converted into heat, not light. At the same time, fluorescent and LED lamps consume much less energy to produce the same brightness of light.

Energy savings when replacing incandescent lamps with LED and fluorescent lamps can be up to 15-25 %. This can lead to a significant reduction in energy costs in homes. In addition, such a replacement also reduces maintenance costs, since more efficient lamps have a longer service life and require fewer replacements.

The outlet load control is a device that allows you to control and optimize power consumption in home and office environments. It works on the principle of automatic switching on and off of electrical appliances depending on their load and energy needs. Here are the main characteristics and advantages of this energy saving method:

– Energy saving: Managing the load on the outlet allows you to reduce electricity consumption, thereby saving money on energy bills.

– Automation: The device automatically detects when electrical appliances should be turned on or off, which facilitates the energy management process and reduces the time spent on manual operation.

– Flexibility: The outlet load control can be used with various types of electrical appliances such as lighting, air conditioners, heaters and others.

– Smart Home: Integration with smart home systems allows you to control the load on the outlet remotely via a mobile app or voice commands, which adds convenience and flexibility in energy management.

– Protection and safety: Outlet load control devices can prevent electrical appliances from overloading and overheating, which reduces the risk of fires and equipment damage.

In general, the outlet load control is an effective and practical energy saving method that can be easily integrated into home and office environments to optimize power consumption and reduce costs.

Also, one of the most effective energy saving measures in residential buildings is the replacement of household meters. The new meters can be equipped with remote control and monitoring systems, which allows you to manage energy consumption and take measures to save them. In addition, replacing old meters with new, more modern and accurate models can lead to lower utility costs, since new meters usually consume less energy for their operation and provide more accurate readings of resource consumption [4-7].

Comparing methods such as glazing, lighting modernization and thermal insulation, it can be said that for old buildings, a combination of all three aspects is the most suitable solution for improving energy efficiency, since it takes into account both the use of natural resources and the need for heat conservation. However, from the point of view of the most appropriate economic solution, thermal insulation usually provides the best long-term economic efficiency by reducing heating and cooling costs, as well as offering potential savings in maintenance and repair costs. Retrofitting lighting can also provide a quick return on investment by saving energy, while improving glazing can provide a moderate increase in energy efficiency, but can be more expensive and have longer payback periods.

Russia’s Energy strategy for the period up to 2030 was approved in 2009 and defines the key directions for the development of the country’s energy sector. The main objectives of the strategy are to ensure the reliability and stability of energy supply, increase energy efficiency and competitiveness of domestic energy technologies, as well as reduce the negative impact on the environment.

The main directions of development of the Russian energy sector within the framework of the strategy until 2030 include:

– The development of traditional energy sources such as oil, gas and coal. Russia is one of the largest producers and exporters of these fuels in the world, and the development of these industries remains a priority.

– The development of nuclear energy. Russia is one of the leading countries in the field of nuclear energy, and the strategy provides for further development of this industry, including the construction of new nuclear power plants.

– The development of renewable energy sources. The strategy provides for the development of renewable energy sources, such as solar, wind and hydropower, in order to reduce dependence on traditional energy sources and decrease the negative impact on the environment.

– Improving energy efficiency. The strategy provides for measures to improve energy efficiency in various sectors of the economy, including industry, transport and the housing and communal services sector.

– Development of the energy sector infrastructure. The strategy provides for the development of the energy sector infrastructure, including the construction of new energy facilities and the modernization of existing ones.

– Development of export potential. The strategy provides for the development of the export potential of the Russian energy sector, including the export of traditional energy sources and technologies in this area.

– Reducing the negative impact on the environment. The strategy provides for measures to reduce the negative impact on the environment, including reducing emissions of greenhouse gases and other harmful substances.

The goal of Russia's energy strategy for the period up to 2030 is to ensure the sustainable development of the energy sector of the countries [8].

In Order No. 98/pr dated May 15, 2016, the Ministry of Construction of the Russian Federation approved an approximate form of a list of measures that will help management organizations maintain and even increase the energy efficiency class of the building. The Ministry of Construction of the Russian Federation recommends that management organizations regularly monitor their performance:

– heating systems,
– hot and cold water supply systems,
– power supply and lighting systems,
– door and window structures,
– enclosing structures and ventilation.

As a result of data analysis, it can be concluded that the low energy efficiency of old buildings is one of the main problems at present. Most often, this is caused by outdated engineering systems, inefficient thermal insulation and other factors, while most of these buildings continue to be used for residential, office and industrial needs, which leads to high energy costs and significant environmental pollution.

Improving the energy efficiency of old buildings will reduce energy consumption and utility costs, as well as cut the emissions of carbon dioxide and other harmful substances into the atmosphere. This problem is relevant for many countries, and its solution is becoming increasingly necessary in the light of growing energy consumption and climate change.

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PLASTIC RECYCLING IN SAINT PETERSBURG: PROBLEMS AND SOLUTIONS

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Abstract. The article is dedicated to the exploration of current issues and solutions related to plastic recycling in Saint Petersburg. An analysis of the plastic recycling situation abroad has been conducted. The merits and drawbacks of the applied production and technological solutions have been identified, along with potential ways of secondary use of plastic waste. The activities of the Nevsky Environmental Operator servicing Saint Petersburg and the Leningrad Region in 2021 and 2022 have been examined. As a result, an analysis and recommendations for the current state of plastic recycling in Saint Petersburg have been compiled.

Keywords: plastic recycling, solid household/municipal waste, secondary raw materials, waste disposal.

ПЕРЕРАБОТКА ПЛАСТИКА В САНКТ-ПЕТЕРБУРГЕ: ПРОБЛЕМЫ И ПУТИ РЕШЕНИЯ

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Аннотация. Статья посвящена исследованию актуальных проблем и решений переработки пластика в Санкт-Петербурге. Проведен анализ ситуации по переработке пластика за рубежом. Выявлены достоинства и недостатки применяемых производственно-технологических решений, пути возможного вторичного использования отходов пластика. Рассмотрена деятельность обслуживающего Санкт-Петербург и Ленинградскую область Невского экологического оператора по результатам 2021 и 2022 гг. В результате составлен анализ и рекомендации к текущему положению по переработке пластика в Санкт-Петербурге.

Ключевые слова: переработка пластика, твердые бытовые / коммунальные отходы, вторичное сырье, утилизация.

Currently, the issue of environmental pollution by plastic waste is becoming increasingly relevant and serious. Saint Petersburg, as one of the largest and most developed cities in Russia, is not immune to this problem. The introduction and expansion of plastic recycling in Saint Petersburg have become an integral part of the strategy for sustainable development and environmental protection.

Plastic is one of the most common and convenient materials in modern society. However, the issue of its recycling is becoming increasingly acute, as many countries and cities face a lack of infrastructure for plastic waste disposal, and Saint Petersburg is no exception. This article not only addresses the importance and relevance of this problem but also examines the current state of plastic recycling issues in Saint Petersburg, outlining the main steps and initiatives aimed at improving this area of recycling in our city. An analysis of the plastic recycling situation abroad is conducted, highlighting the drawbacks and advantages of the applied production process.

In Saint Petersburg, there are a number of enterprises engaged in plastic recycling. However, the infrastructure for the recycling of plastic waste leaves much to be desired. Existing enterprises often struggle with the growing volume of plastic waste, leading to its accumulation and environmental pollution [1].

For successful waste management and recycling, it is necessary to control all stages of recycling. At present, however, this process rather resembles fragmentation, where each company deals with its own part. In Saint Petersburg, for example, activists from the “Separate Collection” movement handle the sorting and transportation of recyclable materials in the first two stages. This is less of a business and more of an enterprise driven by a passion for the cause. Then business players, such as “Recover Green” or even large companies like “Pulkovo”, take over the stage of separate collection, partly due to the international image that is important to them.

Citizens, showing initiative and bringing waste to collection points, help to gather recyclable materials. This material is then sorted and packed into huge bags, which move to the next stage – small private recyclers. In Saint Petersburg, there are many of these, and each specializes in a narrow recycling niche. Some handle the recycling of specific types of plastic, glass, or aluminum, transforming them into granules, chips, or sheets, respectively.

In the next two stages, manufacturers create new glass bottles, plastic mops, buckets, metal cans, or paving tiles from recycled materials. It is important to note that in Saint Petersburg, there is no company that can cover all five stages of recycling under one “roof”.

The problems of plastic recycling in the city:

– One of the main drawbacks of plastic recycling in Saint Petersburg is the insufficient organization of the collection and sorting of plastic waste. This results in a significant portion of plastic not entering the recycling process;

– The existing plastic recycling technologies limit the possibilities for using various types of plastics. For instance, plastics with different types of polymers require different recycling methods, complicating the process;

– Non-compliance with recycling standards can lead to soil and water resources pollution, which negatively impacts the environment and human health.

Throughout the year, a vast amount of waste is generated in Saint Petersburg, reaching a figure of 2.4 million tons – a weight that even exceeds that of the Egyptian pyramids. The issue of waste disposal is not only relevant in our city but also across the country. In this article, we will examine the journey of waste after it is discarded: what gets a second chance and what ends up forgotten at a landfill. We will also discuss the roles and decisions in this system and how the waste reform has impacted the situation [2].

Current issues related to waste management in Russia cast doubt on the effectiveness of companies responsible for waste management. One such organization is JSC “Nevsky Ecological Operator” (NEO).

One of the key elements of NEO’s activities is the collection and management of waste in Saint Petersburg. Citizen feedback on this matter is varied. Some note the regularity of waste collection and the cleanliness of residential areas, while others express dissatisfaction with the inefficiency of collection and lack of control over illegal waste dumping [3].

The company primarily operates on funds collected from the population for waste management services. However, according to some reviews, concerns about transparency in the allocation of these funds are raised.

Questions arise about how exactly the company spends the funds received from citizens and how effectively it uses them to improve the waste management system. The lack of a clear and transparent policy regarding the financial activities of NEO becomes a subject of criticism from citizens.

Table – Tariff for solid municipal waste management service by JSC “Nevsky Ecological Operator”

№	Tariff	Unit	For the year 2022 (with calendar breakdown)	
			from 01.01.2022 to 30.06.2022	from 01.07.2022 to 31.12.2022
1	2	3	4	5
1.1	Other consumers (excluding VAT)	RUB/cubic m.	808,08	1050,36
1.2	Population (including VAT)*	RUB/cubic m.	969,70	1260,43

Let us take a look at the provided figures (Table). Residents pay for garbage disposal according to established norms. In apartment buildings, these parameters are as follows: each month, 0.0066 cubic meters of waste accumulate per square meter of the building area. To calculate the cost of waste disposal per apartment from December 1, 2022, it is necessary to multiply 1367 by 0.0066 and then multiply by the apartment’s area in square meters. Thus, starting from December 2022, the tariff became 9.0222 rubles per square meter. For comparison: in November 2021 (before the start of the “Waste Reform”), the tariff was 5.58 rubles per square meter [4].

The question that needs to be raised is: what is the reason for such a significant increase in prices?

One of the main drawbacks of the proposed tariff policy is the lack of clear justification for the price increase. The company has not provided detailed information about the factors that led to such changes, raising questions from consumers and the public.

A “pay-as-you-throw” tariff could be introduced: payment depends on the volume of waste disposed of by the residents at the container site – the payment amount corresponds to this volume.

One year after the implementation of activities by the Nevsky Ecological Operator, citizens of Saint Petersburg began paying 41 % more for waste disposal services. Compared to 2021, this increase amounted to 57 %.

The fairness and logic of calculating waste disposal fees based on the area of the premises can be a subject of debate. Nonetheless, the fact remains unchanged. Let us consider hypothetical yet realistic examples from life. Suppose a family of four lives in a one-bedroom apartment measuring 33.4 square meters, while a single individual occupies a three-bedroom apartment measuring 65 square meters. The former would pay 301.6 rubles per month for waste disposal, while the latter – 586.95 rubles. It does not matter that since last January, the owner of the larger apartment has not increased their consumption and, consequently, the volume of waste they generate. They are obligated to pay this exact amount.

In conclusion, the presented figures indicate the unjustifiability of the price increase for solid municipal waste management services by JSC “Nevsky Ecological Operator”. Such changes require additional justification and consideration from the public, regulatory bodies, and the representatives of the company themselves.

Another major shortcoming of the company is the limited sorting of waste. Despite participating in the waste reform, JSC “Nevsky Ecological Operator” faces the problem of insufficient capacity for full waste sorting. This leads to a significant portion of waste, including plastic and other recyclable materials, still being sent to landfills.

In addition to limited sorting, the efficiency of the recycling process at the company is questionable. Only a small percentage of waste is sent for recycling, leading to a large volume of trash that still ends up in landfills. This contradicts the goals of the waste reform aimed at reducing landfill volumes.

The waste sorting process carried out at the company’s facilities does not always meet environmental safety standards. The impact on the environment from the collection and sorting process can lead to negative consequences for nature and the health of people in nearby areas.

The company faces criticism regarding the lack of transparency in its operations. Citizens are not always provided with complete information about what happens to their waste after collection. This creates additional doubts and dissatisfaction among the population regarding the waste management system.

The waste reform introduced in Russia with the aim of optimizing waste management is influencing the work of NEO. Some positive changes in the waste collection and recycling system may occur as a result of the reform, but questions about

the efficiency and transparency of financial management remain open. Transparency in financial management and attention to citizens' needs could become key factors in enhancing the company's efficiency and its impact on the environment.

Let us start from the moment a plastic bottle is discarded into a mixed waste container in one of the yards in Saint Petersburg. Garbage trucks arrive daily, but at different hours depending on the route.

At this stage, two possible paths lie ahead for our bottle. It can be sent to a landfill, where it will decompose over more than 450 years. The alternative is a processing facility, where the waste will be sorted and sent for recycling.

Most waste streams in Saint Petersburg are not sorted, as the capacity to do so according to this scheme is insufficient, and the likelihood that your bottle will end up in a landfill is 50 percent.

Initially, it will be taken to a "transfer station" – a site where waste is transferred from a relatively small garbage truck to a larger trailer truck, and on the same day, it will end up at the landfill. (Figure 1).

Similarly, the plastic (bottle) sent to a processing center named "Ecovast" undergoes a journey. On the way, which takes just over an hour from the city, our bottle will be compressed among many other bottles, cans, rags, and other waste. Modern garbage trucks can compact 120 cubic meters of waste down to 22 cubic meters.



Figure 1. Municipal solid waste landfill

Thus, the bottle arrives in the industrial zone in the south of Saint Petersburg. Waste brought from all over the city is dumped onto a moving conveyor belt, and then workers begin to manually sort the waste. There are 5-7 workers on the belt, each responsible for their own fraction. During an 8-hour shift, they select around 4 tons of waste for recycling. They could do more, but tied-up garbage bags hinder their work. "It's better not to tie the bags or to throw the waste and the bag separately," they request at the center (Figure 2).



Figure 2. Manual sorting of municipal solid waste

In Saint Petersburg, there are factories that accept glass, metal, paper waste, and plastic. However, despite the transformation of waste into recyclables, the journey of the bottle includes transportation over a distance of 511 kilometers to Tver. At the Tver Plant for Secondary Polymers (TPSP), waste, including our bottle and other plastic containers, which accumulate there to about 40 tons, is processed into PET flakes or PET flex. These materials can then be used to create a variety of products, from car wash brushes and roofing tiles to pavement slabs and sleeping bags. These are just a few examples of the potential transformations for our bottle.

However, alas, no more than 10 percent of waste is directed for recycling. The remaining waste goes to landfills.

It is understood that this crucial step – the disposal of waste – is sometimes necessary due to the morphological composition of the garbage, including food waste and large construction materials, which cannot yet be efficiently recycled. These wastes take up space in landfills.

The waste reform that began in 2019 in Russia is aimed at improving the waste management system. Authorities are striving for 100 percent sorting of waste and reducing the volume of landfill by half by 2030. The reform includes the elimination of illegal dumps and the construction of waste processing complexes.

In Saint Petersburg, container sites, garbage bins, and containers for separate waste collection have been introduced. However, separate collection is not yet a mandatory element of the system, and a large amount of waste still ends up in landfills.

Experts assert that to solve the waste recycling problem, a complete and “radical” transition to separate collection is necessary. Such a method of waste sorting would allow reducing the amount of waste requiring landfilling by 70 percent by weight and 90 percent by volume. Separate collection is recognized as cheaper and more effective compared to building expensive recycling plants.

Analysis and Recommendations:

– To address the issue of inadequate collection and sorting of plastic waste in Saint Petersburg, an effective system of separate waste collection should be implemented. This would increase the volume of recyclable plastic and improve the quality of sorting.

– Investment is needed in research and development of new plastic recycling technologies that can more efficiently use different types of polymers. This will help reduce the amount of plastic sent to landfills and decrease the negative impact on the environment.

– It is important to carefully ensure that enterprises engaged in plastic recycling adhere to environmental standards and regulations. Violations can lead to serious environmental problems that will be difficult to rectify.

Brief information about three foreign enterprises engaged in plastic recycling:

1. Veolia Environment S.A. (France)

This is a global company specializing in waste management, water resources, and energy. It offers solutions for recycling and reusing various types of plastics, including PET bottles and HDPE packaging. Veolia is also working on improving recycling processes to increase the output of secondary raw materials and reduce environmental impact. Veolia Environment S.A [5].

Pros:

– Veolia operates in various regions of the world, allowing it to provide a steady stream of recycled material to international clients.

– The company actively implements innovative technologies to improve recycling processes and enhance the quality of the final product.

– Veolia is considered a leader in sustainable waste management practices and actively works to reduce its carbon footprint.

Cons:

– Market fluctuations in the prices of secondary raw materials can impact the economic stability of the company.

2. SUEZ (France)

SUEZ is another major international company that offers plastic waste processing services. The company focuses on the collection, sorting, and processing of plastics, turning them into high-quality secondary materials for industry. SUEZ is also actively developing new methods for chemical plastic processing to create new types of polymers.

Pros:

– SUEZ is recognized for its efforts in environmental protection and water resource management, which enhances its market reputation.

– SUEZ offers a wide range of services, making it a key player in the waste processing market.

Cons:

– The complexity of projects and the need for individual solutions can lead to increased time and cost for their implementation.

3. PreZero (Germany)

PreZero is a part of the Schwarz Group and is an international waste management company that offers services for processing various types of waste, including plastic. It actively works to increase the proportion of recycled plastic by implementing state-of-the-art sorting and processing technologies to create sustainable material cycles and close material loops.

Pros:

– Being a part of the Schwarz Group, PreZero has access to significant resources and market influence.

– The company strives for innovation in plastic recycling, enhancing the efficiency and environmental friendliness of processes.

– PreZero is committed to closing material loops, improving sustainability, and reducing waste.

Cons:

– As a relatively new player in the market, PreZero may face challenges in gaining the trust of customers.

– A significant portion of PreZero's operations relies on the internal network of the Schwarz Group, which may limit its flexibility in working with external clients.

These companies play a significant role in the global plastic recycling industry, making a substantial contribution to the development of environmentally sustainable technologies and the reduction of plastic waste.

Plastic recycling is an important task in terms of environmental preservation and the rational use of resources. In Saint Petersburg, it is necessary to improve the separate collection and sorting of plastic, actively work on enhancing the infrastructure and recycling technologies, and adhere to environmental standards.

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USE OF DIGITAL TWINS AS A WAY TO PREDICT EQUIPMENT FAILURES

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Abstract. This paper contains general information about digital twins, their purpose and functionality, successful applications in large companies, as well as software and possible algorithms for successful implementation of this innovation. Optimisation, modelling, prevention of possible equipment or system failures are discussed.

Keywords: digital twin, manufacturing, optimisation, modelling, economy, intelligent systems.

ИСПОЛЬЗОВАНИЕ ЦИФРОВЫХ ДВОЙНИКОВ КАК СПОСОБ ПРЕДСКАЗАНИЯ СБОЕВ ОБОРУДОВАНИЯ

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Аннотация. В данной работе содержится общая информация о цифровых двойниках, их цель и функционал, примеры успешного применения в крупных компаниях, а также программное обеспечение и возможные алгоритмы для успешной реализации данной инновации. Рассматривается оптимизация, моделирование, предотвращение возможных сбоев оборудования или систем.

Ключевые слова: цифровой двойник, производство, оптимизация, моделирование, экономия, интеллектуальные системы.

In the rapidly changing global energy sector, ensuring equipment reliability and efficiency is becoming a key aspect of power system management. With the ever-increasing dependence on complex technological devices and equipment in the energy sector, predicting potential failures and responding to them promptly becomes an integral part of ensuring uninterrupted power supply. The concept of digital twins brings an innovative approach by providing virtual models of real objects and systems.

This paper discusses the use of digital twins as an effective method for predicting equipment failures in the power industry. The development of digital twin technologies in recent years provides unique opportunities for modelling, monitoring and analysing the performance of power equipment. Their virtual counterparts allow one not only to monitor the current state of the system, but also to anticipate likely failures, which in turn allows timely action to be taken to prevent potential failures and minimise downtime.

Digital twins are virtual analogues of physical objects, processes or systems created using real-time data and advanced modelling algorithms. In the energy sector, digital twins are virtual models of energy equipment or infrastructure that accurately reflect their physical characteristics and functionality (Figure 1).

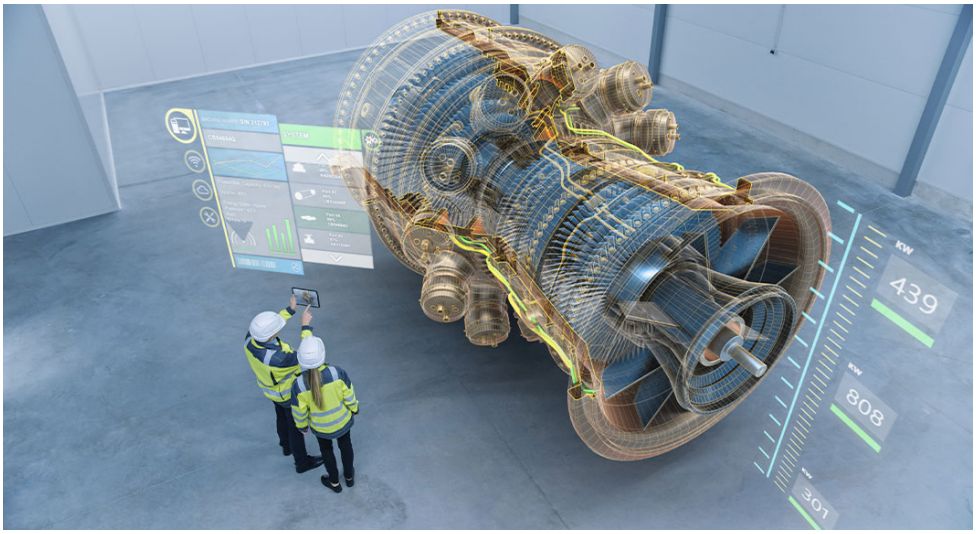


Figure 1. Virtual prototype of equipment

The main purpose of digital twins in the power industry is to provide a deeper understanding of the operation of real objects and systems. Virtual models make it possible not only to control the current state of equipment, but also to analyse past data, predict future events and optimise operational processes [1].

One of the key features of digital twins is their ability to be rapidly updated according to real-time changes. Using data from sensors, IoT devices and other sources, digital twins provide an accurate and up-to-date reflection of the current state of energy systems.

Let us take a look at the capabilities of digital twins, which include:

– Production process modelling. Virtual models of energy equipment allow for detailed simulation of production processes, which is useful for optimising operation and control.

– Equipment condition monitoring. Digital twins constantly monitor equipment performance parameters, providing operational monitoring and warning of potential problems.

– Failure prediction. Data analysis algorithms embedded in digital twins predict potential failures and malfunctions, enabling prevention measures to be taken.

– Resource optimisation. Digital twins help to optimise the use of resources such as energy, time and materials, and consequently finances, which contributes to more efficient and economical operation of energy systems [2].

Let us consider the algorithms that can be integrated into digital twins for continuous monitoring and analysing the state of power equipment:

1. Machine learning methods:

– Classification and regression algorithms can analyse and identify patterns in data, which is useful for predicting malfunctions based on archived data and current equipment operating parameters.

– Cluster analysis is able to identify groups of similar objects or patterns, which can be useful for identifying features that precede failures.

2. Time series algorithms:

– Exponential smoothing based forecasting (ETS) takes into account trends and seasonal patterns in the data, which is important for preventing cyclic failures of power systems.

3. Physical modelling:

– Modelling based on physical principles is used to create digital twins considering physical laws, which improves the accuracy of prediction of equipment or system failures [3].

A combined approach that includes various data analysis methods allows creating more accurate, reliable and efficient digital models to prevent failures and malfunctions in power systems.

To see the relevance and effectiveness of using digital twins in industry, let us look at examples of how this system has been implemented in large companies.

General Electric has implemented digital twins to optimise the operation of gas turbines (Figure 2). The creation of virtual models allows the company to monitor the condition of equipment in real time, predict possible failures and disturbances and optimise production processes. This makes it possible to reduce maintenance costs, increase efficiency and ensure more reliable operation of power plants [4].

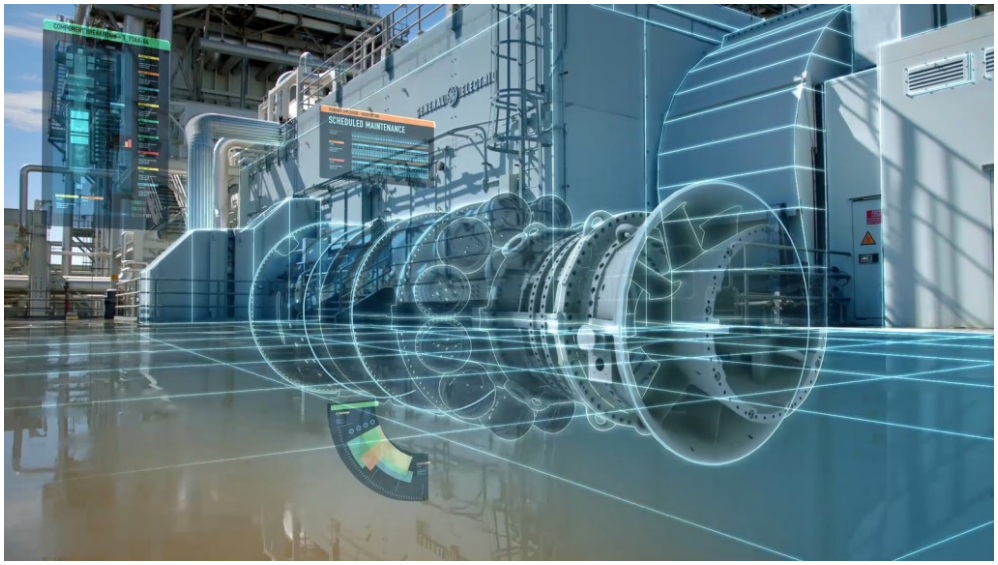


Figure 2. Virtual analogue of equipment on the example of GE [4]

Digital twins at Siemens analyse and process 3D images via software, which then enables warehouse robots to grasp any object in logistics tasks, regardless of its shape and size (Figure 3). A trained deep learning algorithm identifies the most suitable gripper positions in 3D and signals the robot control. Reliable positions become known in a short time, allowing high throughput systems to be utilised without damage inside the box.

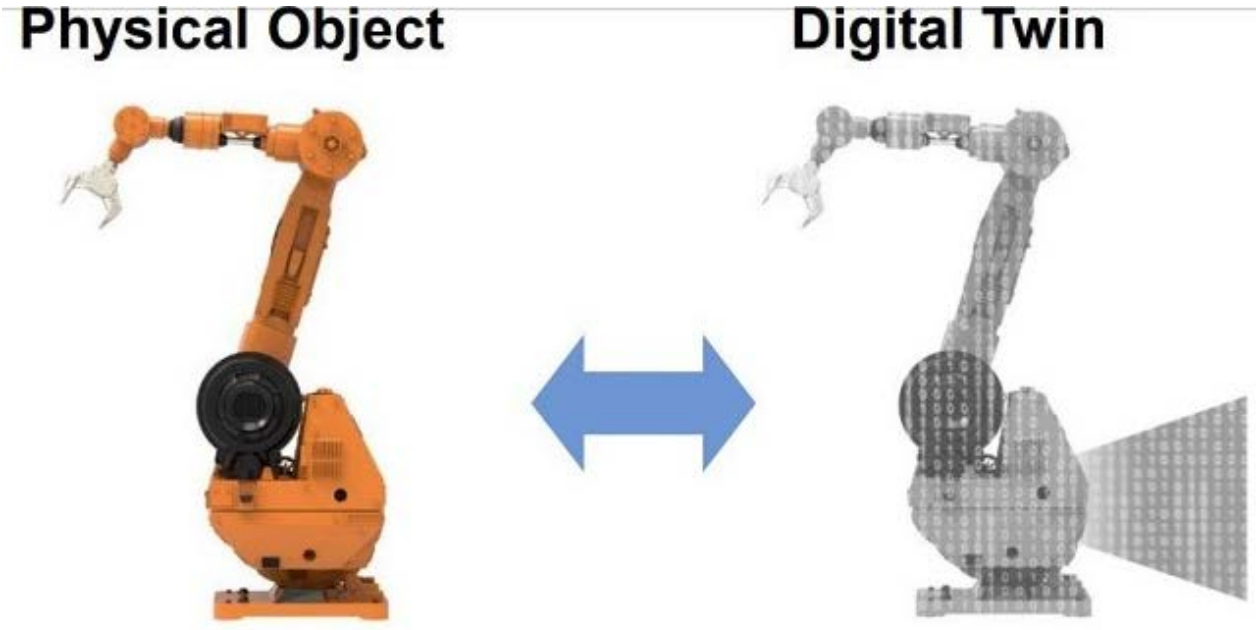


Figure 3. Digital twin of the Siemens warehouse manipulator

Successful realisation of digital twins requires powerful software. Depending on the production and intent, this can vary, let us consider some more examples.

Ansys Twin Builder is a platform solution to assist in the development of digital twins. This multi-technology system enables the creation of simulation-based digital twins – digital representations of equipment with real sensors. The software enables fast and easy system development by combining multi-domain system modeling capabilities with extensive libraries of 0D elements for different applications, 3D solvers and lower-order models. The solution is capable of combining pre-installed base and industry-specific component libraries with custom libraries. Models can be created both in common programming languages (e.g. C/C++) and in standard modelling languages.

The COMSOL Multiphysics platform can handle both individual and coupled physical processes. Once a model is implemented, it can be used to create a simulation program with a multifunctional interface to solve typical problems. For efficient and ergonomic storage of models and applications COMSOL Multiphysics includes an administration system, which is a “cloud” for easy archiving of models in a database, control and management of different versions of models and related files. The software package can be supplemented with various extensions that allow the use of additional specialised tools, thus extending the functionality of the platform (Figure 4).

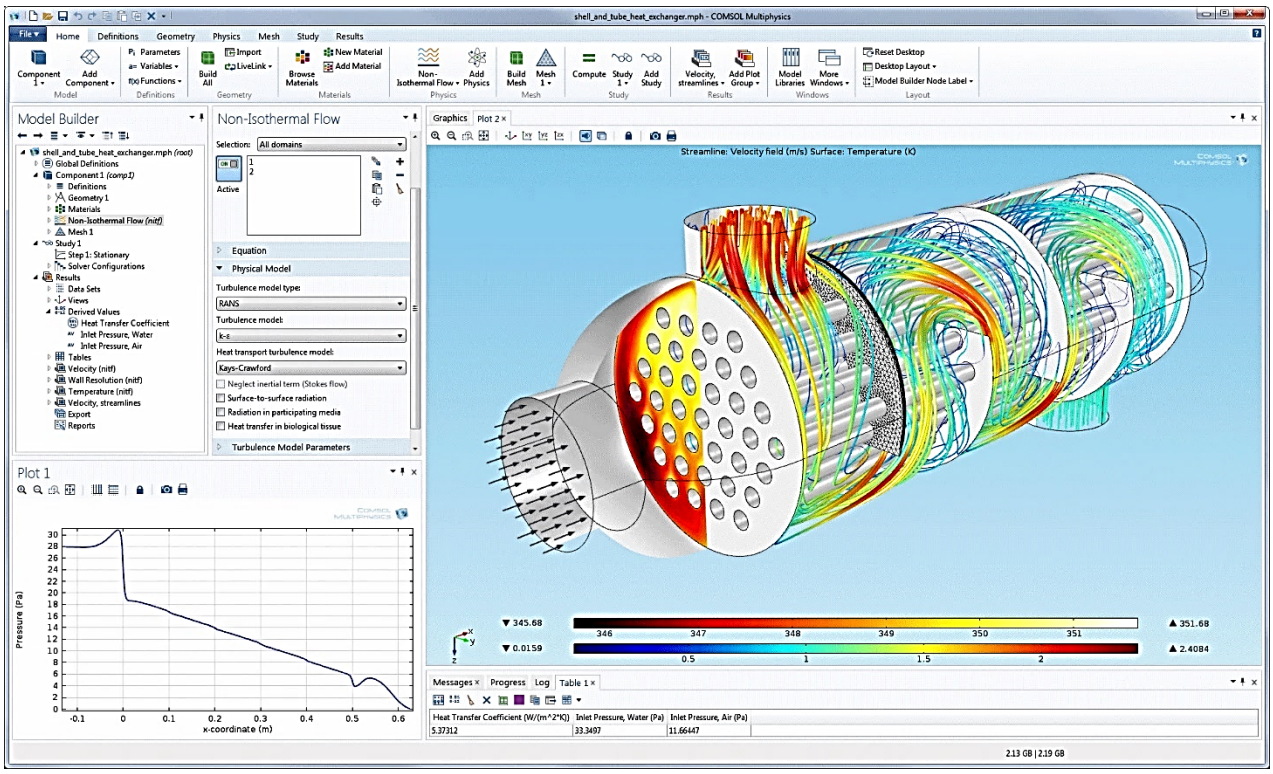


Figure 4. COMSOL Multiphysics software interface [6]

Tecnomatix Plant Simulation professional engineering software allows one to simulate and optimise production systems and processes. Using Plant Simulation, it is possible to optimise material flow, resource utilisation and logistics for all levels of plant planning – from global production capacities, through local plants to specific lines. The software helps create digital models to analyse system characteristics and optimise performance. The digital twin helps users conduct experiments and “what-if” scenarios without disturbing the existing production system or – when used in the planning process – well before the real system is installed. A wide range of analysis, statistics and diagramming capabilities are able to handle different production scenarios and make fast and reliable decisions even in the initial stages of production planning [5].

Such innovations in equipment management open new horizons for creating sustainable and efficient energy systems. The implementation of digital twins is becoming a key element of the strategy of modern energy companies seeking to ensure a reliable and efficient energy supply in the future.

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STUDYING THE RESILIENCE OF TEENAGERS LIVING IN A MILITARY CONFLICT ZONE

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Abstract. This article examines the phenomenon of “resilience” in the works of Russian and foreign psychologists. The analysis of the characteristics of resilience in adolescents living in the zone of military conflict is presented. The study was conducted among teenagers living in Makeyevka in 2023. The sample consisted of 50 people aged from 13 to 16 years.

Keywords: resilience, adolescents, risk-taking, involvement, control.

ИЗУЧЕНИЕ ЖИЗНЕСТОЙКОСТИ ПОДРОСТКОВ, ПРОЖИВАЮЩИХ В ЗОНЕ ВОЕННОГО КОНФЛИКТА

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Аннотация. В данной статье рассматривается феномен «жизнестойкость» в трудах отечественных и зарубежных психологов. Представлен анализ особенностей жизнестойкости у подростков, проживающих в зоне военного конфликта. Исследование проводилось среди подростков, проживающих в г. Макеевка в 2023 году. Выборку составили 50 человек, в возрасте от 13 до 16 лет.

Ключевые слова: жизнестойкость, подростки, принятие риска, вовлеченность, контроль.

In the modern world, a teenager faces a large complex of problems. A teenager grows and develops in the conditions of an ever-increasing pace and changing content of life, information and educational overload. The number of factors that lead to an increase in stress levels in adolescents is constantly increasing. Such a tense state of mind can often lead to negative consequences: affective disorders, suicidal and addictive behavior, impaired driving. According to E. Bern, “resilience” is an individual psychological property. It is a necessary resource that every teenager can rely on when choosing a future in the changing world [1].

According to sources, the term “resilience” was introduced into the conceptual apparatus in the early 80s of the twentieth century by American scientists S. Kobasa and S. Maddi.

Also in the scientific foreign literature, this phenomenon is considered by the following researchers: Lazarus and Folkman, Shyer and Carver, Solkava and Tomanek, Helen Lee, who characterize “resilience” as an indicator of a person’s mental health, his ability to use the available internal resources that help to manage them effectively, determine how much a person is able to cope with difficulties and changes [2].

In Russian psychology, D. A. Leontiev was the first to propose to designate this concept in Russian as “жизнестойкость”. D. A. Leontiev studies the concept of resilience in the context of the concept of personal potential and defines it as an integrative characteristic of a person who is responsible for success in overcoming life difficulties of various kinds. Resilience is considered as “the ability to overcome oneself” (D. A. Leontiev), as a certain degree of “survivability” (L. A. Alexandrova) [1].

Thus, domestic psychologists distinguish three main directions of studying the phenomenon of resilience: resilience as a resource potential of the individual, which can be in demand in certain situations (R. M. Rakhimova, V. D. Shadrikov, R. I. Stetsishina, S. A. Bogomaz); resilience as an integral psychological property of the individual, which develops on the basis of active interaction with life situations (S. V. Knizhnikova, L. A. Alexandrova, E. V. Medvedeva); resilience as an ability to socio-psychological adaptation based on the dynamics of semantic self-regulation (G. V. Vanakova, D. A. Leontiev, E. I. Rasskazova) [2].

At the same time, S. Maddi, analyzing resilience as a system of human beliefs, has developed a clear construct that contains three components: involvement, control, risk taking.

The “involvement” component characterizes the peculiarity of representations in a person in relation to himself, the world around him and the nature of interactions between them. It is a motivating component for a person, which helps to strive for self-realization, leadership, and a healthy lifestyle.

The second component is “control”, which reflects a person’s conviction that there is a causal relationship between his actions, efforts and results, events, and relationships.

If we talk about the third component, “risk taking”, then Maddy describes it as a certain conviction of a person that everything that happens to a person is a key factor influencing his development [3].

In the modern scientific literature, the problems of resilience are considered in various directions, the analysis of individual psychological is focused on characteristics of suicides among adolescents (A. E. Persian, E. V. Shvareva), personal characteristics of bullying participants in the educational environment (V. Yu. Lapteva, V. R. Petrosyants), manifestations of various deviations in adolescents (A. I. Laktionova, L. I. Kolesnikova, A. A. Oshchepkov) [4].

Based on the psychological and pedagogical analysis of the concept of “resilience”, we found out that this phenomenon is a key resource of the individual; it is considered an integral psychological property of personality, which develops on the basis of active interaction with life situations. That is, it is a necessary personal characteristic of modern teenagers.

The purpose of our research was to study the resilience of adolescents living on the territory of a military conflict. The study involved adolescents from the city of Makeyevka, Donetsk Region, in the number of 50 people aged from 13 to 16, 25 boys and 25 girls. We have used the method of "resilience" by S. Maddi, interpreted by D. A. Leontiev. This technique allows one to identify the level and nature of a teenager's resilience, the degree of involvement (the presence of goals and interest in life), control (belief in the possibility of influence on your environment and the world around you), risk-taking as a readiness for constant changes [5].

The methodology is a standardized test questionnaire, consisting of 45 statements, in relation to which respondents express the degree of their agreement or disagreement. The methodology presents three scales reflecting specific problems that a teenager may experience in life (involvement, control, risk-taking).

An analysis of the results (Table) obtained during this study shows that 41 (82 %) respondents have a low level of resilience. Low values of "resilience" are typical for people with low coping abilities with stressful situations. Only 9 (18 %) of adolescents have an average level of resilience, that is, they can react differently to life difficulties. There were no teenagers with a high level of resilience.

Table – Level characteristics of the parameters of the resilience of adolescents

Parameters	*Quantity*					
	low level		*medium level*		*high level*	
	respondents	*%*	*respondents*	*%*	*respondents*	*%*
Resilience	41	82	9	18	0	0
Involvement	7	14	17	34	26	52
Control	0	0	7	14	43	86
Risk taking	0	0	0	0	50	100

If we consider the component of "involvement", then 52 % of adolescents have a high level of the indicator according to this criterion. This means that students enjoy their own activities, they are confident in the effectiveness of their own active position. In the absence of such conviction, that is, with a low level of "involvement" of 14 %, there is a feeling of rejection, a feeling of being "out" of life. The less pronounced this component is, the less a person believes that there is meaning in his actions, he feels the futility of his own attempts to influence the course of events.

86 % of respondents have a high level of indicator for the "control" component. That is, teenagers have the conviction that they influence events that are significant for them, concentrate on performing tasks that require additional effort, set difficult goals for themselves, are not afraid of new, complex and unfamiliar situations.

If we consider the "risk taking" component, then 100 % of respondents have a high indicator on this scale. Based on the data obtained, we can say that such teenagers have the conviction that everything that happens to them contributes to their development through knowledge extracted from experience, no matter positive or negative. They see life as a way to gain experience, they are ready to achieve their goals even if there is no prospect of a successful result.

Thus, as a result of diagnostics, we can conclude that teenagers living in a military conflict zone are able to find activities that will bring them pleasure (updating external resources), can control the situation as much as necessary, set difficult-to-achieve goals and strive to realize them, are convinced that everything that happens to them contributes to development due to the knowledge extracted from experience. However, due to living in stressful situations, unpredictably changing environmental conditions, situations of uncertainty and fear, the ability of a person to withstand a stressful situation of choice, maintaining inner confidence, balance and not reducing the success of the activity is decreased. This indicates the need to work with this group of teenagers in order to form value orientations, develop coping strategies, and actualize personal resources.

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УДК 332.2

TECHNOLOGICAL SOVEREIGNTY OF RUSSIA: STRATEGIC GUIDELINES FOR REGIONAL DEVELOPMENT

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Abstract. In the context of ensuring economic national security, the issue of ensuring technological sovereignty becomes acute. When implementing an innovative transformation strategy, a search for solutions aimed at a rapid technological breakthrough is required. International technological cooperation, through the creation of new alliances, creates new risks of loss of economic national security. Consequently, the issues of finding the optimal balance between national security and minimizing costs through the cooperation of innovative projects are being updated.

Keywords: region, technological sovereignty, innovation, potential.

ТЕХНОЛОГИЧЕСКИЙ СУВЕРЕНИТЕТ РОССИИ: СТРАТЕГИЧЕСКИЕ ОРИЕНТИРЫ РЕГИОНАЛЬНОГО РАЗВИТИЯ

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Аннотация. В контексте обеспечения экономической национальной безопасности становится острым вопрос сохранения технологического суверенитета. При реализации инновационной стратегии трансформации требуется поиск решений, направленных на быстрый технологический прорыв. Международная технологическая кооперация через формирование новых альянсов создает новые риски потери экономической национальной безопасности. Следовательно, актуализируются вопросы поиска оптимального соотношения между национальной безопасностью и минимизацией затрат через кооперацию инновационных проектов.

Ключевые слова: регион, технологический суверенитет, инновации, потенциал.

The transition to the sixth technological order and the achievement of technological sovereignty of the national economy requires significant budgetary

injections and active participation of the state in regulating the development of systemically important industries.

The choice of the basic concept of government regulation depends on many macro and microeconomic factors and the socio-economic state of society.

Achieving sustainable development of the national economy and its individual segments, in particular the oil and gas complex, is impossible without government intervention. The more priority the area, the greater the role it plays in the formation of national well-being, the higher the importance of state regulation. The concept of ultra-liberalism is still dominant in economic science, according to which the economic activity of people itself is a process that self-regulates as production efficiency increases. In order for the economic sector to develop sustainably, it is necessary to provide scientific substantiation of methods for making economic decisions at the level of administrative and government levers. Economic theory and its methods must ensure predictability, efficiency and economy in the process of making economic and other decisions. Essentially, they are a science that studies the economic nature of economic phenomena.

Economic laws are a set of objectively determined, repeating, interconnected, interdependent and consistent properties of economic processes and phenomena that have a decisive influence on their results. As a rule, economic laws reflect the patterns and mechanisms of functioning of the economic system as a whole. In economics, the concept of laws means objective patterns. They reflect the strict correspondence in time and space of both essential elements, processes and their elements, and their interrelations. All economic laws represent an expression of the essence of economic processes, their special law – the law of correspondence. It lies in the fact that the existence of social phenomena appears in a certain way in their connections and relationships. All phenomena of economic life are reflected in those economic laws that determine their essence, objective content, their interaction and interrelation in the process of social production. Economic laws reflect objective connections in the economy and, as a rule, express the social nature of the emergence, change and cessation of economic phenomena and processes. Armed with the law of correspondence, it is possible to give an accurate description of what factors influence certain economic phenomena and processes that ensure the successful sustainable development of the oil and gas sector under conditions of multiple restrictions and thereby foresee the consequences, including in the future, of this impact.

During the period of transition to the sixth technological structure and energy transition, a system-functional approach to state regulation of the oil and gas complex seems to be the most justified.

Global challenges that determine Russia’s strategic perspective pose the task of ensuring national defense, security and sustainable development of society based on traditional Russian spiritual, moral and cultural values.

Providing measures aimed at achieving national economic interests is a complex and multi-level task, the solution of which requires the involvement of many subjects at different levels of national education. Systematicity, hierarchy, complexity – this is an incomplete list of requirements that arise when formulating national economic interests and measures aimed at achieving them.

In the long term, the implementation of national economic projects is a priority task of any state. State support must correspond to a certain level of economic efficiency and development goals of the state. In this case, such decisions not only can, but must be systemic in nature, taking into account the specifics of each specific subject [1].

Public administration measures that contribute to the achievement of technological sovereignty and stabilization of the economic situation during the period of impact of sanctions restrictions are as follows:

1) Reorientation of foreign trade relations, creation of new payment transaction mechanisms adapted to the new sanctions conditions. The anti-crisis strategy should be focused on maintaining an active balance of payments as a result of concluding new trade unions and developing directions for the development of the national economy by increasing the competitiveness of domestic goods, import substitution and growth of export operations [2]. Thanks to comprehensive measures aimed at finding and concluding new trade deals, the country managed not only to maintain, but also to increase the current account balance of payments surplus (according to preliminary estimates, for 9 months of 2022, the trade balance doubled that of 2021) [3] . The growth of positive cash flow was due to the successful anti-crisis strategy of the state and a reduction in imports into the country.

2) State support for the oil and gas complex, processing industry and production (primarily the defense industry) contributed to moderate growth of the national economy in the period from 2021 to 2022. The volume of mining production in real terms increased by 1.9 %, the production of medicines and materials used for medical purposes – by 21.5 %, the production of computers, electronic and optical products – by 4.6 %, the production of finished metal products – by 3.5 %. The weak positions observed in the areas of the automotive industry, electronics production, textiles and wood processing justify the need for direct government intervention through the activation of innovative projects that help create conditions for increased competitiveness and the replacement of manufacturers who have left the Russian market in the short term [4]. The weakness of these industries is due to the technological lag, which cannot be overcome without a systematic approach.

3) Inflationary risks arising from the impact of sanctions measures, voiced in official sources, were mitigated by support measures from the state. The expected effect of a significant drop in the well-being of the population in the Russian Federation turned out to be moderate, but the real level of inflation is comparable to the average in EU countries, which proves the negative impact of sanctions on the countries that impose them [5].

Solving the identified problems of achieving technological sovereignty is facilitated by the implementation of the following systemic and priority tasks.

The system of national economic interests can be built into a multi-level hierarchy, classified into certain groups, based on the designated criteria or classification features. This process makes it possible to break down a complex system of national economic interests into subsystems in order to develop more accurate, targeted solutions, the implementation of which becomes the goal of individual subjects or state regulators. The dynamism of economic systems makes it difficult to

maintain the sustainability of national economic interests, since they are subject to pressure from external factors and other states that oppose national interests while pursuing their own. Therefore, to solve problems of economic stabilization, sustainable national interests are of particular importance, covering not only the interests of the country, industry or business, but also the interests of consumers – millions of Russian citizens.

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APPLICATION OF ROBOTIC SYSTEMS IN MEDICINE

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Abstract. Nowadays automation plays an important role in many spheres of human activity and medicine is no exception. This paper considers the application of automation in medicine, especially in the areas of robotic surgery and diagnostic systems. The advantages and challenges associated with the use of robotics and automation in medical practice are analyzed, and the prospects and opportunities for future development of this field are discussed.

Keywords: automation, robotization, diagnostic systems, medicine, surgery, prospects, development.

ПРИМЕНЕНИЕ РОБОТИЗИРОВАННЫХ СИСТЕМ В МЕДИЦИНЕ

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Аннотация. В настоящее время автоматизация играет важную роль во многих сферах человеческой деятельности, и медицина является не исключением. В данной статье представлено применение автоматизации в медицине, особенно в области роботизированной хирургии и диагностических систем. Произведен анализ преимуществ и сложностей, связанных с использованием роботизации и автоматизации в медицинской практике, а также рассмотрены перспективы и возможности будущего развития данных сфер.

Ключевые слова: автоматизация, роботизация, диагностические системы, медицина, хирургия, перспективы, развитие.

Automation and robotization have long been an integral part of medicine and play an important role in improving the quality of care. With each passing year, their meanings and applications are increasingly expanding, bringing significant benefits to physicians and patients.

Doctors and researchers in medicine are constantly striving to improve the efficiency and accuracy of medical procedures, as well as to reduce potential risks to patients. Automation and robotization are coming to help achieve these goals. They make it possible to perform complex surgical procedures with high precision while minimizing human error.

One of the most striking examples of the application of automation and robotization in medicine is robotic surgery. Robotic surgeons have unique capabilities that allow them to perform complex operations with the highest precision and accuracy. They are equipped with innovative optical imaging tools, three-dimensional endoscopy, micro-instruments and force tools, allowing surgeons to manipulate tissue with a high degree of precision and minimal trauma. Robotic surgeons also allow physicians to work in hard-to-reach areas where manual instruments would not be able to provide the same level of precision and safety.

In terms of the specifics of performing surgeries using the da Vinci robot, surgical manipulations correspond to those performed by surgeons with their own hands. However, their efficiency and precision are increased many times over.

Many patients mistakenly assume that the use of a robot involves programming a device that then performs the necessary actions on its own. There is a lot of doubt and mistrust associated with this misconception. In fact, all manipulations are performed by qualified surgeons with extensive experience, and the doctor does not stand at the operating table, but sits at a technological control panel that provides increased accuracy of each movement (Figure 1). The surgical process complies with all surgical standards set by the World Health Organization [1].



Figure 1. Robotic surgery

For example, a robot removed a cancerous tumor from the throat of a 61-year-old man in a first-of-its-kind operation in the United Kingdom. Surgeons at the Royal Gloucestershire Hospital used a next-generation robot called Versius (Figure 2) to

remove a five-centimeter tumor from a patient. Thanks to the robot, smaller incisions can be created during surgery.



Figure 2. Versius robotic surgeon

Another example of the application of robotic surgery was an operation in Russia – doctors and scientists created a unique robot that is compact, mobile and can assist doctors during the most complex operations. The first living creature operated on with the help of this machine was a pig named Rosa. The animal had a uterine myoma and was unable to have offspring with this diagnosis, but the operation helped to correct the situation in a positive way.

The robotic system offers a number of undoubted advantages. In particular, it provides the surgeon performing abdominal operations with freedom of movement and maximum visibility. The movable EndoWrist arms allow 720-degree rotations and three-handed operation. Thanks to them, exceptional precision of incisions is achieved, thus minimizing damage to the surrounding tissue. The surgeon can easily intervene in all parts of the abdomen, including deep and hard-to-reach areas [2].

In addition to robotic surgery, automated systems also find application in the diagnosis of various diseases. Modern diagnostic systems provide high accuracy and speed of medical data processing, and analyze large amounts of information to identify pathologies and determine the best treatment. For example, computer systems can be used to automatically process medical images, identify pathological changes and determine the stage of disease. This allows for faster and more accurate diagnosis and appropriate treatment.

The British experience shows that machine learning is progressing and the neural network is already capable of processing medical data without errors and can be successfully applied at any stage – from early diagnosis to patient treatment.

For example, a computer system analyzes brain scans and compares them to a huge database of similar records, revealing patterns of disease that even an experienced neurologist cannot identify. Such technology is relatively inexpensive and shows high

diagnostic accuracy. It is now undergoing clinical trials in dozens of hospitals across the UK.

This development is in great demand, because many diseases, such as dementia, Alzheimer's disease, Parkinson's disease, types of cancer, HIV infection, are terrible because they may not manifest themselves in any way for years. When they are finally diagnosed, organ dysfunction can be irreversible. According to the National Health Service of Great Britain, dementia, Alzheimer's and Parkinson's diseases are rapidly "getting younger", the number of patients is growing exponentially. Neurodegenerative diseases cannot be cured, but you can reduce the risk of their development and ease their course, if you take care of it in advance. And that is where artificial intelligence can help.

Based on statistics from M.P.A. Medical Partners, the official representative of Intuitive in Russia, we can summarize the stage of development of robotic surgery in Russia for 2022 [3].

In total, about 28000 operations have been performed in Russia since the beginning of the robotic program (Figure 3) in 2007. In 2022, 4,463 surgeries were performed, which shows a slight but steady increase compared to the previous year (4,099 surgeries in 2021).

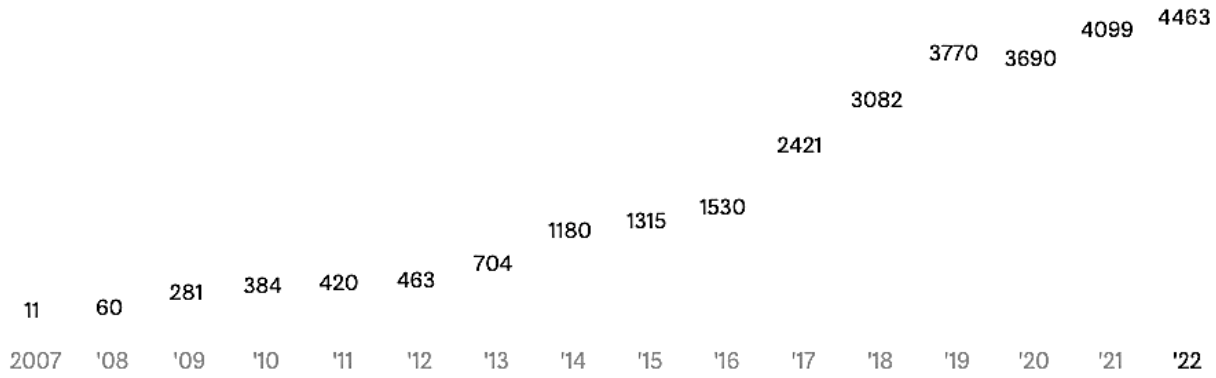


Figure 3. Statistics on the implementation of the robotic program

In 2022, 5 robotic systems of the fourth generation da Vinci Xi were installed in Russia at once. Figure 4 shows the distribution of operations by year and by system.

	2020	2021	2022
da Vinci Si	3701	3765	3362
da Vinci Xi	10	334	1101

Figure 4. Distribution of operations by year and by system

Thus, on 10 da Vinci Xi systems in 2022, 1/4 of all operations in Russia were performed.

With the introduction of the fourth generation, systems (da Vinci Xi) there was a growth in the areas for which the wide capabilities of multiquadrant surgery are of great importance: gynecology +12 %, abdominal surgery +20 %.

The greatest dynamics of development was shown in ENT surgery (+100 %) and vascular surgery (+7100 %). This year, vascular surgery at Prof. Ochapovsky Research Institute-KKB No. 1 for the first time reached the level of over 70 operations, which is an absolute record for the Russian Federation (robotic surgeries in this area have never been performed on such a scale in Russia before).

However, despite all the advantages, the application of automation and robotization in medicine also faces some challenges. For example, the high cost and complexity of implementing new technologies require serious investments and specialized training for physicians. In addition, ethical and safety issues also require attention and discussion.

Employees of Rush University Medical Center (Chicago) conducted a statistical study of the success rate of operations performed using robotic surgeons (Figure 5). The authors of the study analyzed over 10,000 reports of robotic procedures in which something went wrong. Of these, approximately 1,500 cases had a significant adverse effect on the patient. On average, adverse events occurred in 550 procedures out of 100,000.

The researchers identified five major categories among reports of problems with robotic surgeons: arcing and electrocution of patients (1,111, including 193 cases of serious patient outcomes), corrupted or burned instrument fragments entering the patient's body (119 cases out of 1,557, 1 fatal), system errors (23 cases out of 536, 1 fatal), spontaneous movements of robot fragments (52 cases out of 1,078, 2 fatal), and imaging problems (18 cases out of 275) [4].

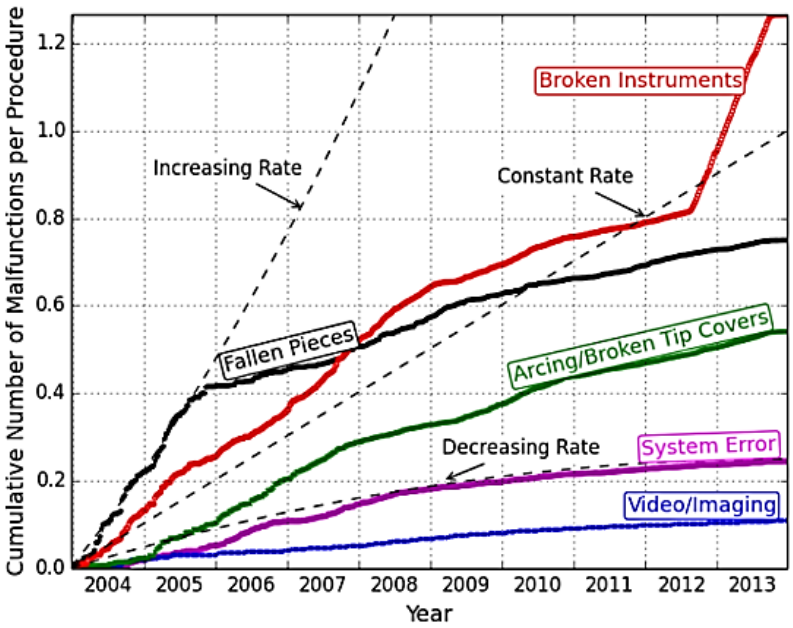


Figure 5. A graph of the accumulated frequency of various failures during operations

The authors note that although there are 144 fatalities in the databases, detailed information about what happened is usually not available. All that is known is that 33.7 percent of the deaths were due to complications during surgery or were the result of unavoidable risks, and 7 percent were due to operator error.

According to the authors, the risk of injury when a robot performs surgery depends on what kind of surgery is being performed. For example, there is a high rate of injury and death in neck, head, and heart surgeries, but this can be explained by the higher complexity of these procedures and little experience with robots.

Nevertheless, the prospects for automation and robotization in medicine remain very encouraging. Modern technologies continue to evolve, and new innovative solutions that improve the quality and outcomes of medical care are emerging every year. In the future, we can expect even wider application of automation and robotization in various fields of medicine, such as surgery, diagnostics, rehabilitation and others. This will significantly improve the quality of life of patients and transform medical practice as a whole.

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THE INFLUENCE OF KANYE WEST ON MODERN WESTERN CULTURE

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Abstract. This article explores the multifaceted impact of Kanye West on modern Western culture, delving into his contributions to the music industry and his influence on society. Through an extensive analysis of his discography, and examination of cultural phenomena associated with Kanye West, this paper aims to provide a nuanced understanding of his significance in shaping the zeitgeist of the 21st century.

Keywords: Kanye West, modern culture, music, fashion, cultural impact, Yeezy, hip-hop.

ВЛИЯНИЕ КАНЬЕ УЭСТА НА СОВРЕМЕННУЮ ЗАПАДНУЮ КУЛЬТУРУ

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Аннотация. В статье рассматривается многогранное влияние Канье Уэста на современную западную культуру, анализируется его вклад в музыкальную индустрию и влияние, которое его личность оказала на общество. Благодаря обширному обзору дискографии и изучению культурных явлений, связанных с Канье Уэстом, автор дает четкое представление о его значении в формировании духа времени XXI века.

Ключевые слова: Канье Уэст, современная культура, музыка, мода, культурное воздействие, Yeezy, хип-хоп.

Kanye West is an American rapper, singer, songwriter, record producer and fashion designer. He is known for his vibrant personal life and controversial, outspoken views. After graduating from high school, in 1997 Kanye received a scholarship at the American Academy of Arts, where he studied drawing. However, West soon got transferred to Chicago State University. At the age of 20, realizing that his busy training schedule hindered him from studying music, Kanye dropped out.

The above life events transformed Ye into a decisive and unstoppable creator. Kanye West is considered one of the most innovative and influential musicians in terms of the sound and sound design of his music. His style and approach to the sound design of compositions made him a pioneer in many areas of the music industry. His debut album, *The College Dropout,* changed not only the sound of hip-hop using speedup samples, but also the aesthetics. Wearing pink polos and Louis Vuitton backpacks, Kanye West literally changed the game. Ye's aesthetics created space for an upper-middle-class Black male in hip-hop. He transmogrified and translocated hip-hop, moving it from the gritty streets of Crenshaw Boulevard to the posh executive spaces on Madison Avenue.

The very first track of *College Dropout* attacks funding cuts for after-school programs, takes jabs at the welfare system, and ultimately exposes an American society that has always simply wished that Blacks would disappear: "We wasn't supposed to make it past twenty-five, joke's on you we still alive". Later, he compares working the "grave[yard] shift" to a "slave ship" while noting his employer's tendency to "show off the token Blackie". Furthermore, he indirectly addresses Black self hatred. His imagery, moreover, spans and unites generations of Black protest: "I basically know now we've been racially profiled, cuffed-up and hosed down, pimped-up and hoed down". Even a nominally apolitical event like his near death car accident provides an occasion to invoke Black struggle, as West compares his face after the accident to that of Emmett Till and summarizes his lyrics as "… spoken word" that "explained the story about how blacks came from glory, and what we need to do in the game" [2].

His ideas voiced in the tracks are continued in his album covers (Figure 1). "The covers of West's albums and videos show how his art descends gradually into an ever-self-effacing nihilism" [3].



Figure 1. College Dropout cover

The cover of *The College Dropout* album is a milestone in Kanye West's career. It depicts a bear, which became the symbol of the era of his creative path. This album

was mainly produced by West and featured his “chipmunk soul” musical style, which used accelerated vocal samples with pitch changes from soul and R&B records, in addition to West’s own programming for drums, string accompaniment and gospel choirs; the album featured Jay-Z, Mos Def, Jamie Foxx, Silina Johnson and Ludacris. Unlike the gangster image that dominated hip-hop at the time, West’s lyrics touch on such topics as family, self-confidence, materialism, religion, racism and higher education. *The College Dropout* debuted at number two on the US Billboard 200 chart, selling 441,000 copies in its first week of sales. By touching on such important topics, Ye makes sure that his artwork will resonate with the general public [4]. The album was a huge commercial success and became West’s best-seller in the USA at that time, by 2014 sales in the domestic market exceeded 3.4 million copies, and in 2020 it was certified 4 times platinum by the Recording Industry Association of America (RIAA). The album was promoted by singles such as *Through the Wire*, *Jesus Walks*, *All Falls Down* and *Slow Jamz*, the latter two reached the top ten of the Billboard Hot 100, with *Slow Jamz* becoming West’s first number one single as a lead artist. Highly appreciated by critics, *The College Dropout* was praised for West’s production, humorous and emotional rap, as well as the balance of introspection and basic feelings in music.

The album brought the rapper several awards, including nominations for the Album of the Year and the Best Rap Album at the Grammy Awards in 2005. Since then, numerous publications, including Rolling Stone and NSV, have named it one of the greatest albums of all time. The debut album included in the trilogy (*The College Dropout*, *Late Registration* and *Graduation*) inspired many to treat life easier, and not to waste the time given to you.

Released just a year and a half later, Kanye’s second album *Late Registration* was created together with composer John Bryon, the author of the soundtracks for *Magnolia* by Paul Thomas Anderson and *Eternal Sunshine of the Spotless Mind* by Michel Gondry. He had never worked with hip-hop before, but agreed to participate in the project when he realized that he and Kanye would not be squeezed by the framework of the same genre. West, on the other hand, wanted to change the sound and resemble the music of Portishead, Coldplay and Fiona Apple – with the help of Bryon, they managed to move on to orchestral music, chamber pop music, jazz, funk, art and psychedelic soul. Thanks to his rich production experience, his original approach to music gave rise to accelerated jazz samples and shocking recognitions of his own weaknesses for the hip-hop world.

Genres have changed, but not Kanye himself – on the second disc he again raises socio-political topics, reads about poverty, terrible medical care and drug abuse, talks about the popularity that has fallen on his head and confesses his love to his mother, who always believed in him, not to mention the humorous scenes in which Kanye joins the dark-skinned brotherhood of ascetics who refused material goods and money.

After the trilogy Ye released *808s & Heartbreak*, *My Beautiful Dark Twisted Fantasy*, *Watch the Throne* and *Yeezus*. The most innovative and authentic is the sixth album. Kanye West’s *Yeezus* was the complete opposite of the explosive work on *My Beautiful Dark Twisted Fantasy*. The artist replaced the usual soul hooks and anthems with electro, acid house and industrial, presenting some of his most obscene and heartbreaking stories. The *Yeezus* album is mostly electronic in nature and boasts

distorted drum machines and synthesizers that sound like they're malfunctioning, low-resolution samplers that add a pixelated digital aura to most analog sounds. One of the key elements of the sound of Kanye West's music is the use of samples. He also experiments with sound, changing the speed of samples and adding effects to create a unique and innovative sound. The musician is known for his use of autotuning and other speech processing effects. He uses these effects to create unusual and haunting sounds that add an extra layer of emotional depth to his music. In addition, live instruments such as guitars, keyboards, drums and wind instruments can be heard in his compositions. He often combines these instruments with the sounds of synthesizers and electronic devices, creating a unique sound uniting organization and technological innovation. Thus, Kanye West experiments with sound effects and mixes different genres of music. He can add reverb effects, explore stereo panorama and other sound elements to create unique soundscapes. West shattered certain stereotypes about rappers that existed at the beginning of the 21st century, becoming a superstar on his own terms, without adapting his appearance, rhetoric or music to someone else's templates.

In his work there is an open follow-in of some directions in art. West's open adherence to the principles of Dadaism can be noted. One of the basic tenets of this trend is the use of onomatopoeia and collages to express complex ideas and circumstances. Kanye West utilizes this type of expression in his lyrics and he employs practices that could be seen as Dadaist in music videos such as "Good Life" from *Graduation* and "Gold Digger" from Late Registration. West's performances in these and other videos highlight the fungibility of art. This was also part of the Dadaists' main objective. They challenged the notion of the systems that served to privatize artistic expression. West uses his own celebrity to demonstrate the idea of pan-fungible system where everything is for sale [3].

In addition to the music industry, Kanye West has significantly influenced the fashion industry. Being an outstanding celebrity, he rethought the concept of celebrity fashion. His fearless approach to clothing inspired others to realize their individuality and use fashion as a means of self-expression. Kanye West's influence on street style cannot be underestimated (Figure 2).



Figure 2. Kanye West's street style

His ensembles have become a source of inspiration for fashion lovers around the world, which has led to the spread of street-style outfits in mainstream fashion. Kanye West's fashion choices often challenge traditional norms and push boundaries. Sticking to non-standard silhouettes, bright color palettes and unexpected combinations, he encourages others to get out of their comfort zone and experiment with their own style. West's unique ability to match streetwear with high fashion has become a defining feature of his personal style. He easily combines luxury brands with elements of casual clothing, thereby proving his ability to create visually spectacular and fashionable outfits.

Kanye West's fashion brand Yeezy has destroyed the industry with its unique combination of streetwear and haute couture. The brand quickly gained popularity and became synonymous with innovative design and the long-awaited limited series. Kanye's status as an outstanding personality in the music industry undoubtedly contributed to the success of Yeezy. One of the most important milestones in his fashion career was the collaboration with Adidas. This partnership has enabled Yeezy to reach a wider audience and gain trust in the fashion industry. In particular, the line of Yeezy Boost sneakers became a worldwide sensation, each issue was sold out in a matter of minutes (Figure 3).



Figure 3. Adidas Yeezy Boost 350 and Adidas Yeezy Boost 350 V2 Black

The Yeezy Boost line revolutionized the sneaker market by combining comfort, style and exclusivity. The demand for Yeezy sneakers has led to a sharp increase in resale prices, which has made them very popular collectibles. Thus, we can say, that Kanye West's influence on fashion trends is undeniable, he has become a cultural icon whose influence will determine trends for years to come. Fearlessly challenging the norms and combining streetwear with high fashion, he inspired a new generation of fashion enthusiasts to show their individuality.

Moreover, Kanye West has experienced significant success and challenges in the business world throughout his career. His journey in the business realm has been marked by innovation, controversy, and ambitious endeavors.

One of the most remarkable accomplishment in West's business journey is his ventures in the music industry. He is not only a renowned musician but also a successful record producer and music label owner. West has released numerous chart-topping albums and has won numerous Grammy Awards, solidifying his position in the music business. His collaborations with other artists and his ability to redefine music genres have contributed to his success in this industry. He has worked with Jay-Z, Travis Scott, Pusha T, Chief Keef and others.

In addition, he founded the creative content company *Donda*, which in the future will be engaged in the development of cities, the construction of amusement parks, sewing clothes and the development of modern vehicles.

However, Kanye West's business path has not been without challenges, one of the most prominent being his often controversial and polarizing public persona. His outspoken and unfiltered statements on social media and during interviews have sparked backlash and boycotts. This has occasionally affected his brand reputation and sales. Nevertheless, Kanye has also used controversy to his advantage, as it generates buzz and keeps him in the public eye.

West's ventures into other business areas, such as the attempted launch of his own political career and the development of a unique architectural vision, have been met with mixed feelings. He declared his support for former President Donald Trump, which divided his fan base and led to heated debates about his political stance. He also announced his own presidential bid in 2020, although it was widely viewed as a symbolic gesture [5]. His presidential campaign was met with skepticism and criticism, raising questions about his ability to transition into the political world successfully.

In conclusion, it should be emphasized that Kanye West has experienced notable success and faced significant challenges in the business world. His ability to blend creativity with business acumen has been evident in his fashion brand, Yeezy, and his accomplishments in the music industry. Nonetheless, his controversial public persona, ventures into politics, and ambitious architectural projects have presented challenges. West's ability to navigate these obstacles and continue to innovate in various business sectors demonstrates his resilience and determination in the face of adversity. As he continues to evolve and expand his business portfolio, the world watches with both anticipation and curiosity.

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THE USE OF DIGITALIZATION IN THE DESIGN OF CUTTING TOOLS

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Abstract. The article emphasizes the importance of automation, digitalization and monitoring in production in order to increase efficiency and overcome the shortage of skilled workers. It reviews the latest tools, such as ECOtronic and my WALL Cockpit, which optimize production processes and reduce energy consumption. The text also highlights the importance of collaborating with customers to understand and address their needs in the rapidly changing machining industry.

Keywords: automation, digitalization, monitoring, efficiency, tools, energy consumption, cooperation with customers, machining.

ИСПОЛЬЗОВАНИЕ ЦИФРОВИЗАЦИИ ПРИ ПРОЕКТИРОВАНИИ РЕЖУЩЕГО ИНСТРУМЕНТА

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Аннотация. В статье подчеркивается важность автоматизации, цифровизации и мониторинга в производстве с целью повышения эффективности и преодоления нехватки квалифицированных рабочих; рассматриваются новейшие инструменты, такие как ICO tronic и my WFL Cockpit, которые оптимизируют производственные процессы и снижают энергопотребление. Также делается акцент на необходимости сотрудничества с клиентами для понимания и решения их потребностей в быстро меняющейся индустрии механической обработки.

Ключевые слова: автоматизация, цифровизация, мониторинг, эффективность, инструменты, энергопотребление, сотрудничество с клиентами, механическая обработка.

Intelligent automation systems combined with intelligent digitalization solutions bring obvious benefits to the company. The preparatory work associated with the development of these solutions is not unimportant: it is necessary to use your basic

experience in setting up and measuring properly prepared complete tools. The next important step in the development of an intelligent solution is to network a preconfiguration and measurement device with a processing center. Data transmission using RFID tags is very secure, but also extremely expensive. A solution that is equally secure, but at the same time simple and inexpensive to implement – even for small companies – is data transmission using a data matrix code [1].

On the preset device, the code is scanned on the tool holder using a hand scanner, the tool is measured, and the actual data is stored in the central database of the tool. The processing center also has a code reader for the unique identification of the tool. The machine controller automatically extracts measurement data, including all other information necessary for the tool, directly from the tool database and reads them into the machine. This process provides a unique identification, and is also automatic and error-free.

But secure data transfer is just one of the advantages. Using flash software for production analysis, we can make operational inquiries about the tool life based on the traffic light principle. As soon as the tools reach the warning limit, a message is sent in the tool preset area, and a new tool can be prepared and provided on time. Another result of the digitalization project in the design of cutting tools is the integration of complete tool model data into Protect Line [2]. All data about the tool – the geometry of the tool and the geometry of the tool holder – are added to the digital double of the machine during a fully automated process. This provides a highly efficient process of creating a digital twin, which forms the system basis for collision avoidance in the car.

When programming cutting machines, it's all about the software. This trend is felt throughout the industry, as another foreign example shows. Vollmer, a sharpening company based in Swabia, Germany, offers internet-based gateways for its sharpening machines. They provide network data exchange for storing and evaluating production data. IoT gateways exchange technological and production data between peripheral and local client systems or the cloud. Vollmer is a leader in this field despite the fact that the market for digital solutions in the field of sharpening technology is still in its infancy. It is important for Vollmer to promote digitalization together with our customers and partners, because there are different advantages for each target group. For us, we are talking about the logical and efficient integration of our machines into a network through various IoT platforms in order to improve production processes and generate new ideas when developing tools [3].

In this context, Vollmer has adapted its additional digital products and services to the needs of customers as part of the V@dison initiative. The most recent example is a web portal for customers, which will provide customers with online access to digital information about their own equipment or to an integrated spare parts store.

The initiative includes four more areas: V@screen provides an overview of all relevant machine tool parameters and machine tool sharpening networks with end devices. It provides a high level of transparency due to the quick availability and clarity of information. V@check allows tool manufacturers to model, test and optimize their production processes without material loss to reduce equipment downtime. V@boost

combines software tools that optimize the performance of grinding machines for specific workpieces and expand the familiar set of functions. Finally, V@guide detects errors in the forecasting process. It is suitable for preventive maintenance and knowledge transfer through digital modules or automated communication processes.

The production management system minimizes the lead time for the mold manufacturer. Information about the condition of the tool during processing can provide valuable information to the operator and the organization [4]. For real-time tool monitoring, Horn, in close collaboration with the Kistler Group, has developed a real-time tool monitoring system for use in the turning process. The specialists provided a dynamic measuring system for registering pressure, force, torque and acceleration.

The result of the partnership was the Piezo Tool System (PTS), which includes a force sensor built into the turning tool, which provides information about the condition of the tool during processing. It can measure forces from just a few Newtons. The standard sampling rate is 10,000 Hz, which allows you to measure even the smallest cutting forces. This allows machine operators to immediately detect any defective cutting materials or other materials, as well as broken tools.

As a result, waste is minimized while maintaining a high level of quality. In addition, the user can purposefully make full use of the service life of the tools. Additional interfaces for other machine manufacturers are currently being developed.

The PTS solution is compatible with selected standard Horn turning holders. This does not require intervention in the CNC controller. It does not depend on the machine in use and requires only limited space in the machine. The consequence of the use of MTC is a reduction in the cost of production and an increase in production capacity.

Automation is seen as a potential way to counter the growing shortage of skilled workers. Industrial digitalization affects machines, processes and systems. Digitalization increases labor productivity due to better control over the physical and functional capabilities of machines. The fact that systems on the production line are better connected and coordinated with employees thanks to digitalization means that equipment downtime is reduced, which increases the reliability of systems and, ultimately, increases productivity [5].

Automation will continue to grow rapidly, not least due to a shortage of skilled workers. The motivation is not so much to create an autonomous factory, but to produce small batches in the second and third shifts. Obviously, this area is related to the issues of digitalization, data management and information acquisition. Further improvement in the use of machines is needed. The initial processing time is very carefully designed and optimal machines and tools are used. When it comes to unproductive time, setup time, and downtime, there is still potential for improvement. However, it is more important to anticipate trends and identify them in advance so that we already have the right product or the right development ready.

Also abroad, the ICO tronic tool has been developed, equipped with sensors and providing information about the cutting process as close as possible to the cutting edge.

Its goal is not only to optimize milling processes in the future, but also to increase the productivity of the machine. The new my WFL Cockpit operational data collection system is presented. It shows the status of the machine and program over time, as well as performance and technical availability. Visualization is carried out on a controller, on a PC or on a mobile device via a browser.

Another innovation is the myWFL Energy energy measurement device integrated into the WFL Cockpit, which displays current data on performance and energy consumption, as well as energy consumption for each billet. Another advantage of WFL is the integrated status monitoring cycle. During the cycle, the friction values of the axes and spindles, as well as the temperature in the milling spindle housing and vibration or the state value of the rolling bearing of the front bearing of the milling spindle are continuously recorded and stored in the control system. Using the Status Monitoring Viewer, you can select data from various status monitoring runs in the management system, graphically overlay them and analyze them over time.

It is difficult to look into the future, but regardless of issues such as digitalization and automation, in the future it will be just as important to continue working closely with customers so that companies understand their problems and can develop and implement solutions. Complexity is increasing, so we consider effective cooperation with customers and partners to be the key to success. Specialization and focus on complex machining, as well as the role of a system partner with maximum production experience will remain very attractive in the future, whatever the needs of the market.

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MEANS OF INFORMATION PROTECTION IN LAN

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Abstract. This article discusses the recommended list of information security tools, promising methods of information protection, as well as authentication, methods of protecting control and access to information.

Keywords: information security, confidentiality, authentication, algorithms.

СРЕДСТВА ЗАЩИТЫ ИНФОРМАЦИИ В ЛВС

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Аннотация. В данной статье представлен рекомендуемый перечень средств защиты информации, перспективные методы защиты информации, а также рассматриваются аутентификация, методы защиты контроля и доступа к информации.

Ключевые слова: защита информации, информационная безопасность, конфиденциальность, аутентификация, алгоритмы.

To form a recommended list of information security tools, three stages can be distinguished:

1) definition of the list of threats for each existing information flow in the organization;

2) determination of the protection mechanisms functioning in the LAN and their sufficiency for each existing information flow;

3) selection of recommended means of information protection for each existing information flow, allowing one to neutralize “uncovered” threats [1].

The most modern mechanisms for protecting information in the LAN include:

– identification and authentication;
– access control;
– memory cleanup;
– event registration;
– encryption.

Promising methods of information protection are:

– the mechanism of biometric authentication of users through the use of neural networks and their integration with conventional methods;

– encryption mechanism by improving algorithms for determining the simplicity of the number;

– a mechanism for secure transmission and authentication of digital objects through the development of steganographic methods of data transformation;

– a mechanism for determining the authenticity of elements of automated process control systems and the organization of secure communication channels when transmitting information between these objects by adapting standard network protocols to the specifics of the functioning of the automated process control system [2].

The classic approach to user authentication is to use traditional password protection. As part of this approach, the identifier-authenticator pair (login-password) is compared with similar information stored on the side in one form or another. At the same time, it will not necessarily be the same login-password pair – the information can be stored in encrypted form, or only hash functions from this information can be stored.

The obvious advantage of this approach is the simplicity of implementation, the absence of the need to purchase any additional hardware and complex software for this.

However, this approach may have a number of significant drawbacks:

1) the password can be easily transferred to another person, and such transfer can be either accidental or intentional (which, in turn, can be voluntary or carried out under the influence of various threats);

2) after such a transfer, the fact of the disclosure of the password remains completely unclear and until the moment of damage after such disclosure, its very fact, in the vast majority of cases, remains unnoticed, which does not give direct reasons for changing the password;

3) the possibility of the user forgetting the ordinary password, leading to a potential loss of access to information;

4) the ability to select a password by brute force methods;

5) possible attacks on the storage location of login-password pairs on the side conducting a direct comparison during authentication [3].

The identified weaknesses require additional measures to strengthen traditional password protection through the use of multi-factor authentication.

Multi-factor authentication (MFA) is a method of controlling access to a resource or software, in which the user must present several details confirming his right to access. In this way, it differs from one-factor authentication, when access is provided by a single requisite, for example, a login-password bundle [4].

Biometric characteristics are a set of certain physical or behavioral traits that allow the verification of the user’s identity.

Static methods of biometric authentication are based on the physiological characteristics of a person present from birth to death, being with him throughout his life, which cannot be lost, stolen and copied.

Traditionally used static characteristics include: fingerprint; hand geometry; face geometry and others. It is possible to use dynamic biometric characteristics.

The following static characteristics can be distinguished as used:

1) signature image;
2) signature dynamics;
3) voice;
4) keyboard handwriting.

At the same time, it should be noted that the use of dynamic biometric characteristics is not a panacea, since almost all of them have a significant probability of errors of the first and second kind, which does not allow us to talk about their independent use. In turn, their integration with other methods within the framework of multi-factor authentication constructions with the “And” system (to pass all subsystems) leads to a significant increase in the probability of errors of the first kind, again reducing the system’s operability.

Many modern cryptographic systems are based on prime numbers. So, in the well-known cryptographic system with the RSA public key, the need to choose prime numbers has a fundamental position and the strength of encryption largely depends on the choice of prime numbers. Therefore, an important direction in the development of methods and information security systems is the development of effective methods and algorithms for generating prime numbers. One of the key tasks associated with the generation of prime numbers is to check for the simplicity of the generated number.

All simplicity testing algorithms (simplicity tests) are divided into two large classes: deterministic and probabilistic algorithms. Deterministic algorithms are guaranteed to accurately determine a prime number, but they have great computational complexity. Probabilistic algorithms allow you to establish the simplicity of a number with some probability of error, but in much less time. To reduce the probability of error, the algorithm is repeated, but with different parameters. If a number does not satisfy the probabilistic algorithm verification conditions, then it is guaranteed to be a composite number.

Therefore, research in the development of simplicity criteria and algorithms based on them for checking natural numbers for simplicity are of great importance for improving the quality of cryptographic systems during encryption.

One of the modern directions of secure data transmission in information systems is based on the use of digital steganography methods that implement the embedding of hidden information sequences of various purposes into digital objects.

Steganographic methods of information protection allow us to solve such tasks as ensuring the confidentiality of information and ensuring the authentication of digital objects [5]. In addition, digital steganography methods are used in areas not directly related to information security. An example is the embedding of service information in medical images for the convenience of their storage and processing.

In addition to the tasks being solved, digital steganography methods are classified according to the types of data they work with. These are mainly audio-video data and digital images. Next, we will talk about embedding information in digital images.

In this case, the next level of classification is determined by the presence of compression: methods and algorithms working with compressed images and images without compression are considered as two different classes.

There are a large number of spatial embedding algorithms information in digital images. The widest class consists of algorithms based on the least significant bits method (LSB), according to which the lowest one or two bits of pixels of a digital image are used to record bits of a secret message, carrying the least amount of information perceived by human vision.

The main problem of LSB-like algorithms is that as a result of embedding, the lower bits of the pixels of a digital image acquire statistical characteristics inherent in a secret message, which is unmasking a sign indicating the presence of an embedded message in the image.

There are different approaches to solving this problem. One of these approaches is the preliminary transformation of a secret message before embedding, aimed at hiding its statistical characteristics.

The classic LSB – like embedding of information into the pixels of a digital image – does not allow you to subsequently restore the original values of the changed pixels. However, there are algorithms that implement reversible data hiding, when when extracting an embedded message from a container image, the original image is restored without any loss.

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ENVIRONMENTAL SAFETY OF WASTE WATER OF A THERMAL POWER PLANT

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Abstract. The article describes the impact of wastewater on the environment. The classification of wastewater, the occurrence and possible options for their treatment with subsequent discharge into the environment are presented. The stages of treatment measures for the treatment of contaminated wastewater are considered. An example of working with water pollution at a real CHPP is given.

Keywords: waste water, environmental safety, sewage, sewage treatment plants, CHPP, thermal power plant.

ЭКОЛОГИЧЕСКАЯ БЕЗОПАСНОСТЬ СТОЧНЫХ ВОД ТЕПЛОЭЛЕКТРОСТАНЦИИ

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Аннотация. В статье описано влияние сточных вод на окружающую среду. Представлена классификация сточных вод, возникновение и возможные варианты их очистки с последующим сбросом в окружающую среду. Рассмотрены этапы очистных мероприятий для обработки загрязненных сточных вод. Приведен пример работы с водными загрязнениями на реальной ТЭЦ.

Ключевые слова: сточные воды, экологическая безопасность, стоки, очистные сооружения, ТЭЦ, теплоэлектроцентраль.

Pollution of the Earth’s atmosphere, land and water resources with harmful impurities negatively affects the state of natural ecosystems and human settlements. Environmental pollution adversely affects the human body, the surrounding plant and animal world. A negative impact is also exerted on the quality of products

manufactured by enterprises, leading to wear of mechanisms, destruction of buildings and structures.

The protection of the environment from the negative impact of human activity refers to issues solved within the framework of the concept of “environmental safety”. Environmental safety is a set of organizational and technical measures aimed at ensuring compliance of environmental protection activities of enterprises with regulatory requirements [1]. It includes study, understanding and control of human impact on nature, as well as the creation and application of methods and technologies aimed at minimizing negative consequences for the environment. Environmental security strives to preserve the natural resources, biodiversity and health of the planet for present and future generations.

In the process of household and especially industrial activities, water is used everywhere, resulting in used or waste water. Wastewater can contain various pollutants, such as organic and inorganic substances, toxic chemicals, microorganisms and other harmful substances. Wastewater needs to be treated before it can be safely discharged into the environment.

The assessment of the environmental impact of wastewater includes the study of its composition, quantity, ways of movement, as well as an assessment of its impact on the environment and on the health of humans and animals. These assessments make it possible to develop measures for the management and treatment of wastewater in order to minimize their negative impact on the environment and ensure the safety of water resources.

Wastewater can be divided into stormwater, industrial and domestic wastewater.

Stormwater is formed as a result of rains, snowmelt or other natural phenomena. When it gets on roofs, sidewalks, open ground, rainwater mixes with various impurities, such as dirt, garbage, petroleum products and other contaminants collected from the surface. At best, in large cities, water flows go into drains and are treated by passing through the sewage system, and for the most part, polluted storm water is absorbed into open soil or discharged into open reservoirs [2].

Industrial wastewater is generated during the production process at industrial enterprises. It may contain various chemicals such as oils, solvents, acids, alkalis and other waste from production. Such wastewater requires a special type of treatment before being discharged into the environment.

Domestic wastewater is formed as a result of economic activity and the remnants of human activity. This type of wastewater is formed after baths, sinks, toilets and the like. They have a relatively constant composition, containing about 60% organic and about 40 % mineral substances. Pollution in wastewater is in the form of suspensions, colloids and solutions. The composition of organic pollutants includes fats, proteins, fiber, carbohydrates, organic acids, etc. Household wastewater is sent to urban treatment plants.

Ensuring environmental safety in production increases with the increase in the level of automation of the enterprise: stabilization of production processes, optimization of operating modes and improvement of equipment reliability, reduction of industrial emissions and consumption of chemicals. Proper control over the operation of the equipment allows minimizing the probability of accidental emissions,

reducing the total mass of annual discharge of pollutants by reducing the volume of discharge and concentration of pollutants in wastewater.

Water runoff management makes it possible to conserve water resources and maintain an ecological balance. Drains can be controlled using drainage systems and hydraulic structures. The main factor determining the magnitude of the prevented environmental damage is the reduction of discharges of pollutants into surface reservoirs and underground horizons.

Sewage treatment plants, or wastewater treatment plants, are engineering facilities designed to treat wastewater before it is discharged into the environment. They play an important role in maintaining the ecological safety and health of our planet. Sewage treatment plants remove pollutants and harmful substances from wastewater so that it does not harm the environment and does not threaten human health. The purification process includes mechanical, biological and chemical treatment of wastewater to eliminate contamination and reduce the content of organic and inorganic substances to a safe level.

Treatment facilities may include various components and processes, such as grates for the disposal of large waste, sedimentation tanks for the deposition of solid particles, aeration pools for biological treatment, filters for the removal of organic substances and chemical processes for disinfection and removal of residual contaminants. The result of the work of the treatment facilities is the production of purified wastewater.

Treatment measures usually consist of several stages, each of which performs a specific function in the wastewater treatment process. The main stages include:

– Pre-cleaning. At this stage, large solid particles and floating materials such as sand, gravel, plastic and other waste are removed. This is usually done with the help of lattices and settling tanks.

– Biological purification. Biological processes are used here to decompose organic pollutants. This is usually achieved through an active sludge process or the use of bioreactors, where microorganisms decompose organic substances into simpler compounds.

– Physical and chemical cleaning. Various physico-chemical processes such as flocculation, precipitation, filtration or adsorption are used to remove residual pollutants such as petroleum products, heavy metals or chemical compounds.

– Disinfection. This stage is used to destroy bacteria, viruses and other pathogenic microorganisms that may be contained in treated wastewater. Chemical or physical methods such as chlorine treatment, ultrafiltration or ultraviolet irradiation can be used for this.

After passing through all stages of purification the treated wastewater can be safely discharged into water bodies or used in other processes.

As an example of the use of large volumes of water resources in production with a subsequent successful purification system, Pervomaiskaya power station (CHPP) can be cited. Pervomaiskaya CHPP is one of the leaders in the production of electric and thermal energy for enterprises, as well as residential buildings in St. Petersburg. The automation system of Pervomaiskaya CHPP is a man-machine system operating in real time. This makes it possible to minimize the volume of water consumption and

sanitation through the use of resource-saving cooling systems and reuse of treated water.

The industrial wastewater of the CHPP is treated at functioning sewage treatment plants. Household effluents are sent to centralized urban sewerage networks with subsequent treatment at municipal wastewater treatment plants.

The amount of waste generated by the plant is reduced by eliminating the accumulation of coal ash and rock scrap in coal, which make up more than 96% of all industrial waste. The impact of the remaining household and industrial waste of the thermal power plant on the environment is negligible.

At least 85 % of waste is low-hazard garbage with a hazard class no higher than the fourth [3]. Waste is mainly transferred to third-party organizations. On the territory of the industrial site, only temporary accumulation is provided in specially equipped places. There is practically no impact on the flora and fauna of the area where the enterprise is located, since the power plant is located on an existing industrial site.

The scheme of drainage of rain and meltwater involves the collection of wastewater, with separation into rain and oil-containing effluents, followed by purification at its own highly efficient treatment facilities.

The rain sewer is intended for the organized collection from the production site of surface runoff not contaminated with petroleum products. The maximum flow rate of rainwater is more than 600 l/s. The average annual volume of surface runoff from the territory of the enterprise is about 100 thousand m3/year. Rainwater flows to its own treatment facilities of industrial rainwater. The structure includes mechanical cleaning facilities on settling tanks – flocculators and a block of filters for mechanical and sorption cleaning. The cleaning efficiency is 95-99 %.

Quartz sand and activated carbon are used as filter materials.

The restoration of the cleaning properties is carried out by washing the filter materials. The trapped impurities and particles of the filter filler together with the sewage are collected by sewer networks and re-enter the rainwater treatment facilities.

After treatment, the reuse of treated wastewater is provided. Clarified water is used in the technological cycle of the plant.

As part of the treatment facilities, equipment for dewatering and compaction of sediment is provided. Control of the cleaning process is carried out using automated process control systems.

The sewage of oiled effluents is designed to collect oily effluents from buildings, auxiliary structures, etc. The volume of permanent effluents contaminated with petroleum products generated from the equipment of buildings is 6.1 m3/hour. The amount of periodically generated effluents is 9.9 m3/hour.

The oiled effluents are sent to their own oil-containing wastewater treatment plants. The installation includes several stages of cleaning: a block of tanks with floating oil-absorbing material; filters of the first and second stages. Microfibre propylene is used as an oil-absorbing filter material.

The capacity of oil-containing wastewater treatment plants is 18 m/h. The design efficiency of purification is: for suspended solids – 99.4 % and for petroleum products – 99.9 % [4].

The treated wastewater is used in the technological cycle of the plant.

Environmental protection measures aimed at minimizing the negative impact of the enterprise on the environment are provided for at the CHPP. Measures to reduce environmental damage include:

– conducting current environmental control, issuing regulations and monitoring their implementation;

– control over the implementation of environmental programs;

– control over the reliability of information on emissions, discharge and disposal of waste supplied by enterprises polluting the environment and control over the accrual, transfer and use of environmental payments [5].

Thus, wastewater pollution is an urgent problem that requires an integrated approach, constant monitoring of the situation and its subsequent solution. It is necessary to introduce modern methods and technologies of wastewater treatment, which will help to reduce pollution and improve the state of the environment. Ensuring environmental safety is an important task for society and requires the cooperation of the state, organizations and each individual.

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TEACHER EDUCATION IN RUSSIA AND ABROAD

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Abstract. The article is devoted to the features of teacher education in the Russian Federation and developed foreign countries of the late 20th - early 21st centuries. Particular attention is paid to obtaining pedagogical education in higher educational institutions of various countries. The article also compares the educational system and teacher education in Russia and foreign countries.

Keywords: pedagogical education, Russia, educational system, continuing education.

ПЕДАГОГИЧЕСКОЕ ОБРАЗОВАНИЕ В РОССИИ И ЗА РУБЕЖОМ

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Аннотация. Статья посвящена особенностям педагогического образования в Российской Федерации и развитых зарубежных странах конца XX – начала XXI веков. Особое внимание уделено получению педагогического образования в высших учебных заведениях различных стран. Также в статье сравнивается образовательная система и педагогическое образование в России и зарубежных странах.

Ключевые слова: педагогическое образование, Россия, образовательная система, непрерывное образование.

At the beginning of the new century, the main trends in the development of teacher education were determined: orientation towards higher education as an indispensable condition for acquiring the teaching profession; complication and strengthening of psychological and pedagogical training; variety of specializations in training programs; improving the system of advanced training of teaching staff; simultaneous training in different educational institutions [1 , p. 84].

A modern teacher in Russia, as well as throughout the world, faces many different requirements. A teacher must have computer and technology skills, know the basics of child psychology, be able to find an approach to each student, be tolerant of different social groups, and become a moral guide for the new generation. The personal qualities of an ideal teacher must be in harmony with professional knowledge and

abilities. It is necessary to cultivate a culture of thinking in a future teacher. He or she must be able to independently acquire information [1, p. 84]. The comprehensive development of a teacher's personality has become one of the most important conditions for ensuring the effectiveness of training for future teachers.

In the process of globalization, teaching is being standardized. One of the general trends in the standardization of teaching is the idea embedded in the standards of a continuous process of professional development for teachers. Continuity of education is characteristic of the entire modern educational system. And if several decades ago the main function of lifelong education was considered to be compensation for the shortcomings of stationary education (general or vocational), now lifelong education presupposes the opportunity and necessity for people of any age to update and supplement previously acquired knowledge, develop abilities, and expand their general cultural horizons [2, p. 85]. Well-designed and clear teaching standards help align policy and practice and provide a framework for the formation, training and professional development of teachers [3, p. 50]. Teaching standards include competencies, knowledge, skills and values that not only characterize the concept of "quality teaching", but also serve as an incentive for future professional growth [3, p. 53].

Teaching standards in different countries are often very similar and are aimed at the technologization of education, the development of an individual approach to students and the development of individual personality. However, many points can vary greatly. For example, Finland has its own system, called the Finnish education system. In Finnish schools there is no single program that every student must go through. Here, teachers proceed from the individual characteristics of the student, there is no assessment or examination system, and instead of individual subjects (literature, history, mathematics), certain historical events are studied from the point of view of several sciences at once. This significantly complicates the process of training future teachers, since instead of one subject they must have solid knowledge of both the natural sciences and the humanities. In Russia, there is a common curriculum for all educational institutions that teachers must follow. Each subject is studied separately and in a certain number of academic hours one or another topic must be covered, after which there is a test that confirms and reinforces the material covered. Future teachers study one specific subject or several interrelated ones, for example, Russian language and literature, history and social studies, physics and astronomy, algebra and geometry.

In most developed countries, teacher education is obtained in higher education institutions and colleges. In each country, the requirements for admission to educational institutions that train teachers are determined by legislation and educational policy. These requirements, in particular, include the conditions for selection into educational institutions, the characteristics of teaching activities and the conditions for maintaining the status of a teacher. Completion of a teacher training program is considered a basic requirement for obtaining a teaching qualification [3, p. 4]. Recently, a new form of higher pedagogical education called two-stage education – a pedagogical college-university – has become increasingly popular among applicants and students. According to this system, the best college graduates have the opportunity to enter the third year of a pedagogical university with a shortened period

of study [2, p. 90]. In Russia, to enter a university, you must have a college or 11th grade school diploma, as well as pass the Unified State Exam in the school subjects required for admission. However, even this does not guarantee free tuition since every year the number of budget places is reduced, and the price of paid education is growing. In addition, representatives of preferential groups enrolling without exams and applicants applying for general competition apply for the same places. In Singapore, applicants to the faculties of teacher education are carefully selected from among secondary school graduates. Each year, Singapore calculates the number of teachers its education system will need and only opens the required number of places in teacher training programs. On average, only one in eight applicants is accepted into teacher education programs. Selected applicants not only sit A-level exams (the most difficult of all university exams), but must also achieve at least a grade point average, which is a very high level of achievement. Other steps in the application process include rigorous panel interviews that focus on the personal qualities of the would-be good teacher, as well as intensive reviews of applicants' academic performance and contributions to the school they graduated from and to the community [3, p. 152]. In the USA and European countries, the situation with admission is much simpler. In the USA, Canada, France, Italy, many universities (including a number of universities) enroll all applicants who have certificates of successful completion of high school without exams; the number of vacancies in the first courses is not limited. In public post-secondary educational institutions in a number of Western European countries, tuition fees have either been completely abolished (Germany, Austria, Scandinavian countries) or significantly reduced, sometimes to a symbolic value [2, p. 107].

The education system in higher educational institutions is currently approximately the same both in Russia and abroad. This was a consequence of the Bologna Agreement of 1999, which was aimed at bringing together and harmonizing the education systems of European countries with the aim of creating a European higher education area. The integration initiative initially came from the University of Bologna, one of the oldest universities in Europe [4, p. 2]. Now the educational system in higher educational institutions has become multi-level, and each specialization ends with a certain degree. The specialization culminating in a bachelor's degree typically involves gaining theoretical knowledge, mastering the latest teaching techniques, and gaining extensive practical experience in the classroom. Through this program, future teachers will acquire the academic skills necessary to teach students. The specialization culminating in a master's degree is a professional development program for aspiring experienced teachers who are interested in expanding their professional practice and the knowledge base and skills necessary for an effective educational process. The specialization culminating in a doctorate typically consists of several required courses, one of which is an approved "elective." Many of these programs are aimed at equipping new and experienced teachers with modern teaching methods; studying the problems and contexts, limitations and opportunities of the teaching process and providing teachers with tools and sources for improving teaching activities [3, p. 105].

If we talk directly about the process of training future teachers, in Russia most of the knowledge is presented in the format of lectures, where the teacher gives students important theoretical knowledge during the lesson, seminars are often held, but

practical classes at pedagogical universities are held quite rarely. The knowledge acquired in lectures is tested in exams, in which the student must show the breadth and completeness of his or her views on a particular subject. Recently, technical means, role-playing games, micro-teaching, etc. have been increasingly used in teaching [2, p. 88]. We can conclude that, in the perception of students, these "classical" forms of education dominate the educational process of universities [5, p. 22].

An important part of the training of future teachers are practices and internships, which in Russia take on average 4-5 weeks. The program of teaching practice includes observation of the educational process, analysis of teaching, and one's own lessons (from one to a series) [1, p. 86]. Russian students can do internships in schools, children's camps or preschool education organizations (for teachers of this profile). There may be several such internships per year; during their completion, the student learns to apply theoretical knowledge in practice, solve assigned problems, and also prepares a report on the internship with a testimonial from the party that provided him or her with this opportunity. Foreign countries also have a system of internships for students, but there are some innovations that allow future teachers to delve deeper into various aspects of their profession during their student years. For example, teacher candidates in Sweden, Norway and the Netherlands now receive two to three years of graduate-level teaching preparation, provided entirely at public expense; a stipend is provided for accommodation. Preparation for teaching in Finland involves training a future teacher at a school in partnership with a university for a year [3, p. 116].

Other training programs include course work in pedagogy, showing significant knowledge in the theory and practice of education, and a dissertation that examines current problems in school education [3, p. 117].

Despite such a large number of common points in matters of obtaining higher pedagogical education, Russia has currently set a course for its own special path of development. This is primarily manifested in the digitalization of education, including distance learning. In 2019, the Federal Project "Digital Educational Environment" was created, aimed at creating and implementing a digital educational environment in educational organizations, as well as ensuring the implementation of the digital transformation of the education system [6, p. 339]. Almost all modern schools and universities have their own website, an electronic diary or office for students and teachers, and even pages on various social networks, common databases of library systems are created, various online schools and educational sites appear that help students improve their knowledge of a particular topic or subject, prepare for exams or olympiads. In addition, some educational institutions are testing and actively introducing distance learning into the educational process.

Thus, the process of training future teachers in Russia and foreign countries is in many ways very similar, thanks to the borrowing of certain educational features by different educational systems. At the moment, modern teacher education around the world is faced with numerous difficulties of a fast-moving technological process, to overcome which more and more advanced methods of training highly qualified employees are being created, but so far none of the presented systems is able to fully meet all the demands of the new time. Awareness of the problems facing modern higher

education and the constant search for ways to solve them allow us to expect positive results in the near future.

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ANALYSIS OF THE ECONOMIC ACTIVITY OF VTB BANK (PJSC)

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Abstract. This paper is devoted to the analysis of the economic activity of VTB Bank. The study examines key financial indicators. The influence of macroeconomic factors on the financial condition of the bank, its development strategy and competitiveness in the market is analyzed. A detailed study of these aspects allows us to form an extensive understanding of the current situation and prospects for the development of VTB Bank in the modern economic environment.

Keywords: financial indicators, analysis, bank, economic activity, market.

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Аннотация. Данная работа посвящена анализу экономической деятельности банка ВТБ. В ходе исследования рассматриваются ключевые финансовые показатели. Анализируется влияние макроэкономических факторов на финансовое состояние банка, его стратегии развития и конкурентоспособность на рынке. Подробное изучение этих аспектов позволяет сформировать обширное представление о текущем положении и перспективах развития банка ВТБ в условиях современной экономической среды.

Ключевые слова: финансовые показатели, анализ, банк, экономическая деятельность, рынок.

The analysis of the bank’s profit and loss can give important insights about its financial condition, such as financial stability, the effectiveness of risk management: the analysis of losses in various segments or due to specific risks can indicate the effectiveness of the risk management system. A variety of profit sources can reduce the risks associated with dependence on certain types of activities. If the losses are related to loans, this may indicate problems in the management of the loan portfolio, the profit may also reflect the results of strategic investments and decisions of the bank.

Analyzing changes in profit and loss over time can help identify trends and predict future changes.

The general conclusion depends on the context and specific data on the bank's profits and losses, as well as on the comparison of these data with industry standards and strategic goals of the bank [1].

Let's analyze the composition and dynamics of the main economic indicators. Let's start with an analysis of the main profit and loss items of VTB Bank (PJSC).

Table 1 – VTB Bank (PJSC) profit and loss analysis for 2018-2021

Name of articles	2018	2019	2020	2021	Absolute change (+;-)		
	billion rubles	billion rubles	billion rubles	billion rubles	2018-2019	2019-2020	2020-2021
Net interest income	468,6	440,6	531,7	646,3	-28	91,1	114,6
Net interest income after provision for credit losses	308	348,4	304,7	551,2	40,4	-43,7	246,5
Net commission income	80,6	121,6	136,8	158,5	41	15,2	21,7
Non-interest income	91,1	61,8	48,3	29,5	-29,3	-13,5	-18,8
Revenue less operating lease expenses	11,6	15,4	13	13,6	3,8	-2,4	0,6
Revenue less insurance expenses from the activities of a non-state pension fund	22,5	-19,7	-15,9	-15	-42,2	3,8	0,9
Revenue less expenses from other non-banking activities	-16,5	1,7	-103,7	-2,9	18,2	-105,4	100,8
Non-interest expenses	-282,9	-276,3	-293,5	-338,4	6,6	-17,2	-44,9
Profit before tax	214,4	252,9	89,7	397,9	38,5	-163,2	308,2
Net profit	181,5	201,2	75,3	327,4	19,7	-125,9	252,1

Based on the data obtained from Table 1, the bank's net interest income for 2019 decreased by 28 billion rubles, compared to 2018, and in 2020 and 2021 increased by 91.1 and 114.6 billion rubles, respectively. The largest share of the total income in this indicator is occupied by loans from individuals and legal entities. This means that we are dealing with a classic bank, the main activity of which is lending to individuals and legal entities. We would also like to note that when creating a reserve for credit losses in 2020, significantly more funds were allocated than in 2019. This trend is most likely caused by the COVID-19 pandemic.

Analysis of the structure and dynamics of the bank's assets provides valuable information about its financial condition and strategy [2].

The study of the asset structure allows us to assess how the bank distributes its resources between different types of assets, which may indicate strategic priorities [3].

Analysis of changes in assets over time helps to determine the dynamics of the bank's growth. Sustained growth can indicate successful strategies and resource management. The study of asset quality, especially in the context of the loan portfolio, allows us to assess the risks associated with possible losses from the insolvency of

borrowers. An assessment of the share of liquid assets can give an idea of the bank's readiness for possible financial stresses and the ability to meet current liabilities.

Asset analysis can also be interconnected with the bank's financing structure, which is important for understanding and managing risks [4].

Let's analyze the structure and dynamics of assets of VTB Bank (PJSC) for 2018-2021. Let's determine which indicators of assets occupy a large share in the balance sheet (Table 2).

Table 2 – Analysis of the asset structure of VTB Bank (PJSC) for 2018-2021

Indicators	2018	2019	2020	2021	Changing the structure 2018 - 2019	Changing the structure 2019 - 2020	Changing the structure 2020 - 2021
	%	%	%	%			
Cash and short-term assets	6,34	8,60	6,78	5,63	2,26	-1,83	-1,15
Mandatory reserves on accounts with central banks	0,75	0,82	0,76	0,79	0,07	-0,06	0,04
Trading financial assets	2,02	3,23	3,57	3,92	1,21	0,34	0,36
Derivative financial assets	1,37	0,92	1,29	1,42	-0,45	0,37	0,14
Funds in banks	4,70	3,93	4,62	5,88	-0,76	0,69	1,26
Loans and advances to customers	72,43	69,44	67,60	66,12	-3,00	-1,84	-1,49
Investment financial assets	2,39	2,04	5,25	6,84	-0,35	3,21	1,59
Investments in associates and joint ventures	1,94	1,71	1,80	1,45	-0,24	0,09	-0,35
Assets of disposal groups and non-current assets held for sale	0,15	0,49	0,01	-	0,34	-0,47	-0,01
Land and fixed assets	2,73	2,72	2,52	2,34	0,00	-0,21	-0,18
Investment property	1,34	1,26	0,55	0,43	-0,07	-0,71	-0,12
Goodwill and other intangible assets	1,08	1,35	1,19	1,82	0,26	-0,16	0,63
Deferred income tax asset	0,81	0,84	0,85	0,64	0,03	0,02	-0,21
Other assets	1,95	2,65	3,22	2,72	0,70	0,57	-0,49
Total assets	100	100	100	100	x	x	x

Next, we will also analyze the dynamics of assets.

Table 3 – Analysis of the dynamics of assets of VTB Bank (PJSC) for 2018-2021

Indicators	Deviation 2018 - 2019		Deviation 2019 - 2020		Deviation 2020 -2021	
	absolute	%	absolute	%	absolute	%
Cash and short-term assets	399,2	42,7	-105,5	-7,9	-55,6	-12,1
Mandatory reserves on accounts with central banks	16,1	14,5	10,0	7,9	27,9	29,8
Trading financial assets	202,6	67,8	145,7	29,1	171,2	63,2
Derivative financial assets	-59,7	-29,5	91,0	63,7	63,3	108,1
Funds in banks	-83,0	-12,0	227,8	37,3	387,6	100,9
Loans and advances to customers	82,5	0,8	1 490,3	13,8	1526,8	28,0
Investment financial assets	-36,0	-10,2	636,1	200,9	473,6	350,5
Investments in associates and joint ventures	-21,9	-7,6	62,0	23,4	-23,7	14,5
Assets of disposal groups and non-current assets held for sale	53,8	244,5	-73,3	-96,7	-2,5	-100
Land and fixed assets	20,2	5,0	34,0	8,0	31,5	15,5
Investment property	-1,1	-0,6	-95,6	-48,8	-10,7	-54,2
Goodwill and other intangible assets	49,2	30,8	5,8	2,8	163,7	81,0
Deferred income tax asset	10,3	8,6	24,8	19,1	-20,3	3,5
Other assets	123,3	42,9	173,0	42,1	-15,7	38,3
Total assets	755,5	5,1	2 626,1	16,9	2717,1	34,4

Based on the data in Tables 2 and 3, it can be concluded that the overall dynamics of assets is positive. In 2019, assets increased by 5.1 %, in 2020 by 16.9 %, and in 2021 by 34.4 %. This dynamic is caused by an increase in such items as trading financial assets, funds in banks, loans and advances to customers, investment financial assets and other assets. The decrease in some other items had a negligible impact on the overall dynamics [5].

In addition, it is worth noting that the main indicator of assets is loans and advances to customers, it was 66.12-72.43 % of the total asset structure in 2018-2021. Analyzing Table 3, we can conclude that the change in the structure has both positive and negative dynamics.

All this suggests that VTB Bank (PJSC) is beginning to conduct its activities more actively in the market of investments in financial assets. But lending remains its main activity [5].

Based on the analysis of the economic activity of VTB Bank (PJSC), we can note its stability and adaptability to changes in the economic environment. The Bank is strategically oriented, maintaining a healthy loan portfolio and effective asset management. However, it is important to take into account the impact of external factors on long-term sustainability, such as macroeconomic conditions and competition in the financial sector. Further monitoring and adaptation to changes will help VTB Bank (PJSC) successfully cope with the challenges of modern economic dynamics.

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PROBLEMS OF IMPLEMENTING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TO IMPROVE THE COMPANY'S MARKETING ACTIVITIES

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Abstract. The article analyzes the key challenges and obstacles that companies face when trying to integrate modern artificial intelligence and machine learning technologies into their marketing practices. The article highlights issues related to data availability and complexity of implementation. It also demonstrates the positive aspects and strategies to overcome these challenges and maximize the benefits that can be gained through the use of artificial intelligence and machine learning in marketing.

Keywords: artificial intelligence, machine learning, data analysis, consumer behavior, advertising campaign effectiveness.

ПРОБЛЕМЫ ВНЕДРЕНИЯ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА И МАШИННОГО ОБУЧЕНИЯ ДЛЯ УЛУЧШЕНИЯ МАРКЕТИНГОВОЙ ДЕЯТЕЛЬНОСТИ КОМПАНИИ

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Аннотация. В статье анализируются ключевые вызовы и препятствия, с которыми сталкиваются компании при попытке интегрировать современные технологии искусственного интеллекта и машинного обучения в свои маркетинговые практики. В статье освещаются вопросы, связанные с доступностью данных и сложностью внедрения. Также демонстрируются позитивные аспекты и стратегии для преодоления этих проблем и максимизации преимуществ, которые могут быть получены благодаря использованию искусственного интеллекта и машинного обучения в маркетинге.

Ключевые слова: искусственный интеллект, машинное обучение, анализ данных, потребительское поведение, эффективность рекламной кампании.

In a world saturated with information and diverse offerings, understanding consumer preferences has become a key element of a successful business strategy. Nowadays, competition is so intense that companies that want to stand out must provide products and services that perfectly match the expectations of their target

audience. In this context, artificial intelligence (AI) and machine learning (ML) play a key role in analyzing consumer preferences.

Artificial intelligence provides companies with tools to analyze data related to consumer preferences in a deeper and more comprehensive way. Here are a few ways AI can be used in this area:

1) Handling huge amounts of data. One of the major challenges in analyzing consumer preferences is processing large amounts of data. Artificial intelligence can effectively analyze and classify huge datasets, which can reveal patterns and trends in consumer behavior.

2) Personalized recommendations. Based on data about consumers' previous purchases, browsing and preferences, AI can offer personalized recommendations. This increases the likelihood that a customer will make a purchase as they are offered products or services that match their interests.

3) Demand forecasting. Artificial intelligence is able to analyze historical data and predict future demand for certain goods or services. This helps companies optimize inventory levels, predict the need for certain products and save resources.

4) Social media analytics. Many consumers actively share their opinions and preferences on social media. Artificial intelligence can analyze text and image data from social media to identify trends and feedback from customers [1].

Machine learning is a subsection of artificial intelligence that allows systems to learn from data and make predictions or decisions without explicit programming. In analyzing consumer preferences, ML plays the following role:

1) Data classification. Machine learning can classify consumers based on various criteria such as demographics, purchase history, or website behavior. This helps companies to identify their target audience more accurately and create appropriate marketing strategies.

2) Sentiment analysis. Machine learning can analyze text data to determine the tone and sentiment of consumers towards a product or brand. This allows companies to understand how their products are perceived in the market and adjust their strategy if necessary.

3) Predicting customer churn. One important aspect of analyzing customer preferences is predicting customer churn. Machine learning can create models that predict the likelihood of a customer leaving, allowing companies to take steps to retain them.

4) Pricing optimization. Machine learning can analyze competitor prices, demand dynamics, and other factors to help companies optimize their pricing and maximize profits.

According to Salekit.ru, the global artificial intelligence market will grow to USD 1,847.58 billion by 2030, while the chatbot market is projected to reach USD 1.25 billion in 2025. The companies studied reported a 50% increase in leads due to the incorporation of artificial intelligence tools into their sales process. One-third of marketers say the main benefit of using AI is saving time in their work.

Machine learning represents a narrower specificity of the application of AI in the company's activities. However, with that in mind, implementing such a tool requires even more money, employee qualifications, data to train the model, etc.

Undoubtedly, artificial intelligence and machine learning is a strategically important tool for the company's work, which can save and multiply the capitalization of the firm. On the example of Dropbox organization, which optimized the process of generation and caching of document previews, we can see that such mechanisms allowed to save about $1.7 million [2]. However, AI implementation itself is also quite expensive. Some of the main implementation challenges are summarized below [3].

– Implementation costs. For example, Amazon's Mechanical Turk service costs $70k per 100k of generated data [4]. At the same time, Dimensional Research says that 66% of companies encounter problems with data set, which means that the money spent partially loses its usefulness in the process of use. Such errors can lead not only to the spent money being inefficiently utilized, but also to the incorrect evaluation of customer data, which will reduce the firm's revenue.

– The need for large amounts of data. ML requires large amounts of data to train models. In some cases, firms may face the challenge of not having enough data, especially if they are operating in a new or highly specialized market segment.

– Complexity of maintenance and support. ML models require constant updating and maintenance. This includes monitoring model performance, regular training on new data, and adapting to changing conditions.

– Data privacy and security issues. Handling large amounts of data involves security and privacy risks. Data must be protected from unauthorized access and leaks.

– Interpretability of models. Some IO models can be complex and difficult to understand. This can cause difficulties in explaining the decisions made by the model, especially if the decisions are critical to the business.

– Ethical and legal issues. The use of data and IO models can confront companies with ethical and legal issues related to transparency, discrimination, and compliance with data protection laws.

– Dependence on technology and experts. Companies implementing IO may face dependency on the technology and AI experts. This can create risk when market conditions change, or qualified experts are unavailable.

– Applicability limitations. Not all tasks and business scenarios are suitable for the use of ML. In some cases, traditional data analytics may be more effective.

– Difficulties in internal decision making. Some companies may encounter resistance from employees when implementing ML, especially if it brings changes to workflows and roles.

On average, marketers spend 5 hours and 36 minutes per week trying to improve their data processes. Modern AI technologies can improve business productivity by 40 % [5]. You can check the effectiveness of the tools used, for example, by analyzing the effectiveness of an advertising campaign (1) and the ratio of operating expenses to revenue (2).

$$ROAS = \frac{AdCampaignRevenue}{AdCampaignCosts} * 100\ \%\ ; \quad (1)$$

$$CRR = \frac{AdCampaignCosts}{AdCampaignRevenue} * 100\ \%. \quad (2)$$

Thus, it can be argued that machine learning data can significantly speed up the processing of large amounts of data, showing calculation results faster than in work without AI. This example shows that machine learning can significantly simplify and speed up the time to produce key marketing metrics.

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IMPACT OF TECHNOLOGICAL INNOVATIONS IN THE FIELD OF GAS HOLDERS ON THE ENVIRONMENTAL SUSTAINABILITY OF INDUSTRIAL PROCESSES

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Abstract. This article is devoted to the study of the impact of technological innovations in the field of gasholders on the environmental sustainability of industrial processes. The authors consider modern technologies used for gas storage and processing and their impact on the environment. The article also analyzes examples of successful implementation of innovations in this area and their positive impact on the environmental sustainability of industrial enterprises. The results of the study may be useful for specialists in the field of ecology, technological innovations and industrial processes.

Keywords: gasholder, gas, industry, gas storage.

ВЛИЯНИЕ ТЕХНОЛОГИЧЕСКИХ ИННОВАЦИЙ В ОБЛАСТИ ГАЗГОЛЬДЕРОВ НА ЭКОЛОГИЧЕСКУЮ УСТОЙЧИВОСТЬ ПРОМЫШЛЕННЫХ ПРОЦЕССОВ

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Аннотация. Данная статья посвящена исследованию влияния технологических инноваций в области газгольдеров на экологическую устойчивость промышленных процессов. Авторы рассматривают современные технологии, используемые для хранения и обработки газов, и их влияние на окружающую среду. В статье также анализируются примеры успешной реализации инноваций в данной области и их положительное воздействие на экологическую устойчивость промышленных предприятий. Результаты исследования могут быть полезны для специалистов в области экологии, технологических инноваций и промышленных процессов.

Ключевые слова: газгольдер, газ, промышленность, хранение газа.

Technological innovations play an important role in modern industry, especially in the field of gas holders. Gasholders are special gas storage tanks that are used in various industries such as oil and gas, chemical, power and other industries. In recent years, technological innovations in the field of gas holders have had a significant impact on the environmental sustainability of industrial processes. In this paper, we will examine what gas holder technological innovations exist and how they affect the environmental sustainability of industrial processes. Consider the diagram of the gas holder shown in Figure 1.

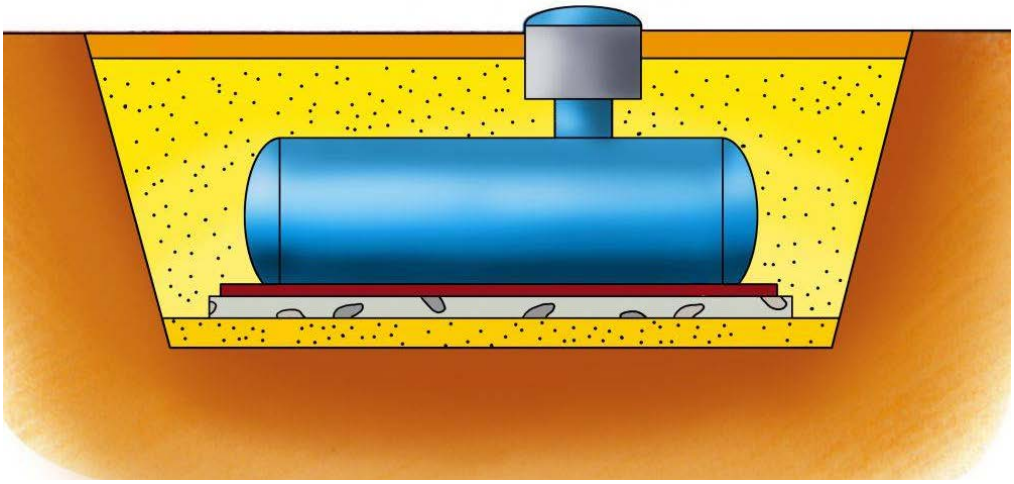


Figure 1. Gasholder

One of the main benefits of gas holder technological innovations is improved safety and reliability of gas storage. Modern gas holders are equipped with advanced monitoring and control systems, which allow one to promptly detect any abnormalities in operation and prevent emergency situations. This significantly reduces the risk of gas leaks and possible negative consequences for the environment [1].

All gas holders are equipped with control and safety systems that make it possible to monitor the condition of the facilities and promptly respond to potential threats. The main components of the control and safety system are:

1. Pressure and temperature sensors. They are installed in different points of the gas holder and are designed to measure gas parameters, as well as for timely detection of changes that may indicate emerging problems.

2. Emergency pressure relief system. In case the permissible pressure level in the gas holder is exceeded, the emergency valve automatically opens and releases the excess gas into the atmosphere. This prevents destruction of the gasholder or possible explosions.

3. Alarm and automatic control. The control and safety system includes a comprehensive alarm system that warns of any abnormal situations and automatically controls the operation of the gas holder. For this purpose various sensors, relays, contactors and other devices are used [2].

All gas holder control and safety systems must comply with the requirements of technical regulations and normative documents that regulate the activities of this sphere. They are regularly tested and subject to mandatory certification.

Thanks to a reliable control and safety system, gas holders ensure safe storage and use of gas. This is an important condition for guaranteed operation of gas supplying organizations and meeting the population's demand for energy resources.

In addition, technological innovations make it possible to improve the efficiency of gas holder utilization. New materials and designs make gas holders stronger, lighter and more compact, which allows increasing their capacity at the same volume. This reduces the number of gasholders needed at the production site, which in turn reduces the environmental and space requirements [3].

Another important aspect of technological innovations in the field of gas holders is the improvement of ecological cleanliness of production processes. Modern gas holders are equipped with special purification and filtration systems that minimize emissions of harmful substances into the atmosphere. This helps to reduce environmental pollution and improve the environmental sustainability of industrial processes.

In addition, technological innovations in the field of gas holders contribute to reducing energy consumption and improving the energy efficiency of production processes. New control and automation systems optimize energy consumption during gas holder operation, which in turn reduces the burden on energy resources and reduces greenhouse gas emissions.

In addition, modern technology offers several alternatives for replacing gas holders that can be more efficient and environmentally friendly. Each of these alternatives has advantages and disadvantages, and the choice of a particular replacement will depend on the specific needs and production conditions.

Underground gas storage facilities are one of the most common alternatives for replacing gas holders. They provide safer and more compact storage of gas while protecting it from external factors. In addition, underground gas storage facilities save space on the ground surface and reduce the visual impact on the environment. Underground gas storage facilities are shown in Figure 2.

Autonomous gasification today is a highly efficient and reliable system, which implies a whole complex of protections, including passive and active protection, as well as automatic protection against internal factors. Nevertheless, the greatest importance is acquired by the gas holder protection from external impact, as the destruction of this element leads to irreversible consequences for the autonomous gasification system.

The main "enemies" of any autonomous gasification system are: water, salts, acids, alkalis, organic compounds, bacteria, fungi, earth-dwelling insects and animals and, naturally, liquefied gas [4].

Top-tier stand-alone gasification offers protection against any of these influences. In order to protect gas holders from the harmful effects of acids and other chemical compounds of the soil, a special coating of the outer part is applied, based on a super-resistant paint, which retains its properties for 30 years. This allows the tanks to be completely buried in the ground. Tightness of the tank, uniformity and great thickness of the paint layer means that melt or ground water will not be able to damage the gasholder and cause corrosion of the outer part.

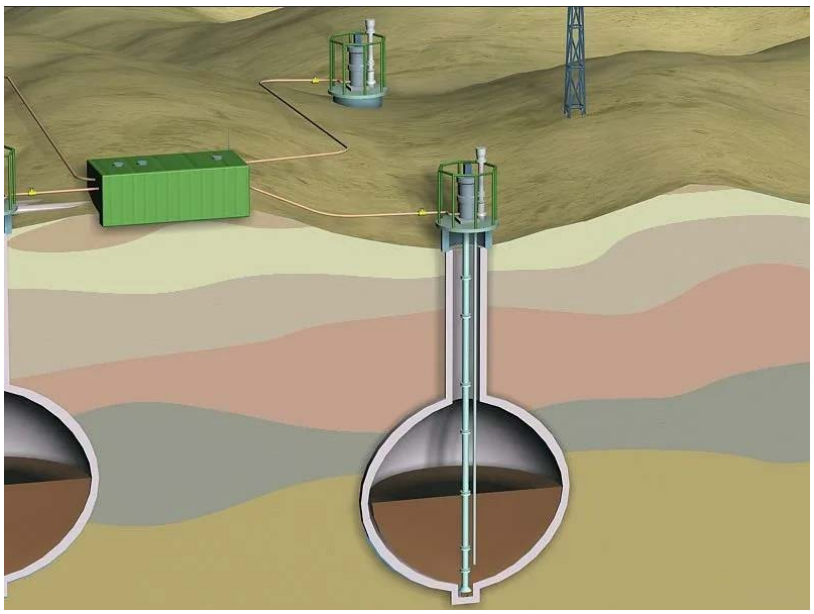


Figure 2. Underground gas storage facilities

Liquefied gas itself is an extremely corrosive medium, so autonomous gasification involves protecting the working surface of the gas holder with epoxy and polyurethane components. Corrosion in metal is one of the main reasons for the failure of autonomous gas supply systems, so one should not skimp on this protection.

All other types of protection, including protection from rodents, perform passive, that is, increase the thickness of steel, use polymer paints, etc. As an additional means of reducing the risk of corrosion, passive anodic or active electrochemical protection is used to make autonomous gasification systems last even longer.

Liquefied Natural Gas (LNG) is also an attractive alternative to replace gas holders. It offers higher energy density and ease of transportation, making it ideal for use in remote or hard-to-reach locations. LNG is also more environmentally friendly and cost-effective, making it an attractive choice to replace gas holders.

The storage of liquefied natural gas is depicted in Figure 3.



Figure 3. Storage of liquefied natural gas

Energy storage systems based on batteries or other technologies also offer a promising alternative for replacing gas holders. They provide flexibility and controllability in energy storage and utilization, which can effectively manage energy market supply and demand. In addition, energy storage systems can be easily integrated with renewable energy sources, making them more sustainable and environmentally friendly.

Each of these alternatives has advantages and disadvantages, and the choice of a particular replacement will depend on the specific needs and production conditions. However, today's technology offers a wide range of options for replacing outdated gas holders that can be safer, more efficient, and more environmentally friendly.

Thus, technological innovations in the field of gas holders have a significant impact on the environmental sustainability of industrial processes. They contribute to improving the safety and reliability of gas storage, increasing the efficiency of gas holder utilization, improving the environmental friendliness of industrial processes and reducing energy consumption [5]. All this helps to reduce the negative environmental impact of industry and create more environmentally sustainable production processes.

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POLYMERIC LUMINESCENT COMPOSITIONS DOPED WITH CURCUMIN COMPLEXES OF BORON DIFLUORIDE: PERSPECTIVES OF CHEMOSENSOR DEVELOPMENT FOR AMMONIA AND ORGANIC AMINES

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Abstract. This work presents the results of investigation of chemosensory properties of polymeric luminescent composition (PLC) based on polycarbonate doped with 2,2-difluoro-4-(p-hydroxy, 2-methoxystyryl)-6-phenyl-1,3,2-dioxaborine (1 wt. %). It was found that the obtained polymeric luminescent composition can be considered as a basis for a promising chemical sensor for the detection of organic amines in exhaled air.

Keywords: curcuminoids, 2,2-difluoro-4-(p-hydroxy, 2-methoxystyryl)-6-phenyl-1,3,2-dioxaborine, chemosensory activity, polymer luminescent composition, analysis of volatile compounds.

ПОЛИМЕРНЫЕ ЛЮМИНИСЦЕНТНЫЕ КОМПОЗИЦИИ, ДОПИРОВАННЫЕ КУРКУМИНОВЫМИ КОМПЛЕКСАМИ ДИФТОРИДА БОРА: ПЕРСПЕКТИВЫ СОЗДАНИЯ ХЕМОСЕНСОРА НА АММИАК И ОРГАНИЧЕСКИЕ АМИНЫ

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Аннотация. В данной работе приведены результаты исследования хемосенсорных свойств полимерной люминесцентной композиции (ПЛК) на основе поликарбоната, допированного 2,2-дифтор-4-(р-гидрокси, 2-метоксистирил)-6-фенил-1,3,2-диоксаборином (1 масс. %). Установлено, что полученную полимерную люминесцентную композицию можно рассматривать как основу перспективного химического сенсора для обнаружения аммиака и органических аминов в выдыхаемом воздухе.

Ключевые слова: куркуминоиды, 2,2-дифтор-4-(р-гидрокси, 2-метоксистирил)-6-фенил-1,3,2-диоксаборин, хемосенсорная активность, полимерная люминесцентная композиция, анализ летучих соединений.

Analysis of volatile compounds in exhaled air is a promising non-invasive method for the assessment of human health and early diagnosis of various diseases [1, p. 18].

The study of exhaled air makes it possible to identify more than 800 endogenous volatile organic compounds (VOCs), which form 17 classes of compounds of various origins (sulfur-containing compounds, alcohols, ketones, nitrogen-containing compounds, etc.), individual concentrations of which can be used for monitoring and early detection of pathological conditions of the body. For example, an increase in the content of gaseous ammonia and organic amines in exhaled air indicates a violation of nitrogen metabolism, in particular, diseases such as kidney failure and liver dysfunction [2].

Currently, the interest in non-invasive respiratory monitoring is due to the wide possibilities for comprehensive screening and therapeutic observation, painless sampling and accessibility compared to invasive methods such as blood or tissue analysis [3, p. 172].

A large number of methods for determining volatile organic compounds are known. The methods of mass spectrometry with gas chromatography (GC-MS) and mass spectrometry with liquid chromatography (LC-MS) are the most preferred, since they make it possible to separate, identify, and quantify numerous biomarkers in respiration simultaneously [4, p. 2].

These analytical methods are highly sensitive and can be considered reference for the analysis of VOCs, however, they are not suitable for widespread use for screening and diagnostics due to cumbersome, expensive equipment requiring maintenance by a highly qualified specialist, a complex process of preliminary preparation of the sample, including its collection, storage and pre-concentration, a long analysis time [4, p. 2].

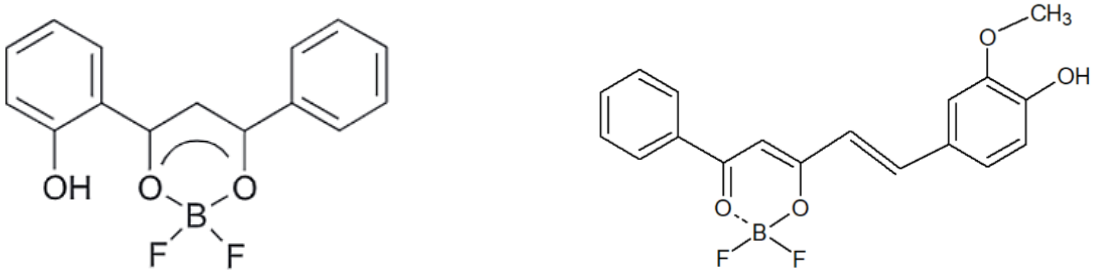
The difficulty in detecting ammonia and organic amines in exhaled air lies in extremely low concentrations of analytes. The concentration of ammonia and organic amines in exhaled air in healthy people ranges from 0.5 to 3 parts per million (ppm) [5, p. 180]. Elevated levels of ammonia in the breath indicate several diseases: kidney failure, liver disease, Helicobacter pylori infections and oral diseases. According to various sources [5-7], the concentration of analytes in the breath of sick people varies depending on the type and stage of the disease and amounts to 8-120 ppm.

In the ideology of HealthNet approaches, the development of personalized medicine, devices for early diagnosis of diseases that are cheap, affordable, suitable for use by an untrained user are relevant. From this point of view, non-invasive, affordable, portable devices, such as respiratory sensors, are promising, the analytical signal in which will be easily detectable parameters, for example, color change over a certain period of time. To develop the design of such sensors, it is necessary to select a substance with the specified reaction parameters at certain concentrations of ammonia and amines in the exhaled air.

There are substances with proven sensory activity for ammonia and organic amines. Earlier, when studying the structural, chemosensory and luminescent properties of boron difluoride o-hydroxydibenzoylmethanate (see Figure 1 – Dye A), it was found that boron difluoride diketonates exhibit high activity when interacting with proton acceptors, thereby representing a promising class of compounds for creating optical sensors [8, 9].

Fluorescent materials based on dioxaborine are of growing interest. Due to their rigid structure created by the cyclic boron complex, dioxaborines have attractive photophysical properties: high molar extinction coefficients, multiphoton absorption, photostability [10, p. 503].

Boric complexes of curcumin structures belong to polymethine dyes [11]. One of such dyes is 2,2-difluoro4-(p-hydroxy, 2-methoxystyryl)-6-phenyl-1,3,2-dioxaborine (see Fig. 1 – Dye B). Compound B has a hydroxyl group in its structure in the para-position of one of the phenyl rings, which contributes to the formation of an intramolecular hydrogen bond. The possibility of interaction of this hydroxyl group with proton acceptors with the formation of colored adducts is assumed.



Dye A Dye B

Figure 1. Structural formulas of luminescent dyes

This paper presents the results of a study of the sensory properties of a polymer luminescent composition based on polycarbonate doped with polymethylene dye B (1% by weight).

The production of polymer microfibres doped with a luminescent dye was carried out on a laboratory installation by the method of spinless centrifugal spinning from a polycarbonate solution [12]. The resulting fibrous material was kept in air for 28 days until the solvent completely evaporated. Samples of the polymer luminescent composition (PLC) were tested for sensitivity to a number of analytes as follows: microfibers were placed in the center of a sealed vessel with the exact amount of gaseous ammonia, methylamine and dimethylamine injected.

The luminescence quenching time was recorded, manifested in a change in the color of the PLC from yellow to bright orange (Figure 2).

A – Monomethylamine; B – Dimethylamine; C – Ammonia



A B C

Figure 2. Color change of microfibers when interacting with analyte vapors (in the vessel on the left – a comparison sample)

The dependence of the response time on the concentration of analytes is shown in Figure 3.

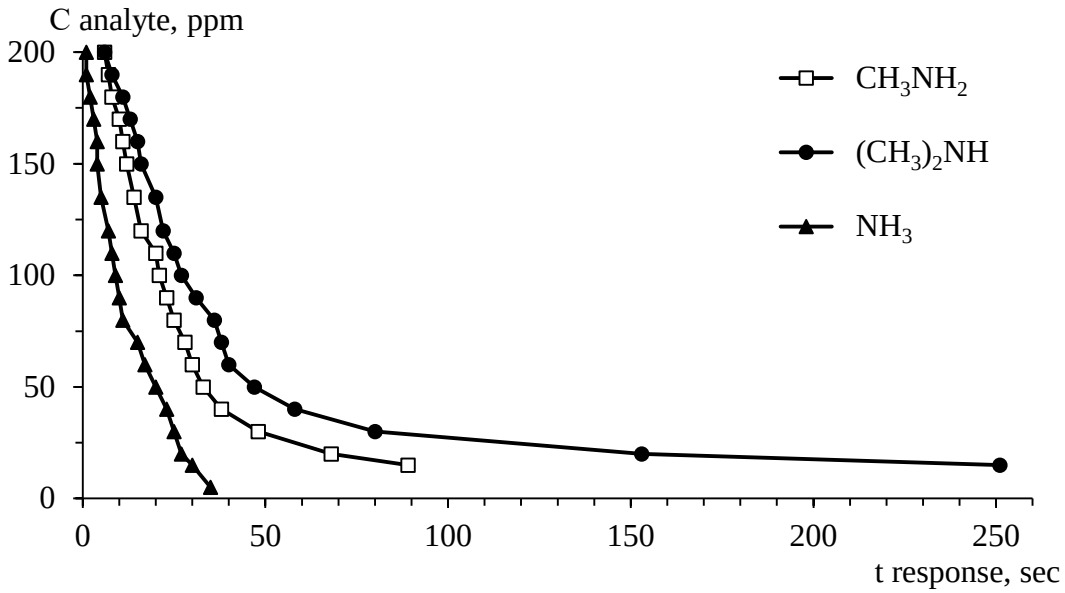


Figure 3. Dependence of response time on analyte concentration

Figure 4 shows the dependence of the response time on the concentration of analytes in the concentration range of 0-50 ppm.

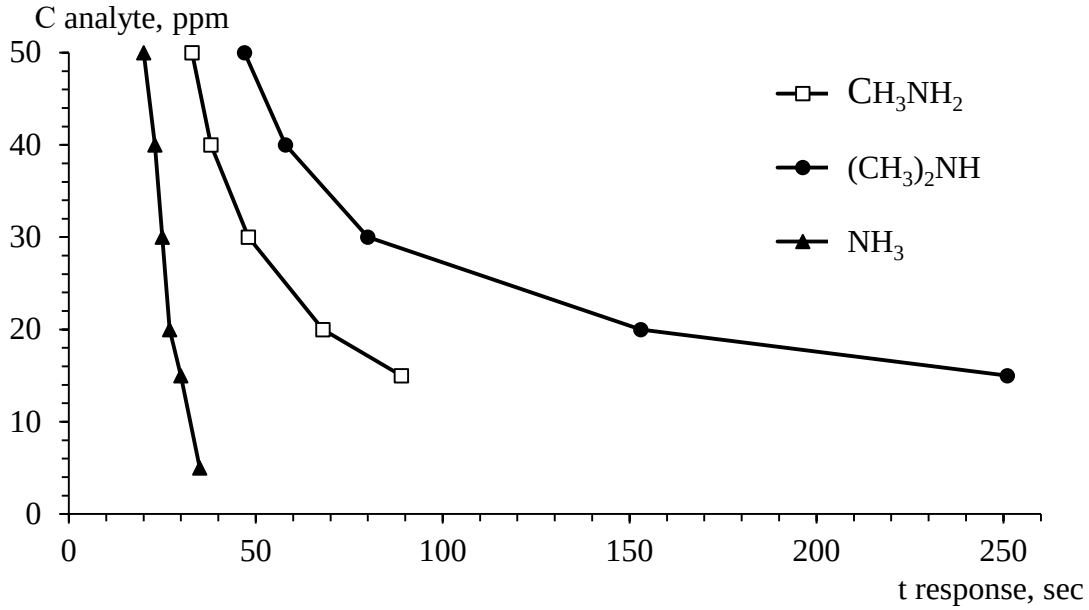


Figure 4. Dependence of the response time on the analyte concentration (0-50 ppm)

As a result, the dependences of the response time (visually marked changes in the color of the material) on the concentration of ammonia, monomethylamine and dimethylamine at a dye concentration in the fiber of 1 wt. % were established. The compound exhibits chemosensory activity on ammonia higher than on other analytes, as evidenced by a shorter response time. The slower response of substituted amines compared to ammonia is most likely due to the steric factor. The color change from bright yellow to orange occurs at the time of formation of the intermolecular complex of the dye with the analyte molecule, therefore, due to the more difficult approach of analyte molecules to the hydroxyl group of sensor molecules for the formation of an intermolecular complex, an increase in response time is observed with an increase in the diameter of analyte molecules.

It is proved that the luminescent material of the studied composition registers low concentrations of ammonia and organic amines within 5-10 pmm with an acceptable response time.

Thus, the resulting polymer luminescent composition can be considered as the basis for a promising chemical sensor for detecting organic amines in exhaled air.

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THE FORMATION OF STEREOTYPES ABOUT THE DIFFERENCES BETWEEN PEOPLE LIVING IN THE SOUTH ITALY AND IN THE NORTH ITALY BASED ON FILMS BY ITALIAN DIRECTORS

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Abstract. This paper examines the peculiarities of the formation of stereotypes about the differences in lifestyle and character of the southern population of Italy and the northern one. The manifestation of these stereotypes is traced in the films of the Italian director Luca Miniero “Welcome to the South” and “Welcome to the North”.

Keywords: stereotypes, southern population, northern population, culture of the Italian film industry.

СТАНОВЛЕНИЕ СТЕРЕОТИПОВ О РАЗЛИЧИЯХ МЕЖДУ ЖИТЕЛЯМИ ЮЖНОЙ И СЕВЕРНОЙ ИТАЛИИ НА ОСНОВЕ ФИЛЬМОВ ИТАЛЬЯНСКИХ РЕЖИССЕРОВ

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Аннотация. В статье рассматриваются особенности становления стереотипов о различиях образа жизни и характера южного и северного населения Италии. Прослеживается проявление данных стереотипов в фильмах итальянского режиссера Луки Миньеро «Добро пожаловать на Юг» и «Добро пожаловать на Север».

Ключевые слова: стереотипы, южное население, северное население, культура итальянской киноиндустрии.

Cinema, as well as other mass media, has a strong influence on the formation of public opinion and ideas about different cultures and people. Often the film industry uses stereotypes to create characters and plots, which can lead to the assertion of certain prejudices and ideas. By studying authentic films, one can understand the historical and social context in which these stereotypes arise, and by getting acquainted with the

richness and diversity of the regions and inhabitants of Italy, stereotypes can be destroyed. In his two films director Luca Miniero first highlights the difference in characters and lifestyle between two regions, hyperbolizing some moments, thereby reinforcing and creating stereotypes, and then at the end of the films masterfully destroys them.

A stereotype is a firmly established, permanent sample of something [1, p. 6]. One of the common stereotypes associated with Italy is the division of the country into north and south. Northern Italy is often portrayed as rich, with developed infrastructure and modern cities such as Milan and Turin. Southern Italy, by contrast, is portrayed as poor, traditional and having problems with crime. This stereotype can be found in many films, such as "The Godfather" and "Gomorrah".

However, stereotypes about Southern and Northern Italy in cinema have their roots in reality. Italy does have regional differences in economic development, education and culture. When considering such problem, the following term arises – the Southern Question. So, the Southern Question is a political and social movement that emerged in the 1960s, active in the south of the country and aimed at fighting for improved economic development, combating unemployment, poverty and social inequalities. The movement includes various groups and organizations such as trade unions, workers' organizations and activists who express their demands and protests through rallies, strikes and other forms of action. The Southern Question in Italy focuses on the problems associated with economic backwardness and social inequality in the south of the country compared to more developed regions in Northern Italy. While in the North, even before the unification of the country, there was an intensive development of commercial and financial spheres, in the South the features of feudal society were preserved for a long time [2, p. 77]. After the Second World War of 1939-1945, due to the extreme severity of the Southern Question, an attempt was made to formulate a policy of industrialization of the South that would meet the requirements of the development of monopolistic capitalism. For this purpose, in 1950, a special state institution was created – the "Ticket Office of the South" – "for carrying out emergency works of public importance in Southern Italy". The total background of the "cash register" was 1000 billion Italian lira. Of these, 77 % was allocated for the development of agriculture, and the rest – for the development of infrastructure (service industries of production and non-production areas) [3, p. 26]. However, despite the efforts of the ruling society to "balance" the economic inequality between the North and South of Italy through public investment in the South, the gap between income levels in Northern and Southern Italy is not decreasing. Harvard sociologist Robert Putnam, who studied the Italian problem of "rich north – poor south", wrote: "Driving from north to south in the 1970s, it was as if you were going back hundreds of years to the past... many lived in one- and two-room shacks; farmers still threshed grain by hand... donkeys served as a means of transportation, sharing their rickety pens with skinny chickens and cats." [4, p. 188]. Italian economist Emanuele Felice wrote: "mountains of literature are written on the so-called 'questione meridionale', the question of the social, cultural and economic backwardness of Southern Italy" [5,

p. 42]. Another Italian economist, Gianni Toniolo, wrote that “works devoted to the Southern Question would occupy an entire library, but many economists' questions about the scope and causes of Italian economic dualism remain unanswered” [6, p. 44]. Based on the opinions of various scientists, this issue remains unsolved, which is why it is so often covered in films.

Director Luca Miniero was born on January 17, 1967 in Naples, Italy. He graduated from the University in the Miniero literature. Later, he moved to the city of Milan, where he started working as a director of the commercial firm “Shorts”. Luka gained the greatest fame as a director in 2010, after the release of the comedy film “Welcome to the South” on wide screens. Later, the director participated in the work on the logical continuation of the picture, which was called “Welcome to the North”. So, the director answered a question in an interview about the idea of making two films, because he himself felt this difference in childhood.

“In the cinema, no one talked about the differences between Northern and Southern Italy like you. What was the South where you were born?”

“About the petty-bourgeois quarters, about the looting of Naples, told by Francesco Rosi in the book “Hands to the City”. My favorite dish was Arenella, which, however, the residents of Arenella call Vomero, although it is much more popular than Vomero. My parents, mom, who worked in Sip, dad in the municipality, came to us in the 1960s from the lower districts of the city. It was a “hello” from the Port of Capuan: they had climbed the social ladder. And although my dad did not change his lifestyle and continued to hang melons on the balcony, my mom was “safer” also because she studied more. We were three brothers, I was a boy in the 80s, and I remember a very violent Naples, felt the presence of the Camorra. Let’s say our 80s were more exhausting than paninari’s in Milan” [7].

Let’s turn to the films themselves. “Welcome to the South” (*Benvenuti al Sud*) is an Italian comedy about the adventures of the main character, who is transferred to work in a small town in Southern Italy. Initially, he considers the south of the country not an attractive place to live, but soon changes his mind, learning about the sincerity and hospitality of the locals. From the very beginning of the film, the South is described as a terrible place, and when the main character goes there, he sees a sign with the inscription – “They die here”. There are other stereotypes about the southern part of Italy in the film:

1. Southerners speak with an accent and use a specific dialect. Paolo initially has difficulty understanding the locals because of their accent and dialect.

2. Italian southern cuisine is considered delicious, abundant and nutritious. Southern Italy is known for its local cuisine, which includes dishes such as pasta, pizza, seafood, olive oil and cheeses. In the film, the characters are shown as lovers of good food and drinks.

3. The South of Italy is presented as a calm and slow place, unlike the fast and bustling Northern Italy. Paolo initially sees the southern town as a boring and sleepy place, but over time he realizes that the slow pace of life here has its advantages.

4. Southern Italians are described as hot and emotional people who often express their emotions through gestures and loud conversations. Many scenes of the film show locals speaking vividly and emotionally.

Contrasted with the aforementioned motion picture, is the film “Welcome to the North” (*Benvenuti al Nord*), which is a continuation of the first part. The main character of the film, Paolo, goes to the north, expecting an unpleasant atmosphere and cold, boring people, but gradually he discovers that life in the north is not as cold and boring as he thought. However, before that, he faces some prejudices and stereotypes associated with life in the north of the country. The main stereotypes about the north that are present in the film include:

1. Coldness and asceticism: Northern Italians are portrayed as serious, shy, and sometimes cold people who value work and order.

2. Inhospitality: Northern Italy is known for its more formal and detached nature compared to the more open and friendly south.

3. Development: The northern regions of Italy are portrayed as more developed and affluent, with large and luxurious houses, restaurants and shops.

4. Accuracy and punctuality: Northern Italians are seen as people who adhere to work schedules and appreciate punctuality and accuracy.

Both films are vivid comedies, in which the emphasis is on the national characteristics of Italy, their cultural diversity and the differences between the North and South of the country. The pictures show that, despite geographical and cultural differences, people can always find a common language and overcome differences for the sake of mutual understanding and friendship, because every film has a happy ending in which the director dispels all myths and breaks stereotypes. The films emphasize the warmth and hospitality that people from different regions of Italy have.

Summing up, it is important to note that it is necessary to be aware of the influence of films and art on the formation of stereotypes and take a critical approach to their interpretation. Public discussion and awareness of such stereotypes can help overcome incorrect beliefs and reunite different regions.

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THE SIGNIFICANCE OF EMULATOR INTEGRATION IN TELECOM SPECIALIST EDUCATION

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Abstract. This paper explores the potential use of emulators as virtualization technologies to enhance the quality of training for telecommunications specialists. It analyzes the advantages and main concerns of using emulators in the educational process at a technical university. The experience of SPbSUT in training specialists in the field of fiber optic communication lines is also examined.

Keywords: virtualization, emulator, FOCL, students training, telecommunications, technical university.

ВНЕДРЕНИЕ ЭМУЛЯТОРА ДЛЯ ПОВЫШЕНИЯ КАЧЕСТВА ОБРАЗОВАНИЯ СПЕЦИАЛИСТОВ СВЯЗИ

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Аннотация. В статье исследуется возможность применения эмуляторов в качестве средства повышения качества подготовки специалистов в области телекоммуникаций. Проанализированы преимущества и ограничения использования эмуляторов в процессе обучения студентов в техническом вузе. Рассмотрен опыт подготовки специалистов в области волоконно-оптических линий связи в СПбГУТ.

Ключевые слова: эмулятор, обучение студентов, ВОЛС, телекоммуникации, технический вуз.

The Russian universities are currently facing the urgent task of preparing technical specialists who can drive the country’s innovative development and ensure technological sovereignty, as emphasised by President Vladimir Putin in his address to the Federal Assembly in February 2023 [1]. As the largest organisation under the Russian Ministry of Digital Development, Communications, and Mass Media, the

Bonch-Bruevich Saint Petersburg University of Telecommunications (SPbSUT) has the potential to lead in the effort to develop a national public communication network that performs independently of external protocols, technologies, hardware, and networking equipment. The fact that the top twenty communication professionals are actively involved in research and teaching at SPbSUT shows how committed the university is to achieving this goal. Given the rapid pace of technological advancements, the rector of SPbSUT, R. V. Kirichek, has identified the training of highly skilled specialists in networks and communication systems as one of the university's key priorities [2]. This emphasis on educating students with the abilities to handle the fast-changing technology world is consistent with the national objective of supporting innovation and ensuring technical sovereignty.

The aim of the research is to study the potential of virtualization technologies, such as hardware emulators, as a means to enhance the quality of the training process for technical students. In the context of import substitution, this research is particularly relevant as it aims to investigate the potential of creating customized domestic software that fulfills the requirements for training students at the university. In the current situation, where foreign software licenses are expiring and cannot be renewed, and the expenses for purchasing necessary hardware and components are increasing, this research becomes especially important.

Different types of virtualization, as well as the specifics of certain subject areas, have given rise to a wide range of methods for using such software as emulators.

Based on the literature studied [3, 4, 5], opinions differ regarding the effectiveness of emulators use for training specialists.

Some proponents of using emulators believe that they can significantly improve the learning process. The advantages of using such technologies are as follows:

– Accessibility. Emulators allow students to practice on near-realistic devices that may be too expensive or unavailable for widespread learning.

– Safety. In some cases, it may be necessary to simulate equipment emergencies. The emulator will allow such operations to be performed under controlled conditions without risk to student life.

– Flexibility. The specificity of emulators allows them, often very flexibly, to adapt to the needs of the learning process, simulating many situations that would be encountered working with real equipment.

Opponents of the use of emulators may point to the following potential limitations:

– Unrealism. Although emulators can provide students with practical skills, they cannot completely replace real experience with real equipment. Differences in the level of realism may affect students' ability to transfer what they have learned to real-life situations.

– Implementation and maintenance costs. Even if virtual counterparts are less expensive than real equipment in some cases, this is not always true. For many educational service organizations, the implementation and maintenance process can be cost-prohibitive.

– Difficulty of perception. Another problem with the use of virtualization technologies is the problem of perception of this approach to learning for certain

categories of learners. Depending on the specific technology, its use may have an impact on the health and well-being of the individuals.

Overall, there is no consensus on the effectiveness of incorporating emulators in the learning process.

There are several areas of training that have not yet been much affected by virtualization. One such area is training for working with fiber optic communication lines (FOCLs). Experience of working with an optical reflectometer during the training process is important for telecom specialist. The importance of this instrument cannot be underestimated, as it allows for the measurement of losses in optical fibers and the detection of defects and misconnections of fibers [6]. Additionally, the optical reflectometer helps students develop practical skills. Through hands-on experience with the device, students develop an understanding of the processes involved in transmitting an optical signal and gain the ability to interpret its representation as a reflectogram. Integrating this device into the educational program enhances the quality of education and facilitates the training of specialists with the required competencies in this field.

As the price for such devices vary, their use in training process can be a challenge for many organizations financially. However, high-quality emulation of such a device would enhance the capabilities of both educational organisations and companies engaged in employees training. At the moment, there are many programs that are more widespread for visualizing and viewing traces taken in advance from real devices, compared to the software for device emulation. Additionally, there is software available for emulating work with this type of device. However, emulators of such devices are not widespread, despite some domestic developments in this area [7]. The cost of such products may be discouraging for certain organizations. In general, it can be concluded that such developments are still limited in the Russian Federation market. Combined with the inability to pay for software produced outside Russia, discussing the effectiveness of emulators in the learning process becomes challenging.

Currently, the Bonch-Bruevich Saint Petersburg State University of Telecommunications employs comparable software for both student training and professional development courses for specialists. The interface of this program is presented in the Figure.

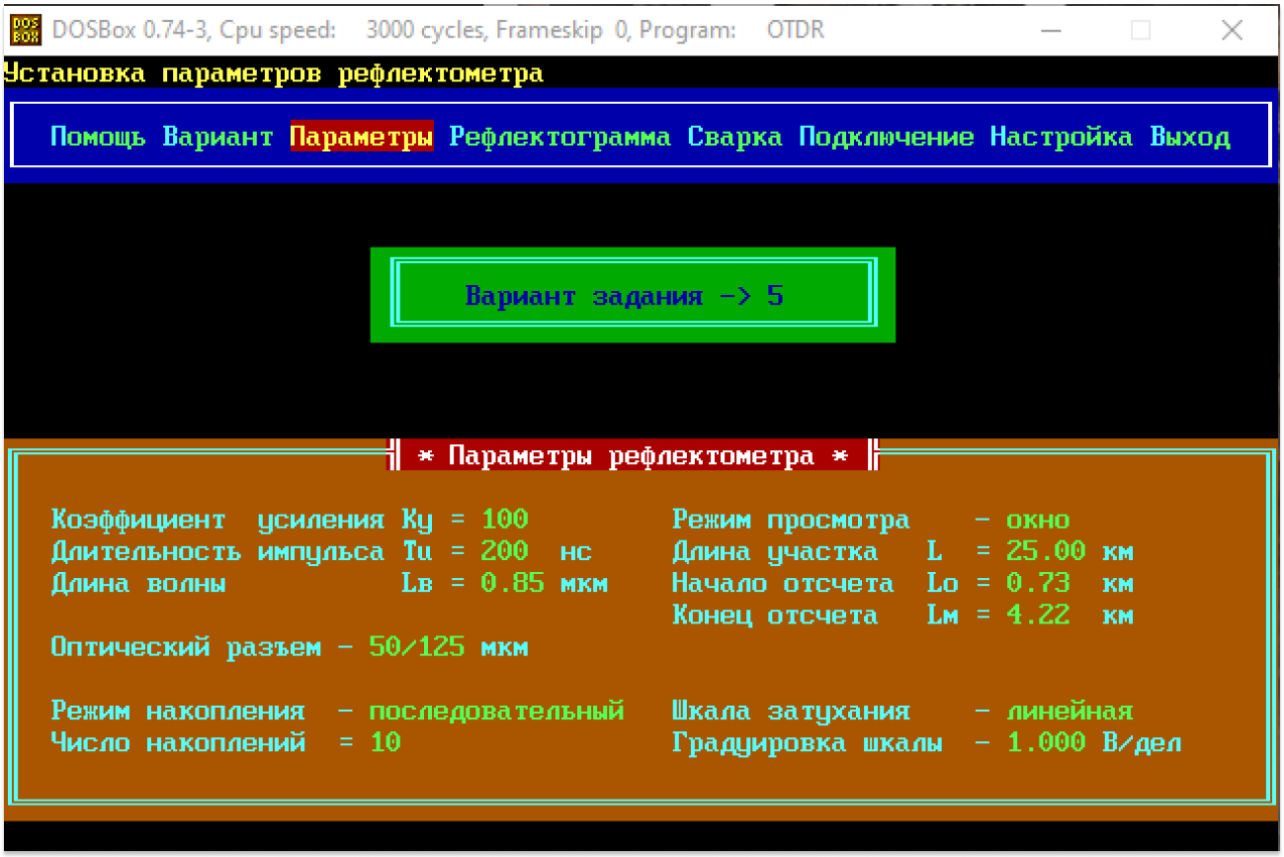


Figure. OTDR research program interface

The program offers several advantages that enable the analysis of fiber link parameters with sufficient flexibility during the training process. It not only allows for modifying the parameters of the OTDR itself but also the length of the fiber link. Moreover, the program verifies the accuracy of user-entered data. The selected parameters directly impact the visualization of the graph. The program provides the ability to change the following parameters: gain factor, pulse duration, wavelength, optical connector, accumulation mode, length of the section, and attenuation scale type. The graph is displayed in a separate window, where users can select specific areas for detailed examination in the viewing mode.

However, a significant drawback of the program is its development for the now obsolete MsDOS operating system. The use of specialized operating system emulator programs is required, which may cause errors in the program operation. As a result, the program lacks support for modern operating systems, severely limiting its functionality and distribution possibilities. Unfortunately, the program's capability is further restricted as it only allows for the consideration of two fiber sections. The variety of training settings is limited by this constraint. It is important to acknowledge that, due to the specific time of its development, the program lacks many technical advancements that have emerged long after its release. For instance, it is unable to perform parallel calculations in multiple threads, which greatly increases the time required to calculate the trace for certain settings. There are additional aspects that, while not technical shortcomings, impede ease of use and user experience. It is related to the program's lack of mouse control functionality and its utilization of an outdated

graphics format known as text graphics. These limitations contribute to a less intuitive and visually appealing interface.

Thus, all of the previously mentioned shortcomings should be considered in future research and the development of modern software in this field. This implies that further study is necessary to design the optical reflectometer emulator and evaluate its effectiveness for training telecom specialists.

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ANALYSIS OF THE PROSPECTS FOR THE DEVELOPMENT OF INNOVATIVE “GREEN” ENERGY TECHNOLOGIES IN THE WORLD

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Abstract. Rapid economic growth in many countries requires simultaneous expansion of all industries. The development of “green” energy contributes, on the one hand, to saving hydrocarbon fuels extracted in the ground and thereby prolonging their use, and, on the other, to the use of alternative high-tech complexes using solar and wind energy. In the article comparative characteristics of the use of solar and wind energy are given, an assessment of the effectiveness of its application is carried out, a comparative analysis of data on the development of “green” energy around the world is provided. Proposals are presented to improve energy generation using renewable energy sources in the world.

Keywords: “green” energy, solar energy, nuclear power plants, world market, electricity.

АНАЛИЗ ПЕРСПЕКТИВ РАЗВИТИЯ ИННОВАЦИОННЫХ ТЕХНОЛОГИЙ «ЗЕЛЕНОЙ» ЭНЕРГЕТИКИ В МИРЕ

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Аннотация. Бурный экономический рост во многих странах требует одновременного наращивания всех отраслей. Развитие «зеленой» энергетики способствует, с одной стороны, экономии добываемых в земле углеводородных топлив и тем самым продлению сроков их использования, а с другой – применению альтернативных высокотехнологичных комплексов с использованием энергии солнца и ветра. В статье приведены сравнительные характеристики применения солнечной и ветряной энергетики, проведена оценка эффективности ее применения, также дается сравнительный анализ данных развития «зеленой» энергетики по всему миру. Представлены предложения по

улучшению выработки энергии с помощью возобновляемых источников энергии в мире.

Ключевые слова: «зеленая» энергия, солнечная энергия, АЭС, мировой рынок, электроэнергия.

Currently, there is more and more news that conventional fuel sources are making things worse for our ecology or tend to run out. In view of this, renewable energy sources are becoming increasingly relevant. At the same time, it cannot be said that they are currently at the initial stage of their development. In some countries, including China, they have already tightly entered the energy supply sphere and occupy a significant share there. However, it is difficult to manage such a sphere without its scientific, primarily economic understanding. The relevance of the chosen research topic is related to the following number of reasons. Firstly, the share of green energy sources is increasing every year, and, consequently, research in this industry is in demand. Secondly, such significant growth causes noticeable shifts in various systems of society, primarily in the economic one. Sometimes the development of green energy sources has an extremely negative impact on the development of the economy, leads to a multiple increase in energy costs, especially in the short term, companies whose activities are related to traditional energy sources suffer losses. Thirdly, no matter how paradoxical it may be, the impact of green energy sources on the environment cannot be called unambiguously positive. The construction of clean energy production facilities can be associated with ecosystem disruption, especially when it comes to construction on the territory of water bodies, seas and oceans. Fourth, in order to maximize the positive effect of the development of green energy, a comprehensive study of this area and an integrated scientific approach are needed [1].

Over the past three decades, research and development in the field of green energy has grown dramatically, and hundreds of promising new technologies have been created that can reduce our dependence on coal, oil and natural gas (Figure 1).

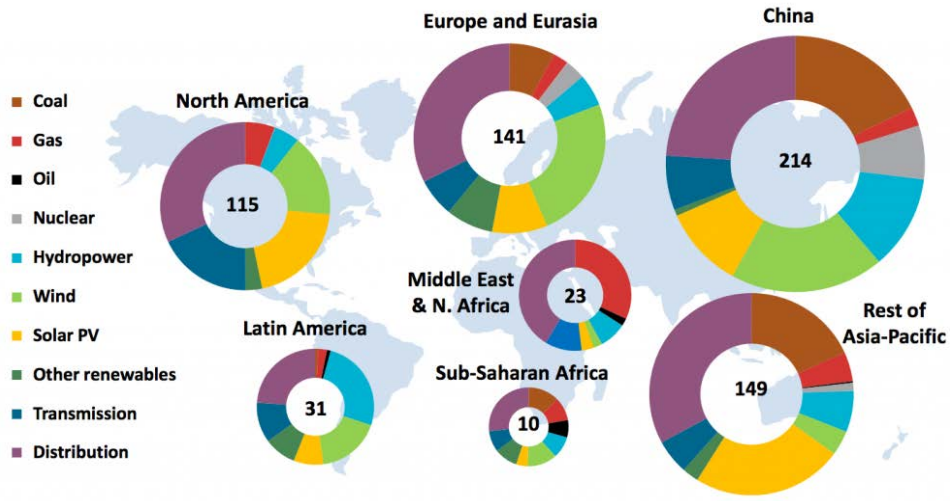


Figure 1. Distribution by country and type of green energy sources

Green energy is sometimes also called regenerative. Its sources are considered inexhaustible by historical standards. The essence of this method is to obtain energy

from processes constantly occurring in nature, followed by its application in the technical field. Renewable energy sources are sources based on constantly existing or periodically occurring energy flows in the environment. Renewable energy is not a consequence of purposeful human activity, and this is its distinctive feature. Now let us turn to the consideration of the content of green energy sources [2].

Solar energy

From time immemorial, solar heat has given us everything we need in life, and now it also provides an endless stream of green energy. Solar energy is already being actively used in various fields. It provides electricity to both industry and everyday life of citizens. The installation of solar panels on the upper floors of buildings has become a frequent practice.

It is customary to divide solar energy into two types:

– photovoltaic energy;

– solar thermal energy.

In the first case, light energy is converted into electricity, and electricity is generated through semiconductor materials that emit electrons. All photovoltaic cells have at least two layers of semiconductors, one positive and the other negative. When light hits a semiconductor, an electric field created between two layers of materials causes electrons to move, creating a constant current. The stronger the luminosity, the greater the current. As for solar thermal energy, it consists in focusing sunlight at some point. The generated heat can be used to produce steam. High-pressure hot steam can drive turbines to generate electricity. In sunny places, solar thermal power plants can supply a significant amount of electricity.

There is an opinion that solar energy is unstable due to various weather conditions, for example. In fact, solar photovoltaic systems do not always need the sun to shine brightly. They can also generate electricity in cloudy weather. This is because sunlight will be reflected by clouds, and a day with few clouds can even produce higher photovoltaic energy than a cloudless sky.

Hydropower

This industry can generate electricity from the energy of moving water. Unlike solar and wind energy, hydropower is not intermittent. It can continuously generate electricity 24 hours a day. Water energy is also divided into two types.

The first one is tidal force, the World Energy Commission estimates that tides can generate 20 terawatts hours of energy per year. This is twice the total amount of electricity produced in the world, and is equivalent to the energy generation of 2,000 large fossil fuel power plants and nuclear power plants. The potential total amount of renewable energy in the world’s oceans can more than 5,000 times meet the current global energy demand. But until now, the use of tides is in many ways still at the theoretical stage, although vivid examples of their use are already also present.

The second type is river hydropower. In 2003, 16 % of all electricity in the world was produced by hydropower. Therefore, this type of green energy can be considered one of the most used. Hydropower uses energy generated from the difference in water level in river water sources. The greater this difference, the faster the water flows and the more electricity is generated. But dams built for the implementation of large hydropower projects can also flood the ecosystem. The development of river

hydropower should also take into account the water needs of downstream communities, farmers and ecosystems. And because of the constant drought caused by climate change, hydropower may not be stable enough.

Geothermal energy

Geothermal energy uses thermal energy in the Earth's rocks to produce energy. The temperature in the Earth's core is extremely high, reaching 5500 degrees Celsius. Geothermal energy typically uses reservoirs at a heat source to supply hot water to places where thermal energy is needed. Geothermal water can be used for heating homes, as well as in industry or in electricity generation. Geothermal energy production does not cause pollution, greenhouse gases, or noise. However, despite the fact that many countries have very rich geothermal resources, this type of renewable energy has not yet been widely developed. A striking positive example of the use of this type of energy is the Hellisheiði geothermal power plant (Figure 2), it is located in Hengill on an active volcanic ridge, in the southwest of Iceland. This geothermal power plant is the second largest in the world and the largest in Iceland.



Figure 2. Hellisheiði geothermal power plant

Wind energy

Wind energy is a truly clean energy source with endless sources that does not produce pollutants like other fossil fuels. Wind power is the fastest growing energy source in the world because the technology is relatively simple and is a good helper in mitigating the effects of climate change. Wind power is a relatively cheap source of energy. Wind turbines are not dependent on fossil fuel prices. Wind power is not like fossil fuels that need to be mined, drilled, or transported to power plants. The less fossil fuels are dug up, the more the price increases, and the cost of wind energy, on the contrary, gradually decreases due to technological progress.

Biomass energy

Bioenergy village Juehnde is the first biomass-powered village in Germany, using compost and wood chips to generate heat and electricity for the entire community [3].

In order to assess the role of green energy sources in the world economy, and even more so to make any management decisions on their use, it is necessary to understand their advantages and disadvantages compared to traditional energy sources. This will allow them to be used more effectively in the future in those areas where they are most justified, as well as to offset the consequences of their weaknesses. Let us consider their advantages first.

1. Environmental friendliness. The main advantage of absolutely all green energy sources is their environmental friendliness, which is why they are called green. In other words, no harmful emissions into the surrounding atmosphere occur during the operation of such stations. Even an accident at a wind, solar or any other alternative power plant will only lead to material losses of its owners, but will not cause a global environmental disaster, as it can happen, for example, with a nuclear power plant. It should also be noted that the installation of most types of stations does not harm the surrounding landscape. If we talk about wind ES, they occupy minimal areas and can even be combined with some other types of economic activity.

2. Inexhaustibility. Although in the first section we talked about the importance of distinguishing the concepts of green and renewable energy, we came to the conclusion that in many ways these energy sources coincide. And of course, an energy source that does not run out over time is quite attractive. People only need to organize its receipt or other useful use, and nature itself will do the rest.

3. The possibility of installing low-power stations. As a rule, thermal power plants powered by fossil fuels, or even more so nuclear power plants, are built in the form of large-scale projects, and one such station provides energy to entire cities or regions. But this is not always beneficial when there are small, disparate or remote regions. In such cases, green energy sources are especially useful. For example, solar panels or small wind farms can provide individual settlements without large-scale construction work and the laying of long power supply networks.

4. The possibility of simultaneous use of land for economic purposes. Wind farms or, for example, damless hydroelectric power plants do not occupy a large space and can allow the territory to be used for agriculture or for other economic needs at the same place.

5. The cost of energy. Until recently, we would have attributed this moment rather to disadvantages, since most of the elements of green energy, although they were eco-friendly, developed at a very slow pace. And this was due to the high cost of implementation. At the same time, green energy sources can compete with fossil fuels, and in some cases significantly surpass them. The main costs are associated with the organization of the use of green energy, the construction of stations, the configuration of equipment, the creation of infrastructure. Further use of them is quite cheap. It is not related to the extraction of minerals, the work of the service staff is minimal compared to other sources. Modern scientific and technological progress makes it possible to significantly reduce the costs of using green energy sources [4].

With the available positive aspects, green energy sources also have a number of disadvantages, which, in particular, significantly slows down their development.

1. Fickle character. For many types of green energy, this factor is essential. People need energy constantly, in winter and summer, at daytime and nighttime. However, they are not able to control wind currents or solar energy. And although we noted that solar power plants sometimes work even more efficiently in light clouds, this does not apply to very cloudy weather, or even night. In particular, the installation locations of such objects depend on this. In some regions, their use is completely unjustified, and the efficiency of use is negligible compared to traditional energy sources.

2. The need to use storage devices. As a consequence of the previous drawback caused by people's need for energy, even when the sun is not shining and the wind is not blowing, it is necessary to save the extracted energy. Various batteries and other technical installations can be used for this purpose. They, in turn, create a number of new problems – both the high cost of use, and a decrease in efficiency, and a decrease in environmental friendliness.

3. Violation of ecology. Another paradox associated with green energy sources is that, on the one hand, they provide more environmentally friendly methods of energy extraction, and on the other, sometimes they themselves cause negative environmental consequences. Hydroelectric power plants due to the construction of dams have a catastrophic effect on the ecosystem and flood large areas, disrupt the migration of fish in the river, blocking their passage and thereby destroying populations. The use of batteries for energy storage is associated with the use of toxic chemicals, and their improper disposal pollutes large areas. During the construction period, green power plants can affect the local human habitat or ecological environment due to construction equipment and topography changes.

These aspects should be taken into account when building systems for the extraction and use of energy in general and in combination with traditional energy sources. Otherwise, such systems will not only be economically inefficient, but may also cease to be "green", negatively affecting the environment.

The foundations for accelerating the transition to new energy sources already exist, but additional investment growth and technology development are required (in particular, the development of energy storage systems is necessary). Today, new power plants using renewable sources are being commissioned all over the world. They will generate electricity at a lower cost than fossil fuels. And until 2050, decarbonization will fuel sustainable economic growth and the creation of new jobs from green energy sources [5].

Thus, we can observe several trends in the global energy sector that will lead to the transformation of the market:

1. An increase in electricity demand, according to various sources, from 30 % to 60 % by 2040, due both to economic growth in developing countries and directly to population growth.

2. The negative impact of traditional energy on the environment, entailing the adoption of international standards in the field of greenhouse gas emissions, already today serves as an incentive for the development of green energy sources.

3. An increase in investments in renewable energy, and a parallel reduction in subsidies for the development of new oil and gas fields.

4. We should also note such an important fact as the negative impact of the use of fossil fuels on health, respiratory diseases in particular, which is also becoming a factor in the development of cleaner technologies. The role and place of green energy sources in the transformation of global energy seems to be one of the key ones.

The conducted research allows us to draw the following main conclusions. The global energy landscape is changing rapidly, and countries around the world are forced to reduce greenhouse gas emissions and abandon fossil fuels. Green energy is an extremely relevant topic today, and we have identified a number of arguments on this issue, primarily related to the active development of this industry and the need for a scientific approach to this process.

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GENDER ASPECTS OF INTERCULTURAL COMMUNICATION

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Abstract. This article examines the characteristics of communication between men and women in different countries of the world, and also compares their peculiarities in the context of the peoples of both Western and Eastern countries, making it possible to see differences in communication between the two genders in countries with opposite cultures.

Keywords: intercultural communication, stereotypes, gender, gender differences, culture.

ГЕНДЕРНЫЕ АСПЕКТЫ МЕЖКУЛЬТУРНОЙ КОММУНИКАЦИИ

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Аннотация. В статье рассматриваются особенности коммуникации между мужчинами и женщинами в различных странах мира, а также сравниваются характеристики данной коммуникации в контексте народов как западных, так и восточных стран. Благодаря этому появляется возможность увидеть различия в общении между двумя гендерами в странах с противоположными культурами.

Ключевые слова: межкультурная коммуникация, стереотипы, пол, гендерные различия, культура.

Communication with the opposite sex is difficult for people from a very early age. Even small children understand that a boy and a girl talk differently than a boy and a boy or a girl and a girl. There are a number of very important objective reasons that lead to problems in communication between men and women. Any literate person should know these reasons and foresee their consequences. However, difficulties in communication between men and women arise not only due to gender, but also cultural differences and are therefore historically variable. In countries with a traditional culture, men’s attitudes towards women are more domineering and patronizing. In

countries where patriarchy is pronounced, girls often still do not have a strong influence in society, and therefore their communication with men is based on subordination. In countries with more progressive values. Gender roles are often confused and the boundaries between men and women become thinner, and therefore communication is built on mutual understanding and respect [1, p. 123].

However, first it's worth understanding some important concepts.

Let's turn to the definition of gender – it is a social concept that determines a person's behavior in society and how this behavior is perceived. Simply put, gender is the behavior expected by society for each gender.

Also, one of the most important definitions is "gender stereotypes" – generalized ideas formed in culture about how men and women actually behave. The term should be distinguished from the concept of "gender role", which means a set of expected behavior patterns (norms) for men and women.

Let's consider various aspects of communication between men and women using the example of different countries.

1. China

Despite the patriarchal system that persists in China due to the demographic situation (the number of women is noticeably smaller than the number of men), women have acquired a significant degree of freedom in their actions and decision-making. These changes in behavior and communication between men and women in China are due to both historical and demographic factors.

Chinese men tend to be pragmatic and realistic, avoiding unnecessary words and empty promises. For them, the spoken word is mandatory. Despite this, both sexes are prone to indirect communication; both men and women avoid explicit refusal, preferring evasive answers.

Women are highly sociable and can discuss personal topics easily. They have no difficulty in starting a conversation on such topics. All these nuances highlight the importance of mutual respect in communication between men and women in China.

The communication style of Chinese women is marked by elevated verbal engagement in comparison to men. They tend to openly discuss various aspects of their own lives, including intimate details, and willingly share the latest news they come across. Additionally, the pace of women's speech is notably faster than that of men.

Observations indicate that the use of vulgar vocabulary is less common in women's speech in China compared to men's. However, in modern society, certain changes have affected women's speech, particularly among young and middle-aged individuals. For instance, there is an increasing occurrence of profanity in the speech of contemporary girls. Seeking to match men in various aspects, women, along with their male counterparts, now incorporate elements in their speech that were previously associated exclusively with men.

Currently, contemporary Chinese youth are coming together through various trends, one of which is the embrace of glamour. Increasingly, young people are engaging in discussions about subjects that were traditionally associated with femininity, such as fashion, shopping, and perfumes. Additionally, noticeable variations in intonation exist among Chinese speakers: women often employ a more

melodic intonation in their speech, while men tend to convey a greater sense of authority and imperativeness.

2. South Korea

Society in South Korea is traditionally conservative, and therefore open expression of feelings is not common among men and women. In accordance with this, it is not customary in the country for girls to address men by name [2, p. 126].

It should also be noted that there are a number of phrases in the Korean language that are used exclusively by women or men, and therefore may be perceived as unusual and inappropriate if uttered by members of the opposite sex. This is due to the traditional social roles of men and women. The male language, predominantly used outside the home, is often innovative, while the female language, used in everyday life, tends to be conservative [3, p. 113].

However, in a rapidly changing modern society, many women actively work alongside men and occupy high positions. In this regard, in modern language, some phrases previously associated exclusively with men can now be used in relation to women of high status.

In a rapidly evolving modern society, many women actively work with men equally and hold prominent positions. Consequently, certain phrases once exclusively linked to men can now appropriately be applied to women in positions of high status.

Despite significant changes in the rights of men and women, like many other patriarchal countries, the country retains a stereotype in which men are perceived as tough, fair and decisive, while women are perceived as soft, gentle and polite. This stereotype is also reflected in language: masculine language represents formality and directness, while feminine language is associated with intimacy and indirectness.

3. Germany

In Germany, women are highly self-sufficient and therefore are not used to relying on men. Often gender roles are not just mixed, but reversed, for example, a man can act as a housewife, and a woman as the main breadwinner. And although in their hearts many men are not against the financial insolvency of women, women really do not like to depend on men.

Due to the high level of equality between the sexes in Germany, differences in speech are becoming less and less noticeable. However, some minor features remain. For example, men are less likely to use familiar language in formal conversations with women, while women may resort to taboo words and abusive language in dialogue with men. An interesting fact is that in conversations, women show emotion when discussing positive things, while men use it to express dissatisfaction and other negative emotions.

Women demonstrate greater observation in what interests them, as a result of which adjectives of aesthetic, emotional and sensory-gustatory evaluation are most often found in their speech.

4. Switzerland

Gender equality occupies an important place in public life in Switzerland. This principle is recognized and adhered to by both men and women. Consequently, the communication style, manners and habits of both sexes in this country are much closer to each other than in most other countries. Any gifts or displays of attention to ladies

are perceived as an inappropriate attempt at humiliation and an expression of arrogance. In Switzerland, both sexes are characterized by a high degree of restraint in expressing emotions. The Swiss also place a lot of emphasis on personal space, so communicating with those outside their circle of interests can be difficult. In the professional sphere, the Swiss also adhere to the principles of equality, which is reflected in the high percentage of women in leading positions in the country [4, p. 286].

Thus, it can be noted that in Western countries relations between men and women are built more on the principles of equality. In communications between both sexes, some attempts by men to show concern or respect through compliments and gifts can be perceived as offensive [5]. While in Eastern countries the quality of female meekness in front of men is considered positive, however, even in such a situation, mutual respect and equality are valued when communicating between a man and a woman.

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GASHOLDER: TECHNICAL FEATURES AND APPLICATION IN MODERN INDUSTRY

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Abstract. The article deals with technical features and application of gasholders in modern industry. It describes the design of the gasholder, its main functions and advantages. It also considers the role of gasholders in the storage and transportation of gases, their use in the power industry, chemical industry and other industries. The article also discusses the latest technological developments and innovations in the field of gasholders, as well as their impact on production efficiency and environmental safety.

Keywords: gasholder, gas, industry, gas storage.

ГАЗГОЛЬДЕР: ТЕХНИЧЕСКИЕ ОСОБЕННОСТИ И ПРИМЕНЕНИЕ В СОВРЕМЕННОЙ ПРОМЫШЛЕННОСТИ

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Аннотация. В статье рассматриваются технические особенности и области применения газгольдеров в современной промышленности. Описывается устройство газгольдера, его основные функции и преимущества. Также обсуждается роль газгольдеров в хранении и транспортировке газов, их использование в энергетике, химической промышленности и других отраслях. В работе представлены последние технологические разработки и инновации в области газгольдеров, а также их влияние на эффективность производства и экологическую безопасность.

Ключевые слова: газгольдер, газ, промышленность, хранение газа.

Gasholder is a tank for receiving and storing liquefied hydrocarbon gas LPG under overpressure and its delivery to gas distribution pipelines. Gasholders are used in oil and gas, oil production and gas processing industries, in autonomous gas supply of industrial and residential facilities [1].

A. Lavoisier invented the first rectangular structure for storing gas with a volume of 100 liters in 1781. Over the years, the first cylindrical tank was modernized. In industry, special tanks and buildings for the storage of gaseous substances were used in the XIX century, since 1816. They could not be located near residential buildings. The structures were loaded with gaseous hydrocarbon fuel, which was stored under high pressure, which was unsafe. The pressure was constantly regulated in wet gasholders by means of a pool of water and a bell, or by means of counterweights. By the middle of the XIX century there was a necessity to illuminate streets with gas lanterns: in St. Petersburg they appeared in 1835, in Moscow – in 1865.

The largest gasholder was built in the USA in 1888. Its capacity was 424.8 thousand cubic meters.

Over time, dry gasholders with variable pressure appeared: a piston moved inside the cylindrical structure depending on the amount of gas in it. The structures failed safety tests. They were abandoned almost immediately.

Modern materials have made gasholders safe for private use. The tanks keep a constant volume and withstand increased pressure, up to 18 atmospheres. Placing them underground, it is possible to keep the temperature of the walls above zero. In such cases it is not necessary to install special evaporation vessels. The gas vaporizes at a low rate. This property is used to provide gas to private cottages and houses. To prevent the destruction of the walls of the case, excessive pressure must be relieved. To do this, the gasholder is equipped with a special valve [2].

Reasons for installing an autonomous gas tank:

– low pressure and poor gas supply in the main pipe;

– absence of a gas main in the settlement (village, town);

– high price for connection to the central main line.

Gas is stored in tanks in a liquefied state. This fuel is much more efficient than conventional firewood, coal and diesel.

Advantages of gas:

– the cost of gas is lower than the price of diesel;

– it is cleaner to use, without the dust and dirt that coal produces;

– the use of gas is economically more favorable and cheaper than the use of electric heaters;

– gas is stored in special containers at a certain temperature, unlike firewood, which requires a complicated loading scheme and storage in a warm, dry room [3].

Gas tanks are divided according to several features: size (capacity), storage principle, installation method.

There is a distinction between constant and variable volume gasholders. At constant volume gas is stored with pressure up to 1.8 MPa. At variable volume of the tank gas is stored inside at ambient temperature and atmospheric pressure practically without compression.

According to the principle of installation, vertical, horizontal and mobile tanks are sold.

Vertical models do not require serious excavation work – they can be installed on the surface. These models are compact, take up little space and have a small working area. Tanks should have an insulating wrap, which will maintain the necessary rate of

gas vaporization in the cold period of time. Heating units can also be used to speed up the process. A vertical gasholder is shown in Figure 1.

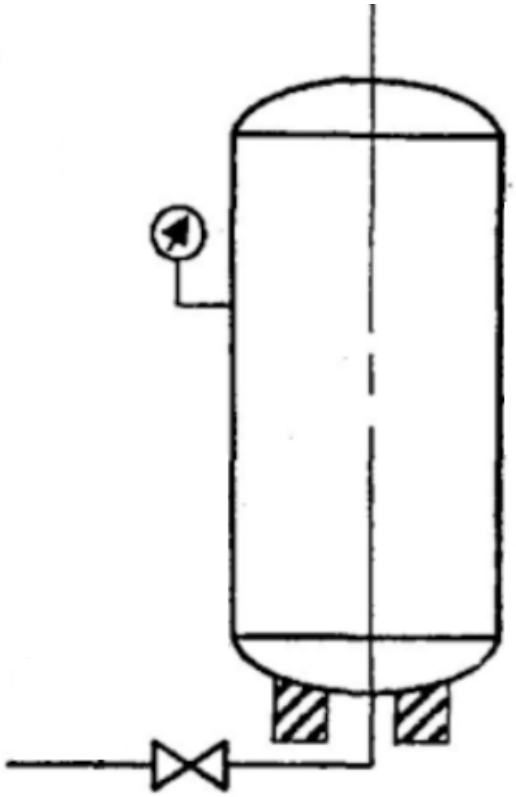


Figure 1. Vertical gasholder

In horizontal tanks, the mixture is converted to gas more efficiently. The working surface has a large area and the tanks are filled to 85 % of nominal capacity. The main thing is to choose the right size of the product. A horizontal gasholder is shown in Figure 2.

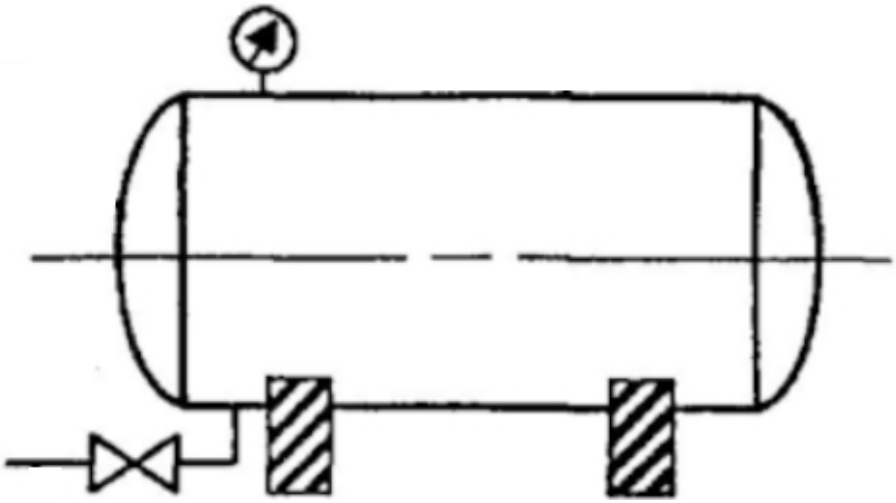


Figure 2. Horizontal gasholder

The third type is mobile gasholders of small capacity (up to 500 liters). Their advantage is cost-effectiveness – they can be refueled at a station with a reduced price for liquefied gas. They do not require mounting and installation underground. The

drawback of these mobile devices lies in the fact that refueling must be constant. A mobile gasholder is shown in Figure 3 [4].

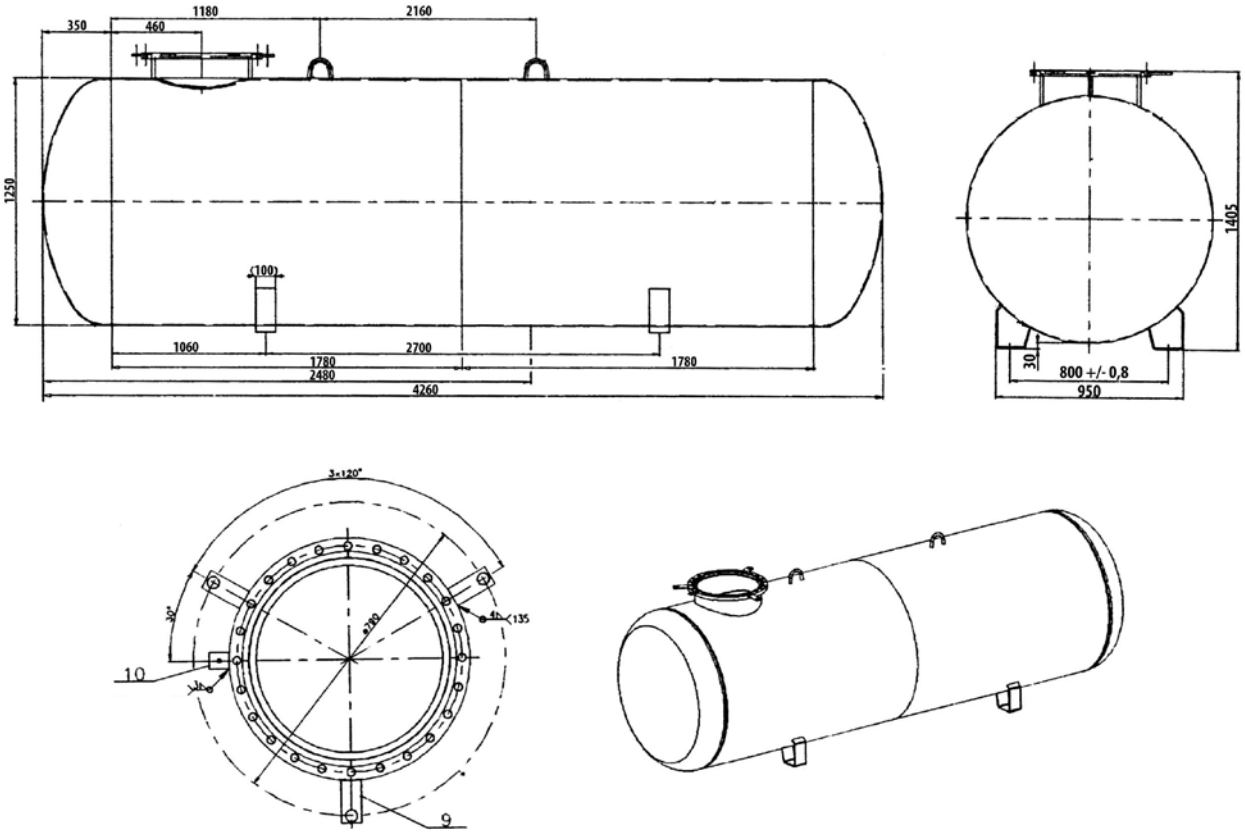


Figure 3. Mobile gasholder

The Russian climate is considered harsh. Seasonal temperature differences should not affect the purchased products. Tanks should have thick walls (from 6 to 10 mm) and a high neck (from 40 cm). The tank will last long if the surface of the body is covered with a protective layer: anti-corrosion material and epoxy resin, which will soften shocks and save from temperature fluctuations. You can buy a polymer-coated gasholder – its cost is high, but the tightness of the boiler will be preserved for many years, which will justify the cost. There are also electrochemical coatings that provide additional protection for the walls.

For safe use of the gas mixture, you should buy factory-made gasholders. Quality equipment should have a certificate and warranty from the manufacturer, service characteristics and technical requirements in accordance with state standards, Russian or international [5].

Gasholders are indispensable for obtaining an autonomous uninterrupted gas supply due to a number of positive qualities:

– there is an opportunity to choose a suitable volume of the tank with the calculation of the requirements of a particular house;

– autonomous operation of the device;

– safety of use throughout the entire period of operation;

– minimal maintenance requirements;

– no waste is generated when using clean fuel;

– it operates on environmentally friendly fuel, which is safe for health;

– silent gas supply system in the home;

– if the volume is correctly calculated, it does not require repeated filling of the tank with gas;

– in case of underground arrangement it not only saves space, but also makes it possible to organize a separate useful area above the plot, for example, beds;

– it is possible to customize gas supply to individual appliances.

It is necessary to take into account some features of gas holders, which draw out the disadvantages:

– high cost of the equipment and a large expenditure of money for installation;

– in case the unit needs to be serviced, it will be necessary to pay a decent amount of money;

– the tank is installed in a place convenient for the car train, which can bring a lot of inconvenience in terms of location on the territory;

– used gasholders cannot be installed as re-installation may result in gas leakage.

Thus, for each technological process it is possible to choose the appropriate gasholder for storage and delivery of liquefied hydrocarbon gases, which will meet the needs of any consumer, ranging from private, which needs to install a system of autonomous gas supply of individual houses, to large gas production and gas processing enterprises to provide them with gas tanks.

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POSSIBILITIES OF USING QUANTUM COMPUTERS IN PRODUCTION

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Abstract. The article examines the prospects for the application of quantum computers in industry and manufacturing. The authors analyze key aspects in detail, including the potential for improving manufacturing processes, optimizing supply chains and solving complex optimization problems. Special attention is paid to the high computational power of quantum systems and their ability to efficiently solve problems that are of particular interest to industrial enterprises.

Keywords: quantum computer, production optimization, modern technologies, automation, quantum technologies.

ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ КВАНТОВЫХ КОМПЬЮТЕРОВ НА ПРОИЗВОДСТВЕ

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Аннотация. В статье рассматриваются перспективы применения квантовых компьютеров в промышленности и на производстве. Авторы подробно анализируют ключевые аспекты, включая потенциал улучшения производственных процессов, оптимизацию цепочек поставок и решение сложных задач оптимизации. Особое внимание уделяется высокой вычислительной мощности квантовых систем и их способности эффективно решать задачи, которые представляют особый интерес для промышленных предприятий.

Ключевые слова: квантовый компьютер, оптимизация производства, современные технологии, автоматизация, квантовые технологии.

Quantum computers are becoming a more realistic weapon in the arsenal of industry every day, opening up new opportunities to improve production efficiency. Quantum computers utilize the principles of quantum mechanics to process

information at the level of quantum bits or qubits, allowing them to solve complex computational problems that are impossible for classical computers.

Quantum computers are based on principles of quantum mechanics that are different from the principles of classical physics on which a classical computer operates (Figure 1) [1].

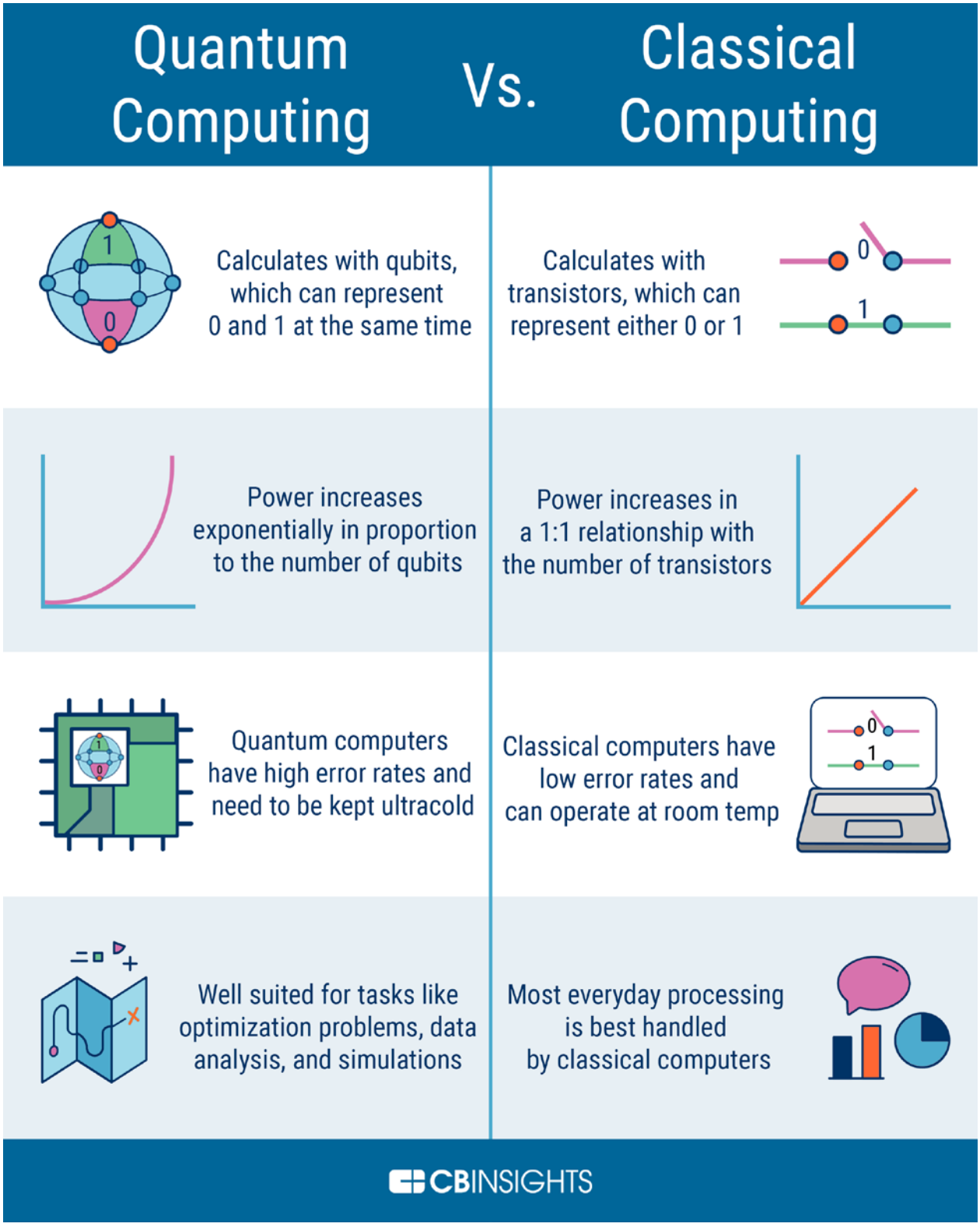


Figure 1. Differences between classical and quantum computers

The main element of such a computer is a quantum processor. It consists of qubits, which, in turn, can be realized in various ways, for example, on the basis of quantum dots, superconductors or ions. The qubits can be interconnected to form quantum circuits and controlled by microwave pulses. In addition to the processor, the device includes other components, such as a quantum register. It is used to store information. Imagine a classical register being in only one of two states and a quantum register being in all positions simultaneously. Due to this, the result of data processing can be obtained almost instantly.

The computer operates using quantum algorithms capable of solving problems that are mathematically difficult for classical computing machines. Such algorithms establish the order in which information is processed on a quantum processor, and harness quantum superposition and entanglement to solve problems faster than the classical counterpart. In addition to the algorithms, there is a device to control and measure the states of the qubits and a mechanism responsible for error correction. Quantum computers are complex devices and require high-precision settings, and special skills are needed to control them.

A quantum computer is a complex device that uses quantum bits (quantum analogs of classical bits) to process information. It consists of several major components, each of which plays a key role in making the device work. Below is a detailed breakdown of the composition of a quantum computer:

Qubits: The basic building block of a quantum computer. Unlike classical bits, qubits utilize the principle of superposition, which allows them to be in state 0, 1 or both at the same time (quantum superposition). This property allows a quantum computer to perform parallel computations.

Quantum Gates: Analogs of classical logic gates that transform the states of qubits. Quantum gates perform quantum operations, enabling the execution of various quantum algorithms. They form the basis for the construction of quantum circuits.

Quantum Circuits: A set of quantum gates and qubits connected in series to represent an algorithm or problem to be solved. Quantum circuits are designed to meet the specific requirements of a computational problem.

Quantum processor: A physical device on which qubits and quantum gates are implemented. A quantum processor can be built using various technologies such as superconductor-based qubits, ions, topological quantum bits, and others.

Quantum Registers: Groups of qubits that are used together to perform specific tasks. Quantum registers can be represented as sets of qubits linked together to perform specific operations.

Quantum State Registers: Where data is stored and processed at the quantum level. They represent the states of all qubits in the system.

Quantum Bitwise Operations: Operations performed at the quantum bit level. These operations include quantum gates and other quantum data manipulations.

Quantum Resources: Include elements such as quantum memory, quantum communication, and error detection that ensure the stable operation of a quantum computer.

Quantum Algorithms: Special algorithms designed to utilize quantum computing. Examples include Shor’s algorithm for factorizing large numbers and Grover's algorithm for searching unordered databases.

Control and Readout: Control systems that monitor the execution of quantum operations and read out the results. Includes mechanisms for error correction and stability of quantum computing [2].



Figure 2. Quantum computer in manufacturing

The principle of superposition, whereby a basic unit of information can exist in more than one state at a time, allows a quantum computer to store and process much more data simultaneously than any other computer. Thus large amounts of data can be managed simultaneously using a concept known as quantum parallelism. With the ability to compute and analyze different states of data simultaneously rather than one at a time, quantum systems can produce results at very high speeds (Figure 2) [3].

Nowadays, the development of quantum computers allows the introduction of this equipment into production to optimize work processes. The main capabilities of such devices are:

1. Supply Chain Optimization: Quantum computers can efficiently solve optimization problems, which enables the optimization of complex supply chains. This includes route optimization, inventory management, and demand forecasting. Quantum algorithms are able to process huge amounts of data, considering many variables, resulting in more accurate forecasts and better inventory management.

2. Modeling of materials and manufacturing processes: Quantum computers can be used to accurately model the properties of materials and manufacturing processes. This allows for more accurate prediction of the outcomes of different manufacturing processes, reducing the time and resources spent testing new materials or manufacturing methods [4].

3. Solving optimization problems in manufacturing processes: Quantum algorithms can be applied to solve complex optimization problems in manufacturing, such as production line planning, optimizing equipment scheduling, and minimizing energy consumption. This can improve the efficiency of manufacturing processes and reduce costs.

4. Cryptographic security in manufacturing: Quantum computers can be used to develop more secure methods of cryptography. In manufacturing, this is particularly important because sensitive data such as intellectual property and confidential information about manufacturing processes require a high level of protection. Quantum cryptography can provide more robust means of encrypting and protecting information.

5. Simulation and optimization of manufacturing experiments: Quantum computers can speed up the simulation and optimization of manufacturing experiments. This allows for faster and more efficient testing of different scenarios and parameters, leading to more innovative and optimal solutions in the manufacturing environment [5].

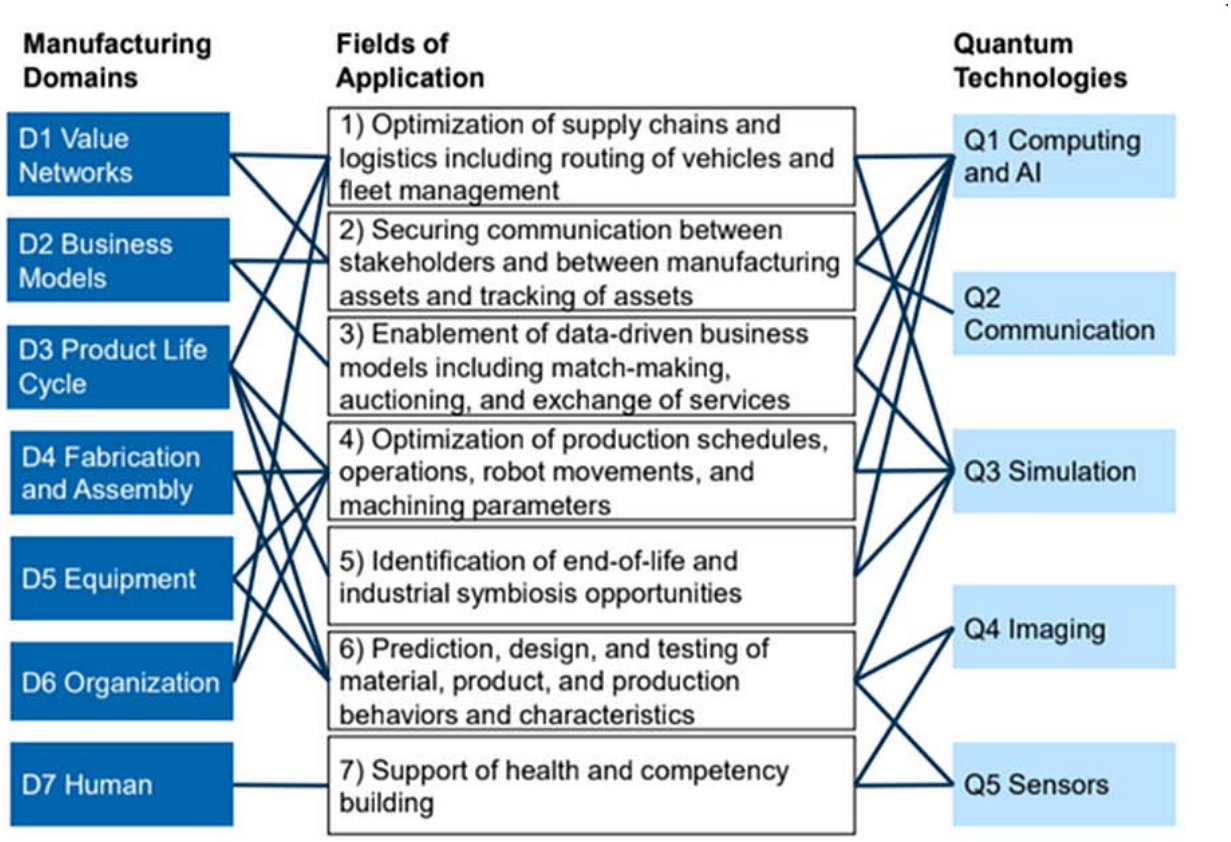


Figure 3. Leveraging quantum computers in manufactory industry

The use of quantum computers in manufacturing opens up many prospects for the industry. From optimizing manufacturing processes to developing innovative materials, these devices offer unique opportunities to improve the efficiency and competitiveness of companies (Figure 3). With the development of quantum computing technology, manufacturing companies will have a powerful tool to solve

complex problems and become more flexible and adaptive to changing market conditions.

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PROSPECTS FOR THE DEVELOPMENT OF ELECTRODIALYSIS PLANTS

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Abstract. Membrane separation is one of the directions of development of environmentally friendly technologies. Various ways of influencing the parameters of membrane processes provide truly unlimited possibilities for their implementation in many industries. Electrodialysis is one of such technologies.

Keywords: electrodialysis, bipolar membranes, ion exchange membranes, solution separation.

ПЕРСПЕКТИВА РАЗВИТИЯ ЭЛЕКТРОДИАЛИЗНЫХ УСТАНОВОК

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Аннотация. Одним из направлений развития экологичных технологий является мембранное разделение. Различные способы влияния на параметры протекания мембранных процессов дают поистине неограниченные возможности их внедрения во многие производства. К таким технологиям относится и электродиализ.

Ключевые слова: электродиализ, биполярные мембраны, ионообменные мембраны, разделение растворов.

The process of electrodialysis is based on the transport of ions across ion exchange membranes under the action of an electric field applied to the membrane. The application of an electric field leads to difficulties associated with reactions at the electrodes, i.e., the formation of alkali near the cathode and acid at the anode [1, p. 9]. In the middle of the last century, attempts were made to create ionic analogs of these electronic devices. At this time, bipolar membranes appeared which consist of two or more layers of ion exchangers that differ in the sign of electric charge of ionogenic groups, as shown in Figure 1.

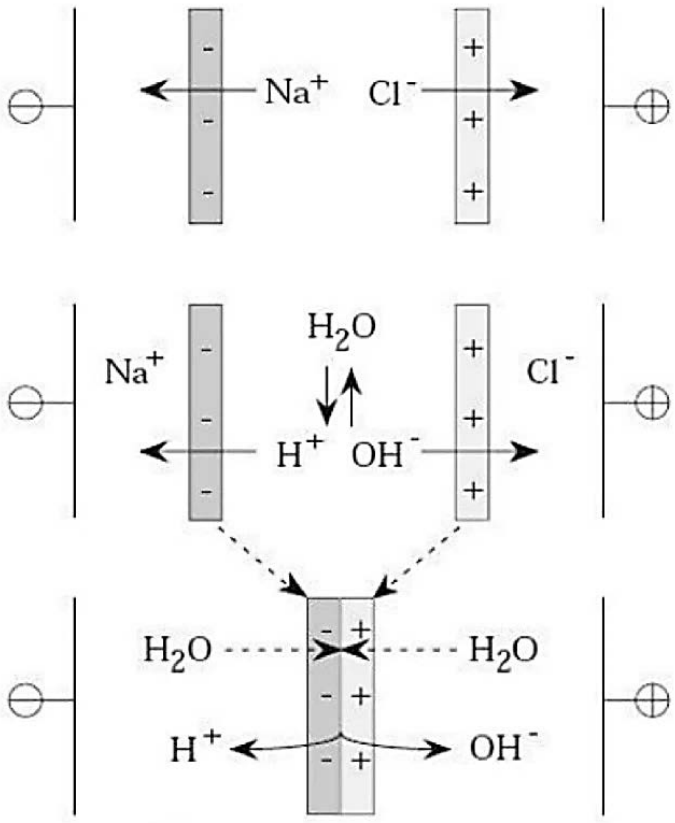


Figure. Working principle of the bipolar membrane

In the technological process, the layers of the bipolar membrane are arranged perpendicular to the direction of the electric current passing through the membrane. The asymmetry of the bipolar membrane structure and, as a consequence, the different nature of the ions in its layers leads to rectifying and transistorizing effects. It was found that due to the asymmetry of the bipolar membrane, it is possible to separate ions having the same sign but different electrical charge. In addition, it was found that the potential difference on the bipolar membrane depends not only on the electric current density, but also on the pressure difference on the membrane, as well as on the intensity of the light flux falling on the membrane. Like other ion exchange materials, bipolar membranes are used in a swollen state, and the solvent can be either water or organic solvents. It has also been found that the nature of the electrolyte in which the bipolar membrane is in solution affects its properties [2, p. 2].

Later, a symmetric bipolar membrane appeared, which, in any direction of electric current passing through it, is a generator of hydrogen protons and hydroxide ions and, accordingly, almost all the current through it is carried by these ions. Such a membrane was considered as consisting of two conventional bipolar membranes and having two cationite-anionite junctions with semiconducting properties, turned one towards the other. Since at any direction of electric current one of the two junctions is always switched on in the forward direction and the other in the reverse direction, the symmetrical bipolar membrane no longer has semiconductor properties, and the

electric current through it in any direction is almost completely carried by protons formed at the cationite-anionite junction switched on in the reverse direction. Due to this, when the direction of the electric current through the membrane is changed, the pH of solutions on the membrane surface decreases profoundly, and, on the contrary, on the opposite surface, where the pH value of solutions was very low, it increases sharply. The bipolar membranes obtained in this way have high electrochemical performance and, most importantly, full reversibility. As advantages of their application instead of conventional bipolar membranes, the author considers the possibility to prevent fouling on these membranes arising due to high pH values and concentration of solutions at their surface in alkaline chambers, as well as the fact that the use of three-layer symmetric membranes somewhat simplifies the assembly of devices, since, firstly, such membranes do not need to be oriented in a certain way relative to the electrodes, and secondly, the membranes themselves have better mechanical properties due to the symmetry of their structure.

In general, there are many methods for obtaining bipolar membranes, the main ones being: casting, bonding, co-extrusion, hot-pressing, cold-pressing with polyelectrolyte addition (obtaining adhesive interfacial boundary), modification of monopolar layers. The use of different methods to obtain bipolar membranes is conditioned by the variety of ion-exchange materials, as well as the desire to create a membrane with the best properties. Which method to choose is usually determined by the possibility of obtaining membranes of a given quality and technical and economic calculations. One of the simplest methods of manufacturing bipolar membranes is hot pressing of initial thermoplastic cation-exchange and anion-exchange membranes.

An example of the application of electrodialysis and bipolar ion exchange membranes is the obtaining of basic amino acids from tartrate solutions with simultaneous concentration [3]. Tartaric acid salts and esters are used in the food industry as an antioxidant in beverage production, in baking, and to control the purity of non-ferrous metals. The advantage of the electromembrane conversion process over the ion exchange method is obvious, since the second method leads to the formation of wastewater and has an undesirable effect on the environment [4].

Electrodialysis plants have advantages because they do not require any chemical or natural reagents in the exploitation process, since electrodialysis is a non-reagent method, moreover, the principle of electrodialysis underlying the functioning of equipment makes it possible to solve the inverse problem – to obtain highly concentrated solutions from natural mineralized waters [5].

Based on the reviewed information on the manufacture and application of bipolar ion-exchange membranes, it can be concluded that this direction in science is poorly studied and promising. Research in this area continues to this day. New properties are discovered, new applications of bipolar ion-exchange membranes appear. Hence we can conclude that their more thorough study is relevant and necessary.

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ENERGY SUPPLY SYSTEM FOR TRANSPORT INFRASTRUCTURE FACILITIES USING RENEWABLE ENERGY SOURCES

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Abstract. This work is devoted to the implementation of the energy supply system for federal transport infrastructure facilities using renewable energy sources. The article presents various methods, application possibilities, and problems related to the integration of renewable energy sources into energy supply systems of transport infrastructure in order to achieve sustainability while reducing environmental impact and dependence on traditional energy sources. A comparison of these methods is also carried out.

Keywords: energy supply, federal transport infrastructure, renewable energy sources, wind turbines.

СИСТЕМА ЭНЕРГОСНАБЖЕНИЯ ОБЪЕКТОВ ТРАНСПОРТНОЙ ИНФРАСТРУКТУРЫ С ИСПОЛЬЗОВАНИЕМ ВОЗОБНОВЛЯЕМЫХ ИСТОЧНИКОВ ЭНЕРГИИ

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Аннотация. Данная работа посвящена реализации системы энергоснабжения объектов федеральной транспортной инфраструктуры с использованием возобновляемых источников энергии. В статье представлены различные методы, возможности применения, проблемы, связанные с интеграцией возобновляемых источников энергии в системы энергоснабжения транспортной инфраструктуры, с целью достижения устойчивости при одновременном снижении воздействия на окружающую среду и зависимости от традиционных источников энергии. Также авторами было осуществлено сравнение данных методов.

Ключевые слова: энергоснабжение, федеральная транспортная инфраструктура, возобновляемые источники энергии, ветровые турбины.

The introduction of an energy supply system for federal transport infrastructure facilities using renewable energy sources is necessary to lower greenhouse gas emissions, reduce dependence on fossil fuels, increase sustainability and energy security. This transition is also consistent with global efforts to combat climate change and contributes to long-term cost savings.

According to the data published in the Transport Strategy of the Russian Federation for the period up to 2030, one of the main goals is the formation of a unified transport space in Russia based on the balanced development of an efficient transport infrastructure. By 2030, it is planned to increase the length of public roads to 1,350 thousand km, of which 95 thousand km are federal highways. The strategy also pays special attention to improving the safety of the transport system and reducing the harmful effects of transport on the environment. The main ways to solve this problem are: installation of solar panels, wind turbines, hydro generators and biomass energy systems (Figure 1).

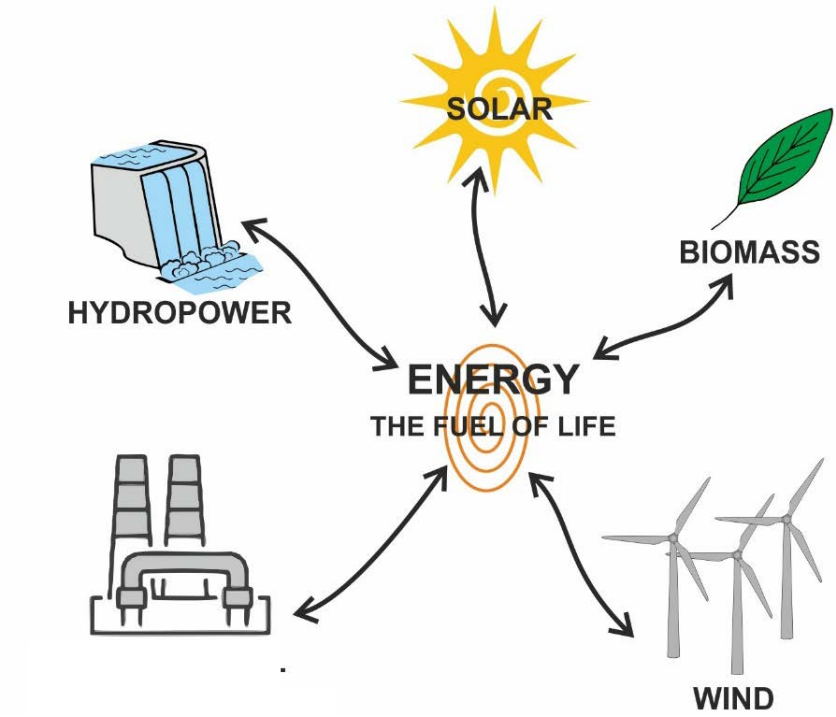


Figure 1. Renewable energy sources

Solar panels are devices that are used to convert sunlight into electricity using photovoltaic cells to capture the energy of the sun rays.

Solar panels can be integrated into the energy supply system of federal transport infrastructure facilities, providing a stable source of power supply for lighting, alarm and monitoring systems. They can help reduce carbon dioxide emissions from transportation by offering an environmentally friendly alternative to power charging stations and electric vehicle facilities. In addition, solar panels can help meet the energy needs of remote transport infrastructure facilities, increasing their sustainability and reducing dependence on traditional energy systems. Incorporating solar energy into transportation infrastructure can enhance energy sustainability by providing backup power during power outages and natural disasters. Solar panels also provide long-term

cost savings by reducing the operating costs associated with traditional energy sources, while contributing to the overall modernization and environmental friendliness of federal transport infrastructure facilities. Transportation infrastructure can benefit significantly from solar energy due to the large areas available for the installation of solar panels, including roofs, parking lots and open spaces, which allows for the generation of significant amounts of clean energy. The integration of solar panels into transport infrastructure embodies a commitment to sustainable energy practices that contribute to a cleaner and more environmentally friendly transport network [1].

The Kuripla Bridge in the Australian city of Brisbane can also be cited as an example of the successful implementation of energy installations based on renewable energy sources [2]. Energy saving for the operation of the lighting system is carried out through the use of solar panels placed directly on the structural elements of the bridge. In good weather, from 75 % to 100 % of the electricity required for the operation of lighting devices is reproduced by solar panels with a total daily output of 100 kWh.



Figure 2. Wind turbines

Wind turbines are machines that convert kinetic wind energy into mechanical energy, which is then used to generate electricity. They consist of large blades mounted on a tall tower, and when the wind blows, the blades rotate and power a generator to generate electricity.

As a pilot project, the designers of one of the studios developed a wind generator built into poles for lighting roads, which generated electricity directly for their lighting, which is shown in Figure 2 [3].

Wind turbines can be integrated into the energy supply system of federal transport infrastructure facilities by using wind energy to generate electricity for various operations such as lighting, alarms and auxiliary systems. Their installation can reduce dependence on traditional energy sources, mitigate environmental impacts and

contribute to sustainable development. In addition, wind turbines can be strategically placed along transport corridors to take advantage of constant wind and maximize their efficiency. Proper planning and integration of wind power plants into the energy supply system can lead to long-term cost savings and reduction of carbon dioxide emissions during the operation of federal transport infrastructure facilities [4].

Hydro generators are machines that use the energy of flowing or falling water to generate electricity. They usually consist of turbines connected to electric generators and are used in hydroelectric power plants.

Hydro generators can be integrated into the energy supply system of federal transport infrastructure facilities through the use of renewable energy sources, such as hydroelectric power plants, to generate electricity. These generators can be used to provide sustainable and reliable electricity to various vehicles, reducing dependence on non-renewable energy sources. Through the efficient use of hydro generators, transport infrastructure can minimize carbon dioxide emissions and contribute to a more sustainable energy supply system. The integration of hydro generators into the energy balance of the federal transport infrastructure is consistent with the broader goal of switching to renewable energy sources and developing a more environmentally friendly transport sector. Such a strategy not only enhances energy sustainability, but also supports the development of a cleaner and more sustainable transport infrastructure system, which ultimately benefits both the environment and the economy.

A biomass energy system uses organic materials such as wood, agricultural waste, and waste to produce heat, electricity, or other forms of energy through processes such as combustion, gasification, or anaerobic digestion.

Biomass energy systems can be integrated into the energy supply system of federal transport infrastructure facilities through the use of biomass power plants capable of providing renewable electricity for energy transmission systems. In addition, biomass-based biofuels can be used to operate vehicles and equipment in infrastructure, which reduces dependence on fossil fuels. The introduction of biomass energy systems can contribute to the diversification of energy supply, increase sustainability and reduce the environmental impact of transport infrastructure facilities. Moreover, the use of biomass energy can support the local economy through the cultivation and processing of biomass raw materials, creating new opportunities for rural communities. By integrating biomass energy, the federal transport infrastructure can work towards achieving sustainable development goals and reducing carbon dioxide emissions. Biomass energy systems also offer a decentralized energy supply solution, potentially ensuring the energy security of critical infrastructure during emergencies or power outages. The use of biomass energy is in line with government mandates and international agreements aimed at developing renewable energy sources and reducing greenhouse gas emissions in the transport sector. Also, the introduction of biomass-powered energy systems can contribute to job creation and economic development, especially in regions with rich biomass resources. The integration of biomass energy into federal transport infrastructure facilities can serve as a model for sustainable energy practices, encouraging similar initiatives in other sectors [5, 6].

Comparing these methods, we can say that each of them has its own unique

advantages and problems. Solar panels and wind turbines are generally easier to install and can be deployed on site, making them suitable for decentralized energy production. Hydro generators require proximity to water sources, and biomass energy systems are suitable for facilities with access to organic waste.

When integrated, these methods ensure the diversification of renewable energy supplies, increasing the overall reliability and sustainability of the energy system of infrastructure facilities, while contributing to environmental sustainability. However, when choosing the most suitable renewable energy sources for federal transport infrastructure facilities, factors such as local environmental conditions, infrastructure requirements and economic efficiency must be carefully considered.

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THE SMART ERA. PROBLEMS, PECULIARITIES, DEVELOPMENT PROSPECTS

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Abstract. This article discusses the era of "SMART" (intelligent, connected and customizable) systems and their impact on various spheres of our lives. It investigates the main problems and challenges associated with the development of this era, and identifies the features that will be crucial for the future development of "SMART" systems.

Keywords: SMART era, intelligent systems, smart cities, transportation networks, data security, control and regulation, artificial intelligence, internet of things, autonomous systems, technology development.

ЭПОХА "SMART". ПРОБЛЕМЫ, ОСОБЕННОСТИ, ПЕРСПЕКТИВЫ РАЗВИТИЯ

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Аннотация. В данной статье рассматривается эпоха "SMART" (интеллектуальных, связанных и настраиваемых) систем и их влияние на различные сферы нашей жизни. Исследуются основные проблемы и вызовы, связанные с развитием данной эпохи, а также выявляются особенности, которые станут определяющими для будущего развития "SMART" систем.

Ключевые слова: эпоха "SMART", интеллектуальные системы, умные города, транспортные сети, безопасность данных, управление и регулирование, искусственный интеллект, интернет вещей, автономные системы, развитие технологий.

Today, with the development of technology, many spheres of life are facing significant changes, including the sphere of management of the state, business or individual production processes. More and more attention is paid to the introduction of

the “SMART” concept, which implies the creation of smart technologies and management systems that are able to respond in a timely manner to changes in the environment and the changing needs of users. In this article we will consider the era of “SMART”, its features, problems and development prospects. In particular, we will talk about the introduction of intelligent control systems for production, transportation and housing, as well as about the problems of preserving information security in this context.

In the innovative technological world, the aspect of areas in need of smart-technology implementation covers all spheres of urban infrastructure management without exception: transportation, analytics, communications, energy, security, ecology, environmental monitoring and others. Today, the IT sphere is being introduced into people’s lives, and innovative technologies expand and bring to a new level of opportunities, urban planning included (Figure 1) [1].



Figure 1. SMART technologies

Foreign countries of the world have been developing the so-called conceptual program called “smart cities” for quite a long time. In Russia, they have actively started to develop automation of control systems, as well as a radical modernization of infostructure. The concept of the “smart city” is aimed at improving the comfort and quality of life of the population by saving resources and digitalization processes.

The very idea of this system is aimed at uniting multiple areas of city development into a single one. The concept of “smart home” is artificial intelligence. It plays a special role in information and communication technologies, as well as in environmental and social resources of city development.

Today, Singapore is a leader in smart-tech innovation developments. It is a politically as well as geographically stable state. High-speed Internet access is available in all homes, and for every two inhabitants of the state there are three smartphones. It can also be noted that in Singapore these technologies are used quite often and everywhere.

One of them is smart sensors that monitor the consumption of electricity, water and other indicators in real time. Based on the data obtained, the higher authorities (government) manage to optimize water consumption and reduce the indicators of imported fresh water from Malaysia. These technologies allow the population to control the consumption of their own resources and thereby reduce spending on them [2].

Let us also consider an example of application of smart technologies in the domestic sphere of life of the population. It is a system of surveillance of people in residential premises (Figure 2), for example, in an apartment. The system is aimed at various kinds of movements, whether suspicious or unusual, as well as the prolonged absence of any movement in the room. In this case, a warning signal is sent to relatives and medical workers.

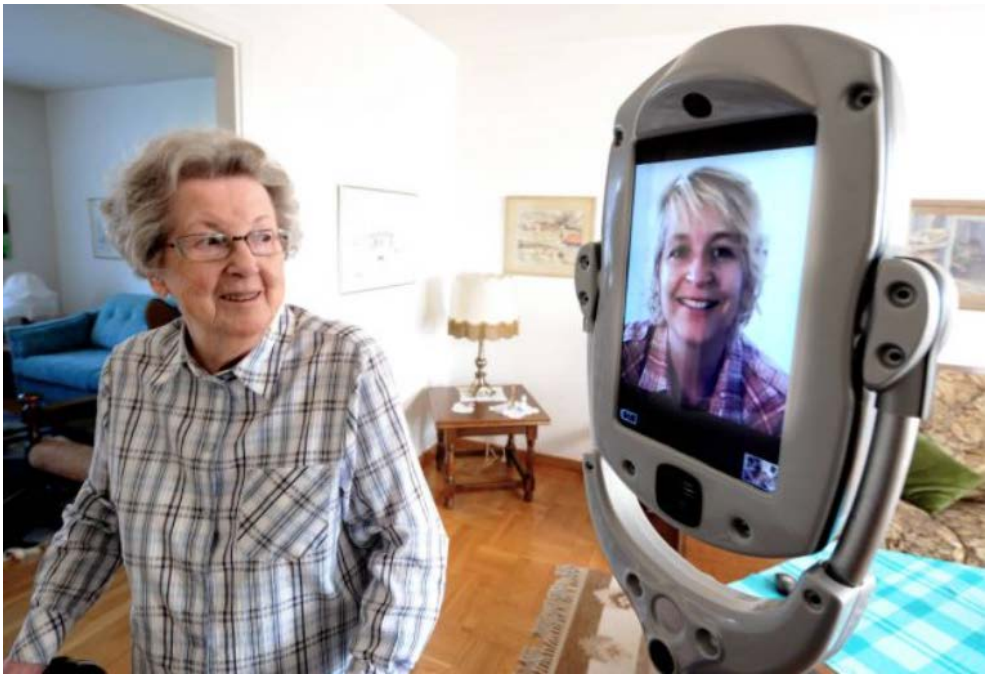


Figure 2. Human surveillance system in living quarters

One of the main elements of the transportation infrastructure of the city of Singapore is street traffic. In this case, “smart” sensors track the movement of public transport (Figure 3), they are responsible for prompt response in case of problems on the roads. Thanks to this system, the intermediate waiting time for public transportation at the stop has been reduced to 3-5 minutes. In the near future they plan to make it mandatory for the owners of private vehicles to equip their cars with navigation systems, which will help to control the movement of vehicles in real time. This information will allow competent distribution of loads on the roads. It will be quite useful and beneficial to drivers, as payment for parking or toll road will be made quickly enough. It will be easier and quicker to get information about situations and traffic congestion online as well.



Figure 3. Smart sensors in the field of transportation

In many regions of Russia, large urban development projects based on the concept of “smart city” are already being implemented. For example, there are plans to build a city called Sputnik Yuzhny near Saint Petersburg. In it they expect to realize the reunification of an innovative city, provided with sites for the production of products, allowing to improve the road and transportation network. In addition, there are plans to use the latest technology in the construction of housing and infostructure. Such a new suburb is planned to appear not far from Kazan. The project is aimed at integrated planning of developments in accordance with the “smart city” concept (Figure 4).



Figure 4. Smart city project

Development challenges. In order for “smart” technologies to be implemented in cities, it is necessary to use a significant amount of financial costs from absolutely all sides, both on the part of the state, and on the part of businesses and consumers. But, unfortunately, to date, for smart-city projects there is no possibility of budget planning. After all, this is a novelty and their appearance in Russia requires changes in federal legislation. For the introduction of smart technologies, it is necessary to form a regulatory framework that will spell out what they are, what are the schemes for their financing and mechanisms for their use.

Two main aspects need to be considered in which this technology will be an integral part of future development. First, the state should understand the scale of smart technologies and recognize them as an integral part of the future. Second, an adequate approach the introduction of some expensive things where it will become truly affordable is necessary. And, thirdly, in order to implement smart technology, the government needs to invest in large amounts within the framework of budget investments that are intended to increase the standards of this technology. And only thanks to this, there will be additional demand aimed at linking commercialization and price reduction for future implementations, – said Deputy Minister of Energy of the Russian Federation Anton Inyutsyn [3].

In addition, the future consumer of smart technologies needs to understand the essence of the benefits of their implementation. Firstly, it is economical consumption of electricity, secondly, quick access to the Internet communication resources, and thirdly, it is the improvement of the quality of the transportation system in large cities, which will relieve the roads from traffic jams and vehicle density [4].

Advantages. It can be noted that today absolutely all directions of activity are carried out exclusively through the prism of profit and efficiency for business and its development, Smart office is no exception. The main advantages of this direction are:

– energy saving due to rational use of equipment, which allows for maximum adaptation to the needs of users, as well as provision of only necessary services;

– maximum efficiency of space utilization: flexible planning solutions, IT infrastructure configuration;

– sustainable development: practically all over the world this direction has full support of the state, where active growth and significant efficiency are clearly visible; unfortunately, in our country, only the part that brings significant savings is being developed so far;

– additional security due to the high organization of access control, video surveillance, as well as additional systems responsible for facial recognition, and license plate numbers [5].

In conclusion, it is worth noting that the era of “SMART” is not just a set of new technologies, but a new stage in the development of human civilization. It is likely that in the near future the changes will be imperceptible, but SMART technologies already now make it possible to significantly simplify and speed up the management of business and industrial processes, reduce energy costs and save time. In the future, this may become a key factor in the growth of economic and technological power of countries, as well as improving the quality of life of people. Thus, the introduction of smart technologies and management systems is a necessary stage in the development

of the modern world, but it should be associated with the solution of many socio-economic problems and new challenges in the field of information security and technological multiplicity.

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ROBOTISATION IN THE MEDICAL AND HEALTHCARE SECTOR

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Abstract. This paper provides general information on types of robots in the medical and healthcare field, their operating principles, applications and capabilities. The paper considers the examples of the da Vinci surgical robot, a medical robot arm for neurosurgery, a robotic biopsy, an automated bionic prosthesis, and a disinfecting robot.

Keywords: robotisation of medicine, robotic surgeon, neurosurgery, robotic biopsy, prosthetics.

РОБОТИЗАЦИЯ В СФЕРЕ МЕДИЦИНЫ И ЗДРАВООХРАНЕНИЯ

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Аннотация. В данной работе содержится общая информация о видах роботов в сфере медицины и здравоохранения, об их принципах действия, применении и возможностях. В работе приведены такие примеры, как хирургический робот «да Винчи», медицинская роборука для нейрохирургии, роботизированная биопсия, автоматизированный бионический протез и дезинфицирующий робот.

Ключевые слова: роботизация медицины, робот-хирург, нейрохирургия.

In a world where technology has begun to play a critical role in so many aspects of our lives, the medical and healthcare sector has been at the forefront of innovation. Roboticisation in this field is becoming not just a new trend, but an indispensable necessity that is shaping the course of medical practices today.

Over the past decades, we have witnessed unique advances in robotics that are confidently penetrating the most delicate and complex processes in medicine. The

importance of innovation in this field does not simply reflect the potential of the technology, but also responds to the challenges facing modern medicine.

Robots used in the medical field vary in their functionality and purpose of use. They can include specialised medical devices as well as diagnostic and treatment devices designed to perform specific medical procedures. The varieties of robots range from autonomous systems capable of performing tasks independently to telemedicine platforms that provide remote interaction and consultation. It is important to note that the different types of robots in medicine are designed to perform a variety of tasks, ranging from surgical interventions to providing assistance in patient rehabilitation.

Consider the da Vinci surgical robot, named after Leonardo da Vinci, the man who helped medical professionals visualise humans and their organs from different angles. The da Vinci robot, shown in Figure 1, performs surgeries with minimal trauma to healthy tissue and reduced blood loss. Thanks to this, various risks are minimised and the length of the rehabilitation period is shortened, while the precision of all manipulations is amazing [1].

The robot is arranged in three main blocks:

– Surgical console. It represents the doctor’s workplace. He can see the surgical field in three dimensions thanks to special apparatus and instruments. The necessary instruments are controlled by two manipulators. The surgeon’s workstation in the da Vinci system is very comfortable, which makes it possible to perform even long operations.

– Patient console. This part of the system includes three working manipulators. They are equipped with the necessary tools for various operations. One arm has a camera that transmits an image of the working field to the surgeon. The instruments have a small diameter (5-8 mm), which allows them to penetrate the internal cavities through tiny punctures.



Figure 1. A visual representation of the da Vinci robot

– Video stand. This system element is a monitor with a touch screen. It displays the operating field. The monitor is necessary for the medical team and nursing staff present during the intervention.

With the da Vinci robotic system, surgeries can be performed with minimal incisions and absolute precision, which means less bleeding, less risk of infection and faster healing.

Modern robots designed to perform minimally invasive endoscopic surgeries can easily remove a 2-3mm tumour. But, as it turns out, this is far from the limit. The "SYMBIS Surgical System" company has developed robotic arms for neurosurgery, allowing to perform surgical intervention at the cellular level. Their pitch is approximately 50 nm. With such equipment, it is possible to perform surgery even while the body is being scanned inside a CT scanner. This allows the surgeon to view the operation online and easily distinguish between tumour and healthy tissue cells [2].

More impressive robots are called "capsule endoscopes", in which the procedure is reduced to simply swallowing a pill-sized robot that travels through the digestive tract and helps take photos and collect data that can be sent directly to a processor for diagnosis [2].

The MURAB project team has developed a robotic system that enables accurate biopsy procedures with minimal intervention (Figure 2).

The essence of this system is to combine MRI and ultrasound technologies. The system first scans an area of the body using an ultrasound sensor attached to the arm. It then combines this data with preliminary MRI images to create a three-dimensional model on the monitor. The system then locates the needle in relation to the body site, providing the highest level of accuracy and control.

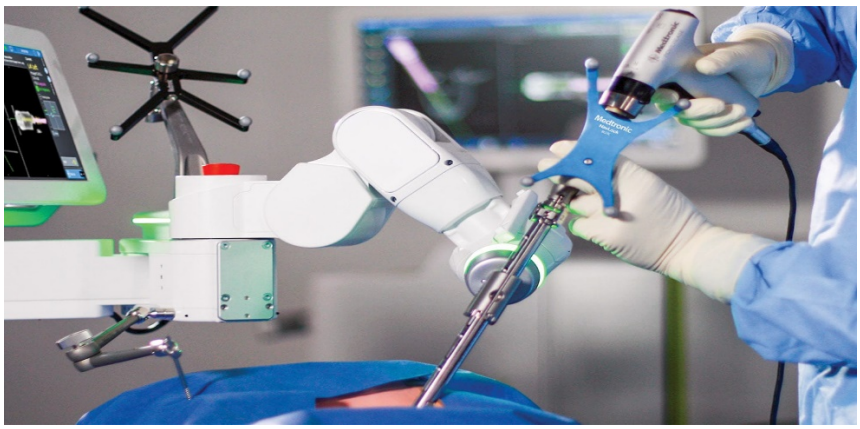


Figure 2. Robotic biopsy

According to the statistics of the International Society of Prosthetics and Orthotics, in 2017, about 58 million people worldwide faced amputation of limbs due to various reasons. This was a major impetus for the development of prosthetic technology and already today we have a new generation of bionic prostheses (Figure 3). A person who has been using a mechanical prosthesis and decided to go for a bionic one is amazed. The way the artificial limb reproduces complex movements without requiring any additional actions from the user is astonishing [3].

A bionic prosthesis consists of several modules:

– One of the most important modules is the receiving sleeve. It is made individually in the prosthetics workshop. The prosthetist takes a plaster cast of the

residual limb and makes a trial socket. The shape of the socket is adjusted until it fits the residual limb perfectly. Inside, an inert, biologically compatible diamond-like coating (DLC) is applied to the surface of the sleeve. Sensors that pick up muscle signals are placed in the sleeve. Neurosensors can read signals from the cerebral cortex or detect impulses in the muscles of the residual limb.

– Mechanical modules: joints simulating joints (knee, hip, elbow modules, foot, hand, fingers), actuators (hydraulic or pneumatic), electric motors, connecting elements and others. All mechanisms are interconnected and controlled by a central microprocessor. In the hip prosthesis, the microprocessor that controls the operation of the system is located in the knee module. The control centre receives information collected by sensors. The brain of the intelligent leg processes the data and sends commands to the mechanisms responsible for carrying out a certain action.



Figure 3. Automated bionic prosthesis

– Battery. The capacity of the lithium battery determines the duration of use without recharging.

Disinfecting robots have become an important innovation in the medical and healthcare industry, especially in the context of maintaining cleanliness and safety in hospital environments. These robots are usually equipped with special systems that allow them to automatically disinfect rooms with high efficiency (Figure 4).

They are used to treat operating theatres, wards, corridors and other medical spaces. Disinfecting robots usually work using methods such as ultraviolet treatment, hydrogen peroxide vapourisation or the application of other antimicrobial agents [4].



Figure 4. XENEX disinfecting robot

The advantage of these robots is their ability to disinfect without the need for direct human intervention. This reduces the risk of infection transmission and ensures a higher level of hygiene in healthcare facilities.

Robotisation in medicine represents not only an important technological evolution, but also a fundamental change in the way we perceive and deliver healthcare. Robots are becoming an integral part of medical practice, improving diagnostic accuracy, enhancing surgical outcomes and providing a safer and more efficient environment for patients and medical staff.

Undoubtedly, there are challenges and issues such as the ethical aspects of robotic use, the cost of technology and the need for staff training. However, given the rapid advances in technology and continuous improvements in medical practice, the prospects for robotisation in this area remain encouraging [5].

Further successful implementation of robotisation in medicine requires continued research, the development of safety and ethical standards, and making new technologies available to a wide range of healthcare providers. Roboticisation is not only changing the face of medicine, but also provides an opportunity to create a more efficient and accessible healthcare system for all.

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AUTOMATION OF TECHNOLOGICAL PROCESSES: ADVANTAGES AND DISADVANTAGES

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Abstract. Process automation is a key factor in modern industry. It increases productivity, reduces costs and improves product quality. The purpose of this work is to provide information on the automation of production and to consider the positive and negative sides of automation of technological processes.

Keywords: process automation, feedback control, machine programming, controller, adaptability, monitoring.

АВТОМАТИЗАЦИЯ ТЕХНОЛОГИЧЕСКИХ ПРОЦЕССОВ: ПРЕИМУЩЕСТВА И НЕДОСТАТКИ

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Аннотация. Автоматизация технологических процессов является ключевым фактором в современной промышленности. Она позволяет увеличить производительность, снизить затраты и улучшить качество продукции. Целью данной работы является ознакомление с автоматизацией производства и рассмотрение положительных и отрицательных сторон автоматизации технологических процессов.

Ключевые слова: автоматизация технологических процессов, управление обратной связью, машинное программирование, контроллер, адаптивность, мониторинг.

Process automation is a key factor in modern industry. It has transformed many industries, from automobile manufacturing to food production. This technology enables companies to increase productivity, reduce costs and improve product quality [1].

Modern automated systems are built on the basis of three basic building blocks that make them function: power source, feedback controls, and machine programming. All of these elements are necessary to create efficient and reliable automated systems.

1. The power supply is the first key component that provides the energy to perform the actions of the automated system.

Although there are many different sources of energy, electricity is the most commonly used in modern systems. Its versatility is based on the fact that it can be obtained from a variety of sources such as fossil fuels, hydroelectric, solar and nuclear power. In addition, electricity can be easily converted into other forms of energy such as mechanical, hydraulic, and pneumatic energy to perform a variety of useful work.

Actions performed by automated systems are generally categorized into two types: processing and transmission/positioning.

The first type involves processing operations on various objects such as metals, plastics, electrical signals or data. These operations require the expenditure of a certain amount of energy. For example, these may include forming metal, processing plastic, processing data in a computer system, or switching electrical signals in a communication system. All of these processes are performed using energy, which transforms an object from one state to another, more valuable state.

The second type of action, transfer and positioning, is often used in automated manufacturing systems where it is necessary to move a product from one location to another for further processing. This could be moving parts along a conveyor belt or moving a robot to perform a specific operation. An important aspect of this process is the accuracy of positioning, as a small deviation can lead to incorrect machining or damage to the product.

2. Feedback correcting devices are widely used in modern automated systems.

A feedback control system consists of five main components, namely input, controlled process, output, sensing elements and controller with actuators. These five components are presented in the Figure.

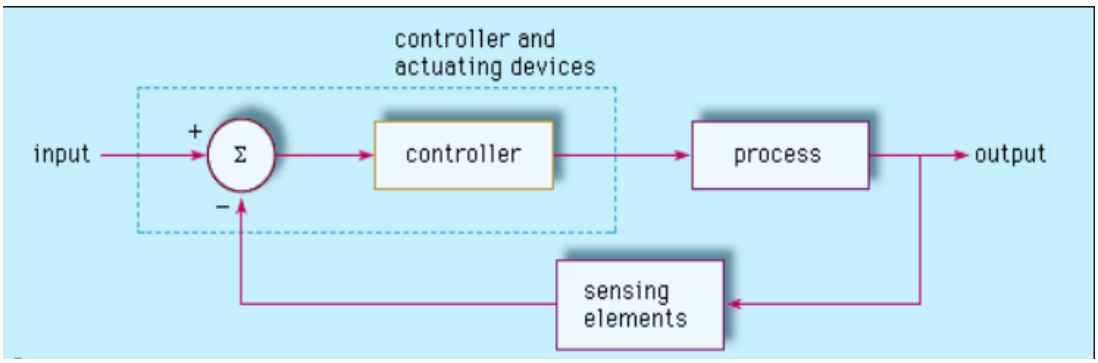


Figure. Main components of feedback control systems

The input signal to the system is the initial or desired output value of the system, representing the desired operating characteristic of the output. As an example a heating system can be provided where the input is a room temperature setpoint. The process is controlled by a heater, such as a furnace. In other feedback systems, the process may be a manufacturing operation, rocket engines on a spacecraft, an automobile engine in cruise control, or any other process that utilizes energy. The output data is a process

variable that is measured and compared to the input data; in the heating example, this would be the room temperature.

Sensing components are measuring devices used to monitor the values of the output variables in the feedback loop. In the case of a heating system, this role is often played by a bimetal strip. The device consists of two metal strips connected along its length. These metals have different coefficients of thermal expansion, so as the temperature rises, the strip bends in proportion to the temperature change. In this way, the bimetallic strip allows the temperature to be measured. There are many different types of sensors used for automation in feedback control systems.

The task of the controller and actuators in a feedback system is to compare the measured value of the output variable with the reference input value and eliminate the difference between the two. Typically, the controller and actuators of a system are specifically designed for the system and include devices such as motors, valves, solenoid switches, piston cylinders, gears, drive screws, pulley systems, chain drives, and other mechanical and electrical components. The thermostat connected to the bimetal strip is the controller and actuator of the heating system. When the power output (room temperature) falls below the set point, the switch turns the heater on. When the temperature exceeds the set value, the heating is switched off.

3. Machine programming

Programming is an integral part of automated systems, defining the set of instructions that a system must execute to achieve a desired result. Although the content of a program can vary considerably from system to system, it always defines the sequence of actions and the functioning of the system components.

In simple systems, a program consists of a small number of well-defined actions that are executed sequentially and repeatedly without deviations from one cycle to the next. However, in more complex systems, the number of commands can be much larger and the granularity of each command is much higher.

In complex systems, the program involves changing the sequence of actions in response to changes in raw materials or operating conditions. This allows the system to adapt and respond effectively to changes in the environment. For example, a robot controller program may indicate that the arm should move to a certain position, and a feedback control system is used to verify that this movement is performed correctly.

Program commands are related to feedback control in an automated system. The program sets the values of the input signals of the various control loops that make up the system. These values control the actions to be performed by the system. Feedback plays an important role in verifying that the program is executed correctly. It allows the system to monitor and correct its actions based on the set parameters.

Thus, feedback provides verification of the programmed step and ensures the accuracy of the system. It is important to note that programming is a key element in the development of automated systems. The ability to create effective programs allows you to optimize the operation of the system, improve its performance and reliability. Copywriters specializing in technical topics must have a deep knowledge of programming and automation to create informative and unique articles on the subject [2].

Process automation is based on several principles that ensure system efficiency and reliability. Let's consider the main principles of automation:

– The principle of automation implies replacing manual labor with automated systems and equipment. Automation makes it possible to reduce dependence on human factor, increase accuracy and speed of work, as well as reduce the probability of errors.

– The principle of control and monitoring implies the presence of control and monitoring systems capable of monitoring and coordinating the operation of technical processes. The control system ensures compliance with the set parameters and conditions of the process, the control system monitors the process and informs the operator about possible deviations.

– The principle of flexibility and adaptability means that the system can quickly and flexibly adapt to different production conditions. The automation system should be able to adapt to changes in the technological process and change the parameters and modes of operation according to the requirements and conditions.

– The principle of reliability and safety is designed to ensure the reliability of system operation and the safety of operators. Automated systems must be stable and reliable to prevent possible failures and accidents. Safety measures should also be avaliable to protect employees from possible hazards and accidents.

– The principle of economic efficiency ensures the economic efficiency of automation. Automated systems should be cost-effective, reduce production costs, increase productivity and product quality, and reduce production cycle time [3].

The advantages of process automation are as follows:

1. Automation improves production efficiency. Computerized systems work more accurately and quickly, reducing errors and increasing productivity.

2. Automation reduces labor costs. Robots and machines can work around the clock without the need for rest or pay. This also reduces the risk of injury and increases the safety of the work environment.

3. Automation helps to improve product quality. Control and monitoring systems ensure constant control of processes, which helps to prevent defects and nonconformities.

Automation of technological processes is currently used in almost all industries. In automobile manufacturing, for example, robots perform complex operations with high precision, thus reducing time and improving assembly quality. In the food industry, automation is used to automatically package, sort, and dispense products. Other industries such as pharmaceuticals, electronics and textiles are also actively adopting automated systems to optimize their processes.

However, despite all the advantages, process automation also faces some challenges. One of the main problems is the high cost of implementing and supporting automated systems. The need to purchase specialized equipment and train personnel can be a financial burden for some companies. In addition, automation can cause resistance from workers who fear losing their jobs. It is important to provide social support and retraining for employees so that they can adapt to the new requirements.

Nevertheless, the development prospects for process automation are very encouraging. With the development of artificial intelligence and robotics, automated systems are becoming increasingly flexible and intelligent. In the future, we can expect

to see increased use of automation in new industries, as well as more sophisticated and innovative solutions [4, 5].

In conclusion, process automation is an integral part of 21st century industry. It allows companies to increase efficiency, reduce costs and improve product quality. Despite some challenges, automation has great potential for further development. This technology will continue to change industries and create new business opportunities.

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THE CURRENT STATE, TRENDS AND TASKS OF INTELLECTUALIZATION OF HEAT SUPPLY SYSTEMS

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Abstract. The article is an overview of the current state, trends and challenges in the field of intellectualization of heat supply systems. It examines the reasons for the need to implement intelligent solutions in this area, such as increasing efficiency, reducing costs and resource intensity, as well as improving environmental safety. The paper also discusses various examples of successful implementation of these technologies and their impact on energy efficiency and stability of systems.

Keywords: heat supply systems, heating, energy efficiency, intellectualization, digitalization, central heating, trends.

СОВРЕМЕННОЕ СОСТОЯНИЕ, ТЕНДЕНЦИИ И ЗАДАЧИ ИНТЕЛЛЕКТУАЛИЗАЦИИ СИСТЕМ ТЕПЛОСНАБЖЕНИЯ

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Аннотация. Статья представляет собой обзор современного состояния, тенденций и задач в области интеллектуализации систем теплоснабжения. В ней рассматриваются причины необходимости внедрения интеллектуальных решений в данной сфере, такие как повышение эффективности, снижение затрат и ресурсоемкости, а также улучшение экологической безопасности. В работе также рассматриваются различные примеры успешной реализации этих технологий и их влияние на энергетическую эффективность и устойчивость систем.

Ключевые слова: системы теплоснабжения, отопление, энергоэффективность, интеллектуализация, цифровизация, центральное теплоснабжение, тенденции.

Heat supply systems are an integral part of our daily life, providing heat to a wide range of objects, including residential buildings, offices, industrial complexes and government agencies. Despite this, modern management mechanisms and technologies

in the field of heat supply significantly lag behind modern standards of efficiency and environmental sustainability in the use of energy resources. Therefore, in recent years there has been an increasing interest in the introduction of innovative approaches and means of intellectualization in heat supply systems.

Heat supply plays a critical role in people's daily lives and in the development of society, providing thermal resources to ensure comfortable living conditions and infrastructure development. The importance of the heat supply system is expressed in the following aspects:

1. Comfortable housing: Heat supply is necessary for heating residential premises, especially in the cold winter months. This creates a warm and pleasant atmosphere, providing comfort for residents.

2. Health and well-being: Lack of heat can contribute to the development of various diseases, especially among vulnerable groups such as children and the elderly. Access to constant heat contributes to maintaining health and preventing cold-related problems.

3. Infrastructure development: Heat supply is an integral part of infrastructure development and ensuring the normal operation of social and economic facilities. It provides thermal energy for water supply, lighting, manufacturing and other sectors of the economy. The lack of reliable heat supply can cause disruptions in the operation of these systems and have a negative impact on public life and the economy.

There are several types of heat supply systems that are used for heating residential and commercial buildings.

1. Central heat supply: This is one of the most common systems in which heat is produced in one place (for example, in a heat station) and then distributed through buildings through heating networks. This system is especially convenient for large cities, where large-scale heating networks can serve many buildings and houses (Figure 1).

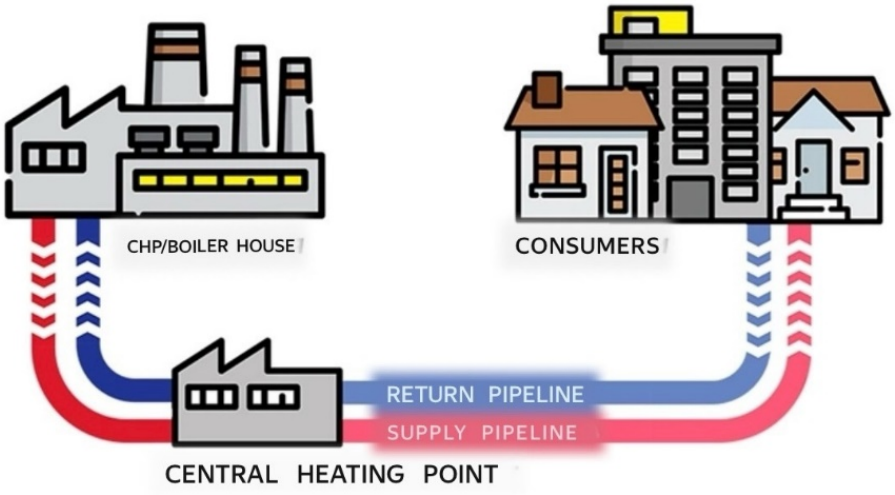


Figure 1. Central heating system

2. Individual heating: This is a system in which each house or apartment has its own separate heating system. These are usually gas boilers, electric heaters, water or

steam heating. Such a system provides independence and control over the heat supply, but it can be more expensive to operate and requires separate maintenance of each system.

3. Geothermal heating: This system uses heat extracted from the ground using geothermal pumps. This system is based on the use of constant ground temperature to heat buildings. Geothermal systems can be efficient and environmentally friendly, but require significant investments during installation (Figure 2).

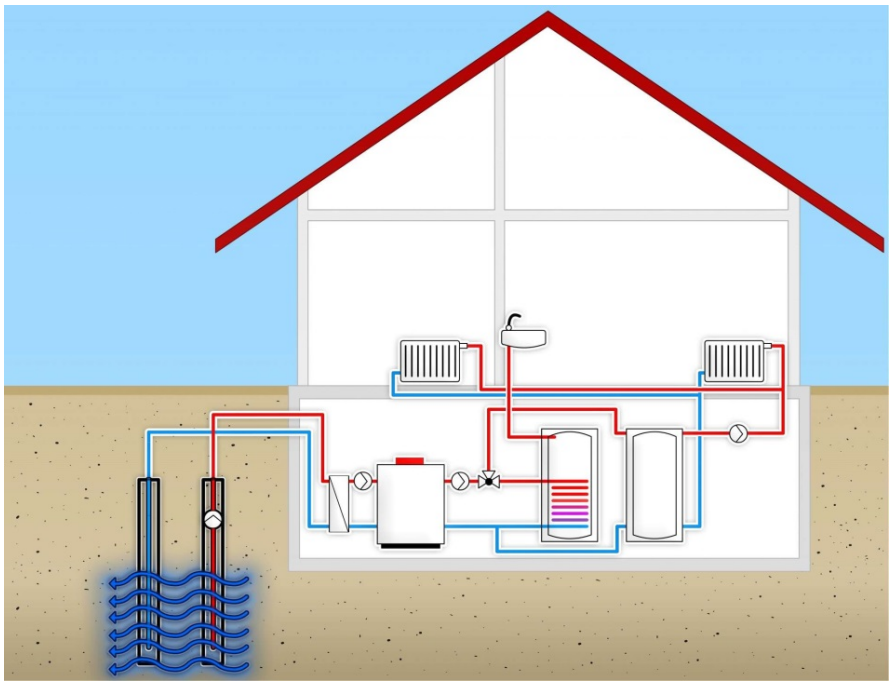


Figure 2. Geothermal heat supply system

4. Solar heating: This system uses solar energy to heat residential and commercial buildings. Solar collectors capture solar radiation and convert it into heat, which is then used for heating. Such a system can be reliable and environmentally friendly, but may be limited in use due to climatic conditions.

5. Heat pumps: These are systems that use energy from the environment, such as air, water or earth, to produce heat. Heat pumps use energy efficiently and can be cost-effective in the long run.

Each of these systems has its advantages and disadvantages, and the choice depends on many factors, such as climatic conditions, budget, project scale and fuel availability.

There are several problems and limitations that heat supply systems currently face.

Low energy efficiency: One of the main problems is the low energy efficiency of many existing heat supply systems. These systems often use outdated heat sources, such as gas and coal-fired boilers, which do not efficiently convert fuel into heat. This leads to significant energy losses and a negative impact on the environment.

Outdated technologies and infrastructure: Many heating systems were built decades ago and do not correspond to modern trends. They often have outdated equipment and infrastructure, which leads to frequent accidents and interruptions in the

supply of heat. In addition, the installation of new heating systems can be difficult and expensive, especially in already built-up areas.

Uneven heat distribution: Another problem is the uneven distribution of heat in heat supply systems. This can lead to distortions in consumption, in which some buildings overheat, while others remain insufficiently heated. Effectively managing and balancing the heat flow between different zones can be challenging.

Environmental problems: Many existing heat supply systems run on energy sources that pollute the environment, such as coal and natural gas. This causes problems with greenhouse gas emissions and climate impacts. The transition to more environmentally friendly heat sources is becoming more and more urgent.

Inefficient use of renewable resources: Some heat supply systems may be inefficient in using renewable resources, such as solar and geothermal energy. The effective integration of these sources into heat supply systems requires careful planning and investment.

The solution to these problems includes the modernization of infrastructure, the transition to more efficient and environmentally friendly technologies, as well as more accurate management and monitoring of heat supply systems.

Intellectualization of heat supply systems is the process of introducing information technologies and automation in the management of heat supply systems. It is carried out through the use of modern control systems, sensors and monitoring, data analysis and decision-making based on the information received.

The importance of intellectualization of heat supply systems lies in several aspects:

Energy Efficiency: Intelligent heat supply systems help to lower energy consumption and reduce energy costs. They optimize the operation of boiler houses and heating systems, contribute to the prediction and adaptation of the level of heat consumption depending on external conditions and consumer goals. This leads to more efficient use of resources and lower costs [1].

Flexibility and scalability: Intelligent heat supply systems have the ability to respond quickly and effectively to changes in external conditions and consumer needs. They can flexibly adjust the parameters of the system, taking into account weather conditions, time shifts and technical features of objects. This increases the reliability and efficiency of heat supply systems.

Comfort and convenience: The use of intelligent heat supply systems allows you to create comfortable conditions in the premises and optimize heat consumption. They are able to regulate the temperature in different parts of the building depending on the needs of users, which ensures the maximum level of comfort with minimal energy consumption.

Reducing environmental impact: The intellectualization of heat supply systems reduces the negative impact on the environment by using energy-efficient technologies and optimizing the use of resources. This contributes to the reduction of greenhouse gas emissions and leads to an improvement in the environmental situation [2].

Currently, more and more cities and regions are striving to make their heat supply systems more intelligent and sustainable. This is explained not only by the need

to reduce the load on the environment, but also by the need to improve the efficiency and reliability of these systems.

This is evidenced by various trends that can be observed in the development of heat supply systems. The introduction of modern technologies plays a key role here. Let's look at some of them.

The first trend is the use of smart technologies (Figure 3). Smart heating systems allow you to collect, analyze and use data to optimize the operation of the system. For example, sensors can be used to monitor temperature, pressure and other parameters at various points in the system. This makes it possible to quickly identify potential problems and prevent emergencies. In addition, smart technologies can help manage the load on the system based on the weather forecast and consumer needs. This reduces energy consumption and increases comfort for residents [3, 4].

For example, smart homes can automatically adjust the temperature depending on the presence of people in the room or on the weather forecast. They can also exchange data with heat supply systems to optimize energy consumption.



Figure 3. Using smart technologies

The second trend is the use of alternative energy sources (Figure 4). Heat supply companies are increasingly paying attention to renewable energy sources, such as solar and wind energy. They not only reduce environmental pollution, but also provide a more reliable supply of energy to the system. Moreover, modern technologies make it possible to use energy efficiently, for example, with the help of heat pumps or solar collectors [4, 5].

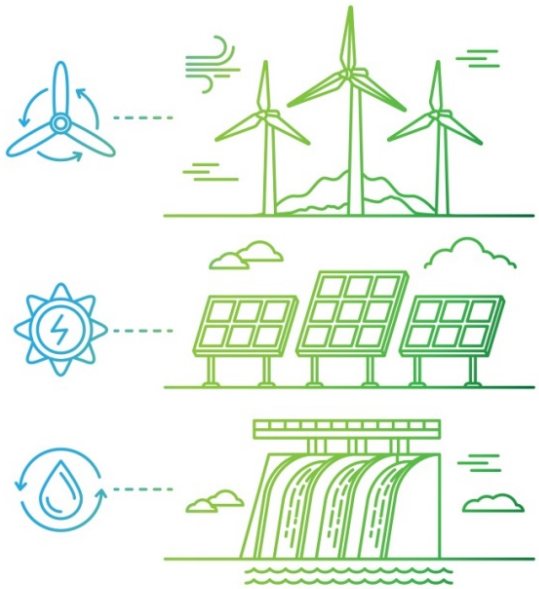


Figure 4. Alternative energy sources

The third trend is the use of energy management systems. Energy management systems (EMS) allow you to optimize the operation of the heat supply system using algorithms and artificial intelligence. They take into account various factors, such as customer needs, energy costs and availability of various resources. This allows you to lower energy costs and reduce the load on the network [4].

The introduction of modern technologies into heat supply systems is a necessary step towards more efficient and environmentally friendly energy. Smart technologies, alternative energy sources, smart home systems and energy management – all this helps to make heat supply systems more reliable, cost-effective and convenient for consumers [3].

One of the key tasks of the intellectualization of heat supply systems is the automation and optimization of the system. This is achieved through the implementation of a monitoring and control system that allows you to monitor the operation of the system in real time and automatically adjust the parameters of heat consumption depending on changing conditions.

An important goal of the intellectualization of heat supply systems is to increase the energy efficiency of these systems.

One of the main laws regulating indicators of reliability and energy efficiency of heat supply facilities is Federal Law No. 191-FZ of July 27, 2010 “On Heat Supply”. This is achieved through the use of modern technologies, such as the installation of low-temperature heat supply networks, the use of a pump-dispatch group with variable pump speed, the use of heat pumps and solar collectors. These technologies can reduce fuel and electricity consumption, as well as reduce emissions of harmful substances into the atmosphere [6].

The task of intellectualizing heat supply systems also includes improving load management and distribution of heat resources in the system. This is achieved through the implementation of a load management system that optimizes the uniform

distribution of loads and takes into account various factors, such as weather conditions, the need to maintain a comfortable temperature in the premises and economic factors.

The intellectualization of heat supply systems can significantly increase the efficiency and reliability of the system, as well as reduce the negative impact on the environment. The expansion of the use of these technologies is becoming more and more relevant every year, and their introduction is an important step in the modern development of heat supply systems.

The intellectualization of heat supply systems has extensive development prospects. First of all, it can significantly improve energy efficiency and reduce heating costs. With climate change and global energy challenges, energy conservation is becoming an increasingly critical issue. The intellectualization of systems makes it possible to optimize management processes, respond to changes in real time and reduce energy losses, which contributes to improving the efficiency of the system.

Secondly, intellectualization allows you to create smart networks that can analyze and predict the demand for heat. This is especially important for large cities with high population density, where effective electronic control of heat supply systems is required. Such systems allow you to flexibly respond to changes in supply and demand, take into account the energy efficiency of buildings and climatic conditions.

The third perspective is related to the integration of renewable energy sources. Expanding the use of alternative sources, such as solar and wind energy, requires the development of intelligent systems capable of efficiently using energy from these sources. This will reduce dependence on fossil fuels and reduce greenhouse gas emissions.

Finally, energy management systems represent another perspective. These systems allow for more efficient management of heat consumption and production, as well as integration of various types of energy. They can be useful both in public buildings and industrial complexes, as well as in residential buildings, allowing residents to control their heat and energy consumption.

From an ecological point of view, heat supply systems can have a negative impact on the environment. Traditional systems based on the use of fossil fuels, such as gas and oil, lead to the release of large amounts of greenhouse gases into the atmosphere, such as carbon dioxide and nitrogen oxides. These gases are the main causes of climate change and atmospheric pollution. In addition, the combustion of fossil fuels releases sulfur and other substances that pollute the air and water.

However, there are also more ecological heating systems that can reduce the negative impact on the environment. One example of such systems is the use of renewable energy sources (RES), such as solar and wind energy. Renewable energy sources not only do not emit harmful gases into the atmosphere, but also reduce dependence on fossil resources. In addition, systems using heat pumps that extract heat from the environment can also be more environmentally efficient.

From an economic point of view, the intellectualization of heat supply systems is also important. They affect the cost of energy, the costs of operation and maintenance, as well as the creation of jobs. Traditional systems based on fossil fuels, as a rule, require high costs for the purchase and installation of equipment, as well as

for a constant supply of fuel. In addition, the prices of energy produced from fossil sources can vary greatly and be subject to geopolitical and economic risks.

On the other hand, the use of renewable energy sources in heat supply systems can lead to lower energy costs. Renewable energy sources, such as solar and wind, are free and virtually unlimited. Although the cost of installing systems powered by renewable energy sources can be high, the costs of operating and maintaining such systems are usually low. In addition, the use of renewable energy sources contributes to the development of new economic sectors and the creation of jobs in the production and installation of appropriate equipment [7].

From all of the above, it can be concluded that the intellectualization of heat supply systems is an important stage in the development of this industry. It allows you to significantly increase energy efficiency, reduce the negative impact on the environment and ensure reliable and comfortable heat supply. However, for the successful implementation of this process, it is necessary to carry out serious work on upgrading the existing infrastructure and ensuring a sufficient level of staff qualifications.

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HIGHLY ACTIVE ORGANIC SUBSTANCES (VITAMINS) AND THEIR ROLE IN SUPPORTING HUMAN HEALTH

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Abstract. This article discusses the necessity of taking vitamin and mineral complexes, describes a number of vitamins, the deficiency of which is observed in Russia, gives examples of diseases observed in the deficiencies of certain vitamins, as well as the answer to the question of the need to take vitamin and mineral complexes in everyday life.

Keywords: vitamins, minerals, vitamin and mineral complexes, the body, vitamin deficiency, hypovitaminosis, vitamin A, vitamin B1, vitamin B2, vitamin PP, vitamin D.

ВЫСОКОАКТИВНЫЕ ОРГАНИЧЕСКИЕ ВЕЩЕСТВА (ВИТАМИНЫ) И ИХ РОЛЬ В ОБЕСПЕЧЕНИИ ЗДОРОВЬЯ ЧЕЛОВЕКА

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Аннотация. В данной статье рассматривается вопрос о необходимости приема витаминно-минеральных комплексов, описывается ряд витаминов, дефицит которых есть в России, приводятся примеры болезней, наблюдаемых при недостатках тех или иных витаминов, а также дается ответ на вопрос о необходимости приема витаминно-минеральных комплексов в повседневной жизни.

Ключевые слова: витамины, минералы, витаминно-минеральные комплексы, организм, авитаминоз, гиповитаминоз, витамин А, витамин В1, Витамин В2, витамин РР, витамин D.

Vitamins and minerals play an important role in maintaining human health. They are involved in many body processes such as metabolism, growth and development, immune defense, and more. Deficiency of certain vitamins and minerals can lead to various diseases and health problems. This raises the question of the need to take vitamin and mineral complexes. Vitamin and mineral complexes (VMC) are supplements that are designed to supply the body with vitamins, minerals and other nutrients. Modern vitamin and mineral complexes are created taking into account the peculiarities of age, gender and human activity. Vitamin and mineral complexes do not contain hormonal and harmful substances, they are not dangerous to health, on the contrary, they are aimed at its strengthening, as well as at activation of metabolic processes [1].

The need for vitamins should be met primarily through natural vitamins contained in foods. Sources of vitamins are products of both plant and animal origin. However, in case of increased need for vitamins, to accelerate recovery processes, to improve performance one can resort to vitamin preparations.

Currently, more than 20 vitamins are known. Many of them are well studied and norms of their needs are established depending on the age of the person.

All vitamins are divided into two groups: water-soluble (vitamins C, P, B) and fat-soluble (vitamins A, D, E, K). Let’s consider basic vitamins and their role in the human body.

Vitamin A (Retinol) is necessary for normal growth and development of the body. It participates in the formation of visual purple in the retina, affects the condition of the skin, mucous membranes, providing their protection, contributes to protein synthesis, lipid metabolism, supports growth processes, and increases resistance to infections.

Vitamin B1 (Thiamine) plays a major role in the functioning of digestive organs and the central nervous system (CNS), and plays a key role in the metabolism of carbohydrates.

Vitamin B2 (Riboflavin) plays a major role in carbohydrate, protein and fat metabolism, tissue respiration processes, contributes to energy production in the body. Also riboflavin provides normal functioning of the central nervous system, digestive system, visual organs, hematopoiesis, supports the normal state of the skin and mucous membranes [2].

Vitamin B3 (Niacin, Vitamin PP, Nicotinic acid) participates in the metabolism of fats, proteins, amino acids, purines (nitrogenous substances), tissue respiration, glycogenolysis, regulates redox processes in the body. Niacin is essential for the functioning of the digestive system, contributing to the breakdown of food into carbohydrates, fats and proteins during digestion and the release of energy from food. Niacin effectively lowers cholesterol, normalizes the concentration of blood lipoproteins and increases HDL, which has an antiatherogenic effect. It dilates small vessels (including the brain), improves blood microcirculation, has a weak anticoagulant effect. It is vital for maintaining healthy skin, reduces pain and improves joint mobility in osteoarthritis, has a mild sedative effect and is useful in the treatment

of emotional and mental disorders, including migraine, anxiety, depression, attention deficit disorder and schizophrenia. And in some cases, it even suppresses cancer.

Vitamin B5 (Pantothenic Acid) plays an important role in antibody formation, aids in the absorption of other vitamins, and stimulates the body's production of adrenal hormones, making it a powerful treatment for arthritis, colitis, allergies, and cardiovascular disease.

Vitamin B6 (Pyridoxine) takes part in the metabolism of protein and individual amino acids, also fat metabolism, hematopoiesis, acid-forming function of the stomach.

Vitamin B9 (Folic acid, Bc, M) takes part in the function of hematopoiesis, promotes the synthesis of red blood cells, activates the body's use of vitamin B12, important for the processes of growth and development.

Vitamin B12 (Cobalamin, Cyanocobalamin) plays a major role in hematopoiesis and the central nervous system, participates in protein metabolism, prevents fatty degeneration of the liver.

Vitamin C (Ascorbic acid) takes part in all types of metabolism, activates the action of some hormones and enzymes, regulates redox processes, promotes the growth of cells and tissues, increases the body's resistance to harmful environmental factors, especially infectious agents. It affects the state of permeability of the walls of blood vessels, regeneration and healing of tissues, and participates in the absorption of iron in the intestine, the metabolism of cholesterol and adrenal cortex hormones.

Vitamin D (Calciferols) has several varieties. The most essential for humans are vitamin D2 (ercocalciferol) and vitamin D3 (cholecalciferol). They regulate the transport of calcium and phosphate in the cells of the small intestinal mucosa and bone tissue, participate in the synthesis of bone tissue, enhance its growth.

Vitamin E (Tocopherol) is called the vitamin of "youth and fertility", because being a powerful antioxidant tocopherol slows down the aging process in the body, as well as provides the work of sex gonads in both women and men.

Vitamin K is called an anti-hemorrhagic vitamin because it regulates the blood clotting mechanism, which protects people from internal and external bleeding in case of injuries. Because of this function, vitamin K is often given to women during labor and newborn babies to prevent possible bleeding. Also vitamin K is involved in the synthesis of protein osteocalcin, thereby ensuring the formation and restoration of bone tissues of the body, prevents osteoporosis, provides kidney function, regulates the passage of many redox processes in the body, has an antibacterial and analgesic effect.

Vitamin F (Unsaturated fatty acids) is important for the cardiovascular system: it prevents and reduces cholesterol deposits in the arteries, strengthens the walls of blood vessels, improves blood circulation, normalizes blood pressure and pulse. Also vitamin F is involved in the regulation of fat metabolism, effectively fights inflammatory processes in the body, improves tissue nutrition, affects reproduction and lactation, has an antisclerotic effect, provides muscle function, helps normalize weight, provides a healthy skin, hair, nails and even the mucous membrane of the gastrointestinal tract.

Vitamin H (Biotin, Vitamin B7) plays an important role in the metabolism of proteins, fats and carbohydrates, it is necessary for the activation of vitamin C, with its participation reactions activation and transfer of carbon dioxide in the circulatory system take place; it forms part of some enzyme complexes and is necessary for the normalization of growth and body functions. Biotin, interacting with the insulin, stabilizes the blood sugar content, it is also involved in the production of glucokinase. Both of these factors are important in diabetes. Biotin's work helps keep skin healthy by protecting against dermatitis, reduces muscle pain, helps protect hair from graying, and slows the aging process in the body [3].

Currently, one fifth of the adult population of Russia suffers from polyhypovitaminosis – deficiency of three or more vitamins. Vitamins whose intake is insufficient in all regions of the country are A, B1, B2, PP, D [4]. The table of the ratio of deficiency of different vitamins in the Russian population is shown in the Figure.

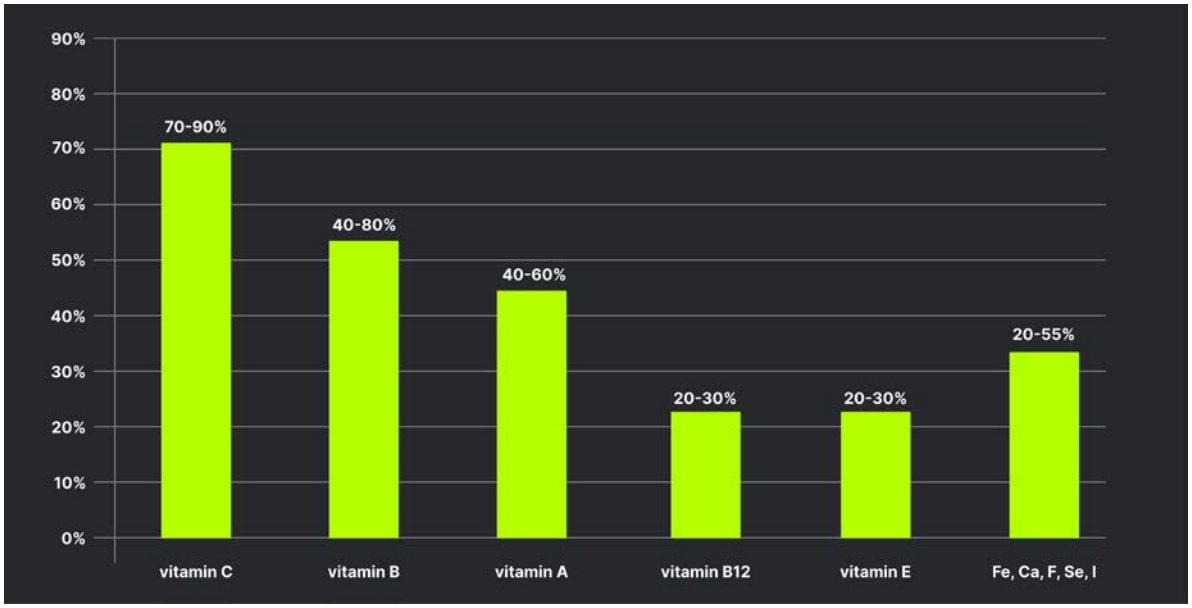


Figure. Table of the ratio of deficiencies of different vitamins in the Russian population

The cause of vitamin A deficiency, as well as beta-carotene, which is partially converted into vitamin A by enzymes in the body, may be an unbalanced diet. Prolonged deficiency of complete proteins (containing all amino acids necessary for humans) and restriction of fat intake impair the absorption of this vitamin [5].

The need for vitamins B1 and B2 depends primarily on the nature of the diet. Extreme weather conditions, strict diets, thyroid malfunctions, and excessive alcohol consumption may contribute to the reduction of these vitamins in the body [6].

The absorption of vitamin D is facilitated by fats and bile acids. Vegetable products (fruits, vegetables, cereals) practically do not contain the vitamin, so vegetarianism reduces its intake. In summer, you can restore the balance of vitamin D by simply being in the sun, since it is able to independently synthesize in the human skin. In this case, it is better not just to sit, but to move – physical activity promotes the production of the vitamin [7].

The main representatives of vitamin PP are nicotinic acid and nicotinamide. In animal products niacin is contained in the form of nicotinamide, and in plant products – in the form of nicotinic acid. Vitamin PP is necessary for the release of energy from carbohydrates and fats, for protein metabolism. It is part of the enzymes that provide cellular respiration. Niacin normalizes the work of the stomach and pancreas.

In addition to the five vitamins that are deficient for the whole country, there are a number of useful substances, the shortage of which is identified only in certain regions of Russia, so in St. Petersburg, in addition to the above-mentioned vitamins, vitamin I (Iodine) is also deficient. Iodine deficiency is often caused by low consumption of fish and seafood. Meanwhile, 10-15 % of the urban and 13-35 % of the rural population of Russia suffer from diseases related to the deficiency of this trace element [8].

By taking vitamin and mineral complexes, you can prevent the development of these problems and maintain the health of the body. However, it is worth remembering that an excess of vitamins and minerals can also be harmful to health. Therefore, you should consult your doctor before starting any supplements. In modern realities, the consumption of the full amount of all necessary vitamins with food is not possible due to the accelerated pace of life of the majority of the population of Russia, or climatic and environmental conditions of some regions. For such cases vitamin and mineral complexes have been created. Nevertheless, striving to take all the daily dose of all vitamins and minerals necessary for the body at the same time can lead to the fact that it significantly hinders the achievement of the ultimate goal – the prevention and/or treatment of certain symptoms. This is largely due to the interaction of the components, resulting in a partial or complete loss of activity.

Hence we can conclude that successful prevention and treatment of hypo- and avitaminosis can be a serious tool for preventing the negative effects of environmental factors, stress, reducing the risk of cancer, cardiovascular, gastrointestinal, metabolic and other types of the most common human diseases, but in most cases vitamin therapy in preventive and clinical medicine should be carried out using evolutionarily, metabolically and physiologically justified methods. It is the complex of vitamins, close in its composition to the set of vitamins entering the body with a full balanced diet, that is necessary for a person to realize most of the vital functions of the body.

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INTERCULTURAL INTERACTION AND ITS INFLUENCE ON THE FORMATION OF HUMAN PERSONALITY

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Abstract. This article examines both positive and negative aspects of the influence of culture on personality formation. The main cultural factors influencing the formation of personality and methods of overcoming the negative effect are discussed. The conclusion emphasizes the importance of studying this issue and the significance of individual self-identification in the context of cultural events.

Keywords: culture, personality, influence, socialization, identification, intercultural interaction, tolerance, conformism, nonconformism.

МЕЖКУЛЬТУРНОЕ ВЗАИМОДЕЙСТВИЕ И ЕГО ВЛИЯНИЕ НА ФОРМИРОВАНИЕ ЛИЧНОСТИ ЧЕЛОВЕКА

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Аннотация. В статье рассматриваются как положительные, так и отрицательные аспекты влияния культуры на формирование личности. Представлены основные культурные факторы, воздействующие на формирование личности и методы преодоления их отрицательного эффекта. В заключении подчеркивается важность изучения данной проблематики и значимость самоидентификации человека в контексте культурных событий.

Ключевые слова: культура, личность, влияние, социализация, идентификация, межкультурное взаимодействие, толерантность, конформизм, нонконформизм.

Culture is the awareness, knowledge of a person about the basic, most important processes of the human psyche and processes in groups of people, i.e. society.

Culture is an integral part of every person’s life. It determines our values, customs and ways of thinking. Culture shapes the perception of the world around us

and influences all spheres of our life – from education to art, from behavior in society to our inner world [1].

One of the main roles of culture in human life is the preservation and transmission of the heritage of previous generations. Thanks to culture we can get to know the history of our people, learn about their traditions and customs. Culture allows us to see our connection with the past and understand how our ancestors influence us.

Culture also plays an important role in shaping our personality. It helps us to define ourselves and our values and to develop our individuality. Culture offers us a wide range of opportunities for self-expression and self-development, allows us to find our place in society and contribute to the development of our cultural heritage.

Culture affects us not only internally but also externally. It shapes our behavior, norms and values, it determines our views on the world and on ourselves as part of society. Culture influences our perception and understanding of art, music, literature, architecture and other manifestations of cultural creativity, and shapes our personality. The concept of personality can be formulated as the uniqueness of a person who has his or her own set of characteristics that determine his or her behavior, character, and interaction with the world around him or her.

The influence of culture on personality can be both positive and negative. The positive influence is that culture allows us to recognize and understand many things that cannot be expressed through science or logic. It develops our thinking, emotional and spiritual spheres, shapes our personality, and helps us to develop and be creative.

However, culture can also have a negative impact, especially if we are exposed to a culture that does not match our values and beliefs. We may feel pressured by the culture around us to sacrifice our principles and beliefs to conform to that culture. In this case, culture ceases to be an expression of our personality and becomes a limitation on our freedom and individuality.

Cultural factors influencing the formation of personality include:

– Family values and traditions. Family is both a school of love and morality, a source of our deepest values. Each of us understands perfectly well that it is in the family that such universal values as the sense of patriotism, love and respect for loved ones, generosity, responsibility for one’s actions are laid down.

– Education and social environment. Personality is a product of socio-historical and ontogenetic human development. Formation of personality is impossible outside of social activity, only by being included in the process of historical practice, a person manifests social essence, acquires social qualities, develops value orientations.

– Religious beliefs and customs. Religious education, has at all times been aimed at the development of spirituality and moral principles of the individual, based on eternal divine principles, the realization of their inalienability, comprehension of paternal roots, centuries-old heritage, the good that has been accumulated by generations.

– Mass culture and media. Mass culture plays an important role in shaping our values. It offers us certain modes of behavior, ideals of beauty, success and happiness. Movies, TV shows and music can inspire us and influence our perception of what is considered important and desirable. However, it is important to realize that popular

culture can promote ideals that do not always correspond to our individual values and needs [2].

The process of personality formation can be formulated through the concept of social adaptation. Social adaptation is the process and result of active adaptation of an individual to the conditions of the social environment. In the process of life activity a person quite often finds him- or herself in an unfamiliar environment and he or she has to adapt to new conditions. Closely related to this concept are the phenomena of conformism and nonconformism, the understanding of which is necessary for further analysis of the influence of culture on the formation of human personality.

Conformism in the conscious activity of an individual and collective thinking is reflected through behavioral change and belief formation as a reaction to imaginary and real aspects of life. This relationship is built on the basis of a system of interaction between a person and other representatives of a social group. It ensures the adoption of experience of group members, exchange of information resources that are important and relevant at the current moment of time. At the same time, the social group influences the opinion of this person.

Nonconformism, on the contrary, describes a person who may not accept society's opinion, but builds his or her own line of behavior, opposite to society. Then, he or she inevitably draws attention to him- or herself, develops a sense of dislike and, even, hatred from other members of the collective. Their displeasure and censure is inevitable. Such a personality moves to a new level and is called a nonconformist. Nonconformists are characterized by innovation, initiative. They make innovations in society or social group and contribute to its development [3].

So how can culture influence the formation of a personality? The positive influence of culture on the emotional state is manifested in the fact that it contributes to the formation of positive emotions. For example, folk festivals, songs and dances create an atmosphere of joy and fun. Such events can raise spirits, strengthen a sense of belonging and unite people.

Through culture people acquire knowledge about what is valuable and important in their lives, what goals should be pursued and what should be rejected. It shapes the standards of behavior and norms that define the rules of communication and interaction in society.

Culture also offers a wealth of historical and cultural experiences that can serve as inspiration for the creative process. Studying the past, historical events and traditions helps to understand and recreate the spirit of the times and create works of art that reflect a particular era or culture. Culture plays an important role in shaping people's outlook and attitude towards the world around them [4].

However, due to its nature, culture can create negative stereotypes and prejudices that can have a destructive effect on individuals and society. Through culture and media, negative values such as violence, rudeness, immoral behavior and cruelty are actively promoted and popularized. Information resources and entertainment programs often diligently emphasize these aspects, creating images and ideals that inspire and encourage inappropriate behavior and attitudes toward others.

Negative stereotypes and prejudices generated by culture can lead to discrimination, inequality and rejection of differences. They can hinder the

development of tolerance, cooperation and mutual understanding between people of different cultures and nationalities. The negative impact of culture on emotional well-being can manifest itself in the formation of stereotypes and prejudices. Some cultural norms may restrict the freedom to express emotions, leading to suppression of feelings and emotional distress. For example, some cultures may consider expressing anger or sadness unacceptable, causing people to withdraw and suppress their emotions.

The differences between people from different cultures are incredibly varied. This ranges from different geographical locations, the economic situation in the country, the resources available in the region, to local folklore, language, different perceptions of gestures, local traditions and customs, religion, etc. Sometimes these differences are so great that many cultures, at best, adopt a “ghetto” position in relation to each other, and at worst organize genocide or terrorist acts against the people with whom they cannot find a “compromise” in interaction. To overcome the negative impact of culture on the individual, it is necessary and important to implement educational programs on intercultural interaction [5].

At the moment, many scholars around the world are dealing with the problems of intercultural interaction and intercultural communication. It becomes especially relevant given the fact that society is gradually globalizing, and a huge number of international companies and faculties are appearing in the world. Intercultural interaction is a complex and multifaceted process reflecting contact between two or more representatives of different cultural groups, a phenomenon that is based on communication and can significantly affect the further development of events between the interacting parties and their representatives. The first intercultural interactions appeared together with the first humans. At that time there was no definition for the phenomenon in question, nevertheless, as M. Bodziany notes, today the creation of the possibility of intercultural communication is the basis for peaceful coexistence of many people.

The need to inculcate tolerance to the society is no less important in reducing the negative impact of culture on human personality.

Tolerance is acceptance and respect for other people’s choices, other people’s peculiarities and opinions. However, it is important to realize that tolerance is not just a tolerant attitude to something different from what we are used to, but also an acceptance of the fact that the world around us and the peoples inhabiting it are very diverse. At the same time, each ethnic group is unique and inimitable. Only the recognition of ethnic and religious diversity, understanding and respect for the cultural peculiarities inherent in the representatives of other peoples and religions, combined with the democratic values of civil society, can contribute to the creation of a truly tolerant atmosphere of life. Tolerance means respect, acceptance and proper understanding of the full diversity of cultures, and expressions of human individuality. Tolerance is fostered by knowledge, openness, communication and freedom of thought, conscience and belief. Tolerance is unity in diversity [6].

Thus, the study of the influence of culture on the formation of personality is of great importance because it allows us to understand how different cultural factors affect the development of personality and human behavior. This knowledge is necessary to

create more effective methods to support and develop individuals in different cultural contexts.

Individual self-identification in the context of cultural influences is of particular importance. Understanding one's cultural background and uniqueness, as well as the ability to consciously choose and accept cultural elements that correspond to individual values and needs, is a key aspect of developing tolerance, respect for other cultures and successful intercultural interaction. The study of the influence of culture on personality and individual self-identification plays an important role in the formation of a tolerant and harmonious society that can effectively cope with the challenges of globalization and intercultural interaction.

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ROBOTIC SYSTEMS FOR MAINTENANCE AND REPAIR OF ENERGY EQUIPMENT

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Abstract. The article is devoted to robotic systems used for maintenance and repair of power equipment. The article discusses the basic principles of operation of robotic systems, as well as their advantages and disadvantages. It also describes the different types of robots used in the energy industry and examples of their applications. At the end of the article, possible directions for the development of robotic systems for maintenance and repair of power equipment are given.

Keywords: robotic systems, power equipment, maintenance, repair, industrial robots, autonomous systems, development directions.

РОБОТИЗИРОВАННЫЕ СИСТЕМЫ ДЛЯ ОБСЛУЖИВАНИЯ И РЕМОНТА ЭНЕРГООБОРУДОВАНИЯ

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Аннотация. Статья посвящена роботизированным системам, используемым для обслуживания и ремонта энергооборудования. В статье рассматриваются основные принципы работы роботизированных систем, их преимущества и недостатки. Также описываются различные типы роботов, используемых в энергетической отрасли, и примеры их применения. В конце статьи приводятся возможные направления развития роботизированных систем для обслуживания и ремонта энергооборудования.

Ключевые слова: роботизированные системы, энергооборудование, обслуживание, ремонт, промышленные роботы, автономные системы, направления развития.

In the modern world, robotization and process automation are becoming increasingly relevant, especially in the energy sector. Robotic systems for maintenance and repair of power equipment are a set of technologies aimed at increasing the efficiency, safety and reliability of equipment, as well as reducing costs and risks associated with the human factor. In many cases, robots can be more efficient than

humans because they do not experience feelings and are not subject to human error. Robots can perform tasks with high precision and speed without getting tired or needing rest. They can also be programmed to perform dangerous or complex tasks that could be dangerous to humans. In addition, robots can operate in environments that are dangerous or inaccessible to humans, such as in space or underwater. However, robots have their limitations and cannot replace humans in all areas. For example, robots cannot replace the human intuition and creativity that can be needed to solve complex problems.

Let us consider different types of robots in more detail.

Mobile robots are used to perform various tasks such as inspection, diagnostics, maintenance and repair of power equipment. They are able to move over various surfaces, overcome obstacles and work in hard-to-reach places. Examples of mobile robots include crab robots, walking robots, and wheeled robots [1]. An illustrative example is the advanced development of the NTI Center of St. Petersburg Polytechnic University – a software and hardware platform based on the Ultra-Compact Autonomous Robot vehicle (UCAV) for engineering education in the field of Industry 4.0 technologies (Figure 1).

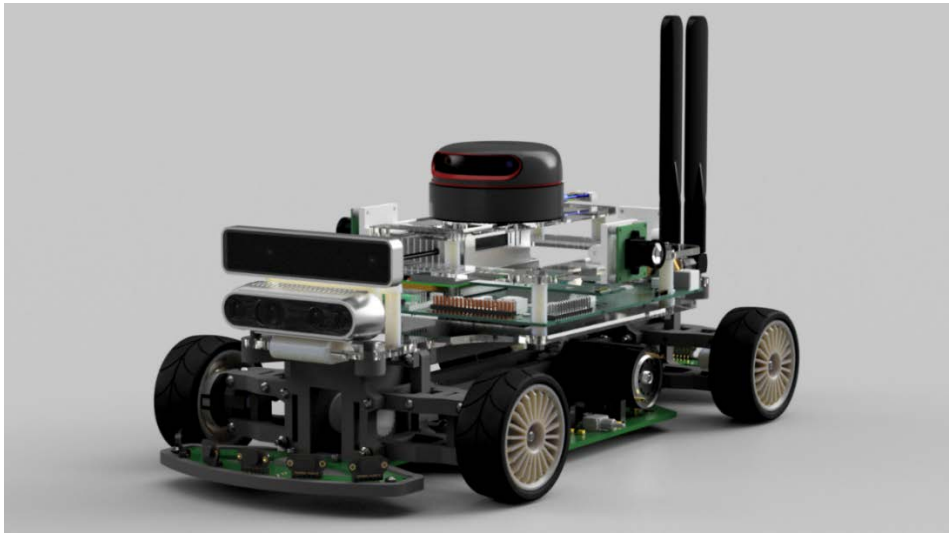


Figure 1. Ultra-compact autonomous robot vehicle (UCARV)

Unmanned aerial vehicles (UAVs) are used to inspect and monitor the condition of power equipment at height, as well as to perform installation and repair work. They provide quick and safe access to hard-to-reach areas such as high-voltage power lines, wind turbines and transformer substations.

Robotic manipulators are designed to perform handling operations such as moving, installing, assembling and disassembling equipment, as well as to perform complex technological processes such as welding and soldering. They have high accuracy and speed of operation, which improves the quality of maintenance and repair of power equipment. Robotic arms can be used to install and assemble solar panels, as well as perform manufacturing processes such as welding and soldering. They can operate in elevated temperatures and altitudes, making them more efficient and safer for workers [2].

It is worth identifying the advantages and disadvantages of robotic systems.

Advantages:
– Improving efficiency and quality of work;
– Reduced maintenance and repair costs;
– Reducing risks associated with the human factor;
– Increased safety of personnel and the environment;
– Ability to work in difficult and dangerous conditions.

Flaws:
– High cost of implementation and operation;
– Difficulty integrating with existing equipment;
– The need to train personnel to work with robotic systems;
– Limited use in certain conditions (for example, extreme temperatures, strong vibrations or humidity) [3].

Artificial intelligence (AI) and machine learning allow robots to analyze large amounts of data, learn from the information received, and make independent decisions. This can improve the quality and efficiency of maintenance and repair of power equipment, as well as reduce operating and personnel training costs.

The Internet of Things (IoT) and digital twins provide the ability to collect, process and analyze energy equipment data in real time. This allows you to optimize maintenance and repair processes, prevent emergency situations and improve resource planning [4].

Collaborative robots (cobots) are a new generation of robots that can work closely with humans. They have special sensors and safety systems that allow them to avoid collisions with people and other objects. Cobots can be used to perform joint tasks with a human operator, which increases the efficiency and flexibility of the process of maintaining and repairing power equipment.

Let us look at examples of successful implementation of robotic systems for maintenance and repair of power equipment:

1. “Robotics for Wind Turbine O&M” project by General Electric (GE). GE has developed a robotic system for the maintenance and repair of wind turbines. Robots inspect wind turbine blades, detect defects and carry out repairs using specialized tools.

2. Transneft has developed a robotic system for diagnosing and servicing oil pipelines. Robots monitor the condition of pipelines, detect leaks and corrosion, and also carry out repair work.

3. “Robotic Inspection and Maintenance on Offshore Platforms” project by Total. Total has developed a robotic system for the maintenance and repair of oil and gas platforms. Robots inspect and maintain equipment on the platform, preventing emergency situations and ensuring the safety of personnel.

4. The Rosatom State Corporation has developed robotic systems for maintenance and repair of nuclear power plants. Robots perform equipment inspection and diagnostics, participate in the process of equipment dismantling and installation, and also ensure personnel safety [5].

Particular attention should be paid to such a project as “Robotic Maintenance of Solar Panels” by Ecoppia – Ecoppia has developed a robotic system for cleaning and maintaining solar panels (Figure 2). Robots automatically remove dirt and dust from the surface of the panels, which increases their efficiency and extends their service life [6].



Figure 2. Ecoppia H4 Robotic Solar PV Cell Cleaner

Robotic systems for maintenance and repair of power equipment represent a promising direction in the development of energy, which helps to increase the efficiency, safety and reliability of equipment operation. The implementation of such systems requires significant investment and technological preparation, but the potential advantages and prospects for the development of this area make them relevant and in demand on the market.

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UTILIZING RENEWABLE ENERGY FOR WATER DESALINATION

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Abstract. This article discusses key aspects of the issue regarding access to clean drinking water, various types of renewable energy sources, their advantages, disadvantages, and potential to meet the energy needs of modern society. The article explores methods of water desalination using renewable energy sources, assessing their effectiveness and prospects for development in this field.

Keywords: energy industry, water desalination, renewable energy, ecology, efficiency.

ИСПОЛЬЗОВАНИЕ ВОЗОБНОВЛЯЕМЫХ ИСТОЧНИКОВ ЭНЕРГИИ ДЛЯ ОПРЕСНЕНИЯ ВОДЫ

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Аннотация. В данной статье рассматриваются ключевые аспекты проблемы доступа к чистой питьевой воде, различные виды возобновляемых источников энергии, их преимущества, недостатки и потенциал для удовлетворения энергетических потребностей современного общества. В статье обсуждаются методы опреснения воды с использованием возобновляемых источников энергии, описываются их эффективность и перспективы развития в этой области.

Ключевые слова: энергетика, опреснение воды, возобновляемая энергия, экология, эффективность.

Currently, the issue of ensuring clean and accessible drinking water for all is becoming increasingly pressing. Despite the Earth being covered in water by 70 %, only a small portion of these resources is suitable for consumption. Many regions are facing acute shortages of clean water, while others deal with water body pollution, posing threats to human health and surrounding ecosystems. This problem is most

acute in the Middle East and North Africa due to rapid population growth. In such conditions, desalination of seawater becomes one of the key methods to address the freshwater deficit, especially considering the abundance of saline water in most countries in these regions.

The process of water desalination demands a significant amount of energy, often obtained through the use of fossil fuels. Estimates suggest that approximately 130 million tons of oil are needed annually to produce 13 million cubic meters per day of freshwater, leading to increased greenhouse gas emissions. Transitioning to renewable energy sources paves the way for more sustainable, environmentally friendly, and efficient methods of water desalination. These changes could reduce dependence on oil-based products and minimize the negative impact on the environment. Solving this problem is impossible without the development and implementation of cutting-edge technologies. One of the most promising approaches involves using renewable energy sources for water desalination. This not only ensures access to clean drinking water but also helps reduce the adverse environmental impact and decrease reliance on fossil fuels. The issue of access to clean drinking water remains relevant for many regions worldwide, but innovative technologies utilizing renewable energy sources could be the key to solving it.

Renewable energy refers to energy sources derived from natural processes that replenish themselves within a comparable period to a human lifetime. These sources include the Sun, wind, rivers, tides, biomass, and geothermal heat [1].

All forms of renewable energy, excluding energy obtained from large hydroelectric power stations, are considered alternative energy sources, but not all forms of alternative energy are classified as renewable energy. By definition, alternative energy is any energy source that is not as widely used as traditional sources, while renewable energy is derived from natural processes that replenish themselves. Let us break down each type.

Solar energy is the energy derived from the Sun’s radiation, which is converted into electrical energy by solar panels or into heat using solar collectors. It is used for generating electricity and heat in homes, commercial buildings, and industrial installations. It is also employed in small-scale systems like solar batteries for recharging devices. Solar energy is obtained through photovoltaic solar panels that convert the Sun’s radiation into electrical energy and solar thermal collectors that absorb heat to warm water or air [2]. Solar energy stands as one of the most accessible energy sources, increasingly becoming more competitive compared to traditional sources. Its cleanliness and infinite nature make it a key element in transitioning towards more sustainable energy.

Wind energy is energy derived from the movement of air (wind) using wind turbines. It is used to generate electricity in wind farms both at large and small scale. Wind turbines can also be installed on individual homes or other buildings. Wind energy is obtained through wind turbines that convert the kinetic energy from the rotation of blades into mechanical energy for the generator, which then produces electrical energy [3]. Wind energy is becoming a more significant energy source due

to its relative environmental friendliness and low operational costs. It helps diversify energy sources and reduces reliance on fossil fuels.

Hydropower is the energy derived from the flow or fall of water (hydropower resources) used for electricity generation [4]. It is applied in hydroelectric power stations on rivers or reservoirs to generate electricity. Hydropower is obtained through turbines placed in the water flow or using falling water to rotate generators and produce electrical energy. Hydropower stands as one of the oldest and widely used sources of renewable energy. It ensures stable electricity generation and contributes to reducing greenhouse gas emissions.

Geothermal energy originates from the heat accumulated within the Earth. It can be utilized for electricity production, heating purposes, generating steam, and powering turbines for electricity generation. Typically, three main technologies are employed for harnessing geothermal energy [5]:

1. Steam and hot water systems: Heat from geysers or hot springs is utilized to heat water and create steam, which is then used to drive turbines and generate electricity.

2. Deep drilling systems: Deep wells are drilled to extract hot water or steam for energy generation.

3. Heat pumps: This technology uses heat from shallow or surface-level geothermal sources to heat buildings and generate electricity.

Among the array of renewable energy sources, geothermal energy stands out for its reliability and continuous energy production, drawing global attention. However, its primary limiting factor is its dependency on local geology.

In addition to environmentally friendly renewable energy sources, industrial waste can also be converted into thermal energy. Biomass, solid, or liquid waste can be used to generate chemical energy through combustion, producing thermal energy applicable in desalination and phase transformations.

Each of these renewable energy sources has unique advantages and suitability for different conditions and needs. Their further development and integration can play a crucial role in establishing a sustainable and efficient energy supply system.

Among the primary renewable energy sources utilized in the water desalination process are wind, thermal, solar, and geothermal energies. The visualization illustrates potential methods for integrating these sources into various water desalination technologies (Figure 1).

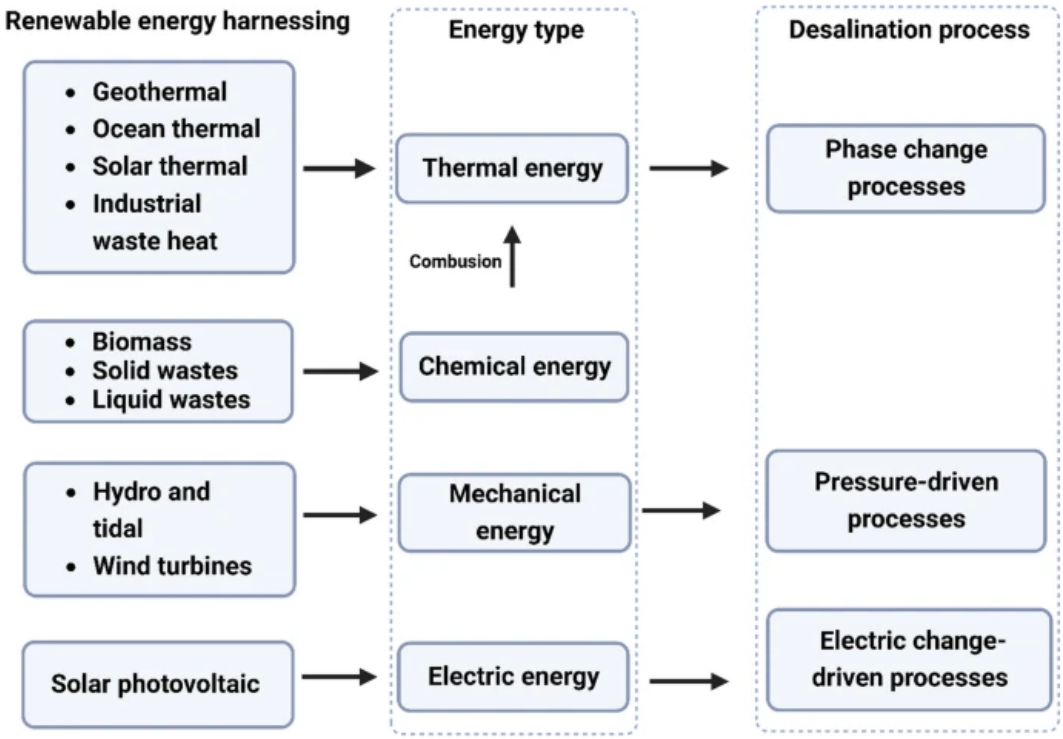


Figure 1. Possible integration of renewable energy sources in various desalination technologies

Global attention has been drawn to geothermal energy due to its reliability and continuous energy production. This method has the potential to reduce water production costs by up to 59 % and decrease energy consumption by up to 95 % [6]. However, its main limitation is its dependency on local geological conditions.

Various applications of wind energy in water desalination, such as using wind energy in electrodialysis, mechanical steam compression, and reverse osmosis methods, along with widespread use of solar stills and concentrated solar power in utilizing solar thermal energy, offer opportunities for generating the required electricity for water desalination based on geothermal and solar photovoltaic energy.

Research shows that hybrid renewable energy systems are the most efficient choice for water desalination, especially in areas abundant in sunlight. For instance, in the Arabian Gulf region, high productivity up to 9000 cubic meters per day is achieved through hybrid systems, combining solar and geothermal energy [7]. Integrating renewable energy sources into various seawater desalination processes presents diverse methods of energy application. Some sources, such as biomass, solid, or liquid waste, can harness chemical energy, converted into thermal energy through combustion. In the case of wind turbines, hydroelectric power, and tidal energy, mechanical energy serves as a source of electricity for pressure-based desalination processes. Finally, solar photovoltaic cells use electrical energy for charge-dependent processes in desalination to remove salt from water.

In comparison to a diesel system, a hybrid renewable energy configuration demonstrated a 60.7 % reduction in overall costs and an 81.5 % decrease in carbon dioxide emissions. The study revealed that a hybrid renewable energy system, combining photovoltaic and wind power supported by diesel generation, is the most

promising solution for ensuring a system considering both economic efficiency and environmental benefits (Figure 2). This allows for a 69 % reduction in water production costs and a 90 % decrease in negative environmental impact compared to similar setups utilizing fossil fuels [8].

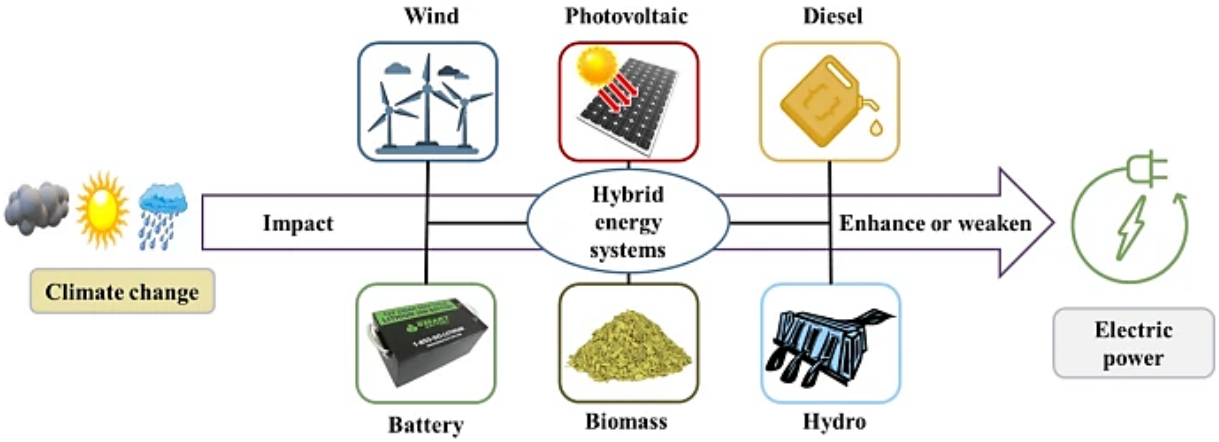


Figure 2. Hybrid renewable energy system with a diesel generator

For instance, to mitigate the impact of the water-energy complex on the coastal regions of India, an efficient desalination system powered by renewable energy was investigated. The best option proved to be a reverse osmosis setup operating on a hybrid system: renewable energy, encompassing photovoltaic and wind energy, with a diesel generator. Analysis of the techno-economic parameters and the environment indicated the lowest cost of water at $4.57 per cubic meter and carbon dioxide emissions at 2887 kilograms per year.

Utilizing renewable energy sources for water desalination represents a crucial step in addressing the global issue of access to clean water. This approach not only resolves the drinking water problem but also fosters sustainable development by reducing adverse effects on the environment. Technologies based on solar, wind, and hydro energy demonstrate potential in providing access to water resources where it was previously deemed impossible or excessively costly. These methods not only purify water but also do so with minimal negative impact on nature. However, continuous investment in research and development is necessary to enhance the efficiency of these technologies, reduce their costs, and extend accessibility to various societal groups and regions worldwide.

The path toward a sustainable future, where every individual has access to clean drinking water, lies in the innovative use of renewable energy sources for water desalination. Simultaneously, this represents a significant step in conserving natural resources and maintaining ecological balance on the planet.

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THE HARM OF ARTIFICIAL INTELLIGENCE FOR THE EDUCATION SYSTEM

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Abstract. Nowadays, the introduction of modern scientific achievements into the education system is becoming commonplace, but we should not forget about the negative consequences. This research paper discusses the principles of artificial intelligence (AI), neural networks, and the negative consequences of introducing AI into the education system.

Keywords: artificial intelligence, neural network, education, deep learning, program.

ВРЕД ИСКУССТВЕННОГО ИНТЕЛЛЕКТА ДЛЯ СИСТЕМЫ ОБРАЗОВАНИЯ

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Аннотация. В наше время внедрение современных достижений науки в систему образования становится обыденностью, но не стоит забывать о негативных последствиях. В данной статье рассматриваются принципы работы искусственного интеллекта (ИИ), нейронных сетей, а также отрицательные последствия внедрения ИИ в систему образования.

Ключевые слова: искусственный интеллект, нейронная сеть, образование, глубокое обучение, программа.

Ideas of creating machines with consciousness date back to ancient Greece. In the Middle Ages and Modern times scientists created mechanisms to replace human labor, for example, in the 17th century Blaise Pascal invented the first mechanical digital calculating machine, in the 19th century Joseph-Marie Jacquard created a programmable weaving machine with instructions on punch cards. In 1937, Alan Turing publicized his invention, the universal Turing machine (Figure 1), and in 1939, the first mechanical man Electro and his dog Sparco were unveiled in New York City [1].

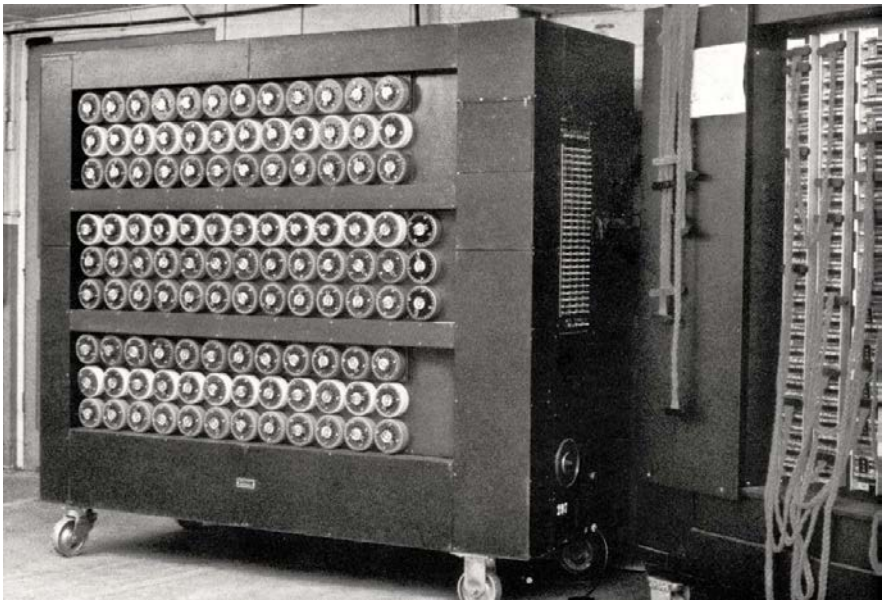


Figure 1. Turing machine [1]

However, the possibility of developing programs that perform complex intellectual tasks did not appear until the advent of modern computers after World War II. In the 1950s, scientists from various fields began to think about the possibility of creating an artificial brain. Then research in neuroscience showed that the brain is a neural network, and A. Turing suggested that any kind of computation could be represented digitally, and in 1951 the first SNARC neural network was created by graduate student Marvin Minsky. By 1950, A. Turing had developed a test to determine the level of similarity between a machine's actions and human consciousness, later called the Turing test. The name "artificial intelligence" was first used at the Dartmouth Conference in 1956, at the same time the scientific discipline "Artificial Intelligence Research" appeared [1].

Since the early 1960s, artificial intelligence has gone through an impressive development path. During this period, the focus shifted from symbolic information processing to statistical machine learning techniques. In the 1980s, expert systems became a popular trend, allowing programs to make decisions based on expert knowledge. The 1990s brought an explosion of computing power and access to large amounts of data, which was the catalyst for the development of deep learning techniques. Deep learning networks such as neural networks began to show impressive performance in pattern recognition, natural language processing, and other areas. In the 2000s, AI began to be applied in a wide range of fields, including medicine, finance, automotive, and even military technology. Interest in robotics and autonomous systems such as unmanned vehicles increased. The 2010s saw further improvements in deep learning, as well as the introduction of AI technologies into everyday life, such as voice assistants and personalized recommendations. These trends continue into the 2020s, where the development of more sophisticated AI systems and their integration into various industries is becoming increasingly significant [2].

Nowadays, many large companies and governments engaged in the development of artificial intelligence have made their developments publicly available, which has

led to a great popularization of AI in the masses. These products are used in many areas of human life, one of which is the education system [3].

Artificial intelligence in education is the application of artificial intelligence technologies to improve the educational process. All this can involve the use of machine learning algorithms, data analysis, process automation, and the creation of personalized educational platforms and tools. With the application of AI, it is possible to process huge amounts of data, analyze data, extract relevant information, and perform various tasks such as text creation, speech recognition, and more.

There are two types of artificial intelligence concepts:

– Weak, capable of the above highly specialized tasks;

– Strong, capable of self-learning, defining goals for itself and choosing the means to achieve them. The implication is that a strong AI should be at the human level in terms of cognitive abilities, and, taking into account technological and computational capabilities, even surpass it. Unfortunately, at this stage of the development of humanity, strong AI is only a concept.

Many AIs that have been created work on the principle of neural networks (Figure 2), which mimic the workings of the human brain. A neural network consists of artificial neurons connected to each other, and uses these connections to process information and learn from that data. Neural networks can be trained on large amounts of data to extract complex dependencies and make decisions based on the insights gained.

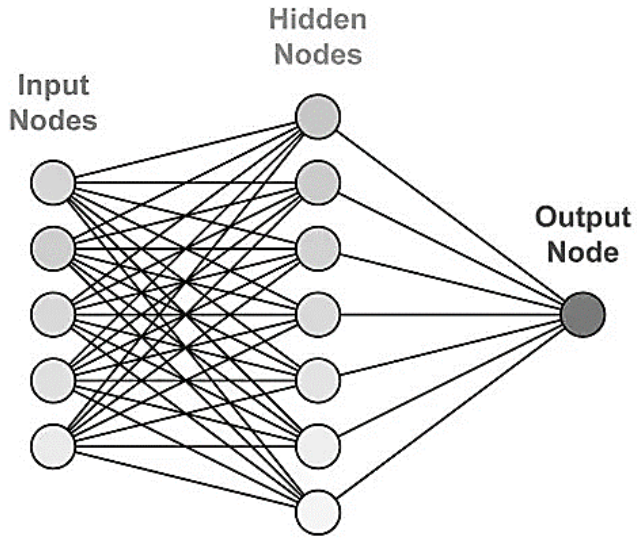


Figure 2. Visualization of neural network operation [4]

Within the neural network, various deep learning techniques such as gradient descent method and error back propagation method are used. These techniques allow the neural network to learn from the data and adjust its weights and parameters to achieve optimal performance.

The application of AI in education is seen as a promising and innovative approach that can significantly improve the education system, personalize the learning process and make it more effective.

The application of AI in education has a number of advantages such as:

– Accelerated learning through access to a large amount of information.

– Expanding opportunities for students with disabilities. AI can help students with disabilities or other limitations by giving them access to information and resources that might otherwise be inaccessible.

– Improving the management of educational processes. With the help of AI it is possible to organize a more efficient process of managing educational processes, monitoring the progress of students.

However, there are also a number of drawbacks to implementing AI.

Already in the near future many people may lose their jobs due to the introduction of AI, the education system will be no exception. AI and programs using it can replace real teachers and professors because of its cheapness and almost infinite workability, which can lead to unemployment [5].

From the above problem, the next disadvantage is the decrease in social engagement. In the long run, human interaction between students and teachers will decrease. When socialization decreases, there will certainly be problems with the psychological state of students, as well as the appearance of depression.

The next problem is the unfair use of AI products among learners. Some students mindlessly perform the tasks assigned to them, completely copying the information generated by artificial intelligence, which in turn undermines the effectiveness of learning, reducing the cognitive functions of students [6].

There is also the problem of bias in AI models. Algorithms can be tuned to certain patterns, which can lead to poor decisions and discrimination. For example, algorithms can be biased towards certain groups of people based on race, gender, age, and other factors. This can lead to inequities in the education system, as algorithms may favor certain groups of students, which can lead to skewed results and lower quality education.

At present, all the above problems are not of high importance due to the relatively low integration of AI algorithms in the education system, but we will inevitably encounter them in the near future. Legal regulation at the state level, as well as restriction of the use of software products within educational institutions may serve as solutions to the problems.

At the state level, laws need to be passed to regulate the field of AI in the education system. The following measures may serve as examples:

– Licensing of IT companies by the government, which may include testing algorithms for unbiasedness and objectivity;

– Passing laws that protect education workers;

– Adoption of a law on mandatory labeling of content generated by artificial intelligence [7].

Within educational institutions, it is necessary to:

– Implement programs that are detectors of AI-generated content;

– Provide educational activities for faculty members;

– Conduct socialization activities for students.

The above measures will help prevent the problems associated with the introduction of AI into the education system.

Artificial intelligence is playing on an increasingly important role in education. The latest algorithms perform more and more complex and demanding tasks to make the educational process more efficient. However, like any technology, AI is not without its shortcomings and these need to be addressed at this stage of technology development.

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SAINT PETERSBURG AND ITS SMELLS: A WALKING ROUTE THROUGH THE PRISM OF SPECIFIC SCENTS

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Abstract. The paper is devoted to the sense of smell as one of the complex processes in the human body. The set of smells in the environment forms the smellscape of the city. The study examines which smells make up a holistic and unique image of the city. Two associative experiments were conducted among young people. As a result, a tourist route of the St. Petersburg smells has been developed.

Keywords: smell, smellscape, olfactory culture, association, composition of scents, sense of smell, Saint Petersburg.

САНКТ-ПЕТЕРБУРГ И ЗАПАХИ: ТУРИСТИЧЕСКИЙ МАРШРУТ ХАРАКТЕРНЫХ ЗАПАХОВ

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Аннотация. В работе рассматривается обоняние как один из сложных процессов в организме человека. Вся совокупность запахов, которую мы ощущаем в окружающей среде, формирует запаховый ландшафт города. С его помощью можно изучить, какие запахи составляют целостный и уникальный образ города. Было проведено два ассоциативных исследования, нацеленных на выявление характерных городских запахов, среди молодой категории людей. В результате анализа был разработан туристический маршрут запахов Санкт-Петербурга.

Ключевые слова: запах, запаховый ландшафт, ольфакторная культура, ассоциация, композиция запахов, обоняние, Санкт-Петербург.

The olfactory sense is a physical sensation of differentiation between the multitude of odours which regulates person’s inner experiences. Depending on certain external factors, the sense of smell causes both negative and positive psychological states. Not any person realizes that smells affect our thoughts and emotions. Aromas

can give peace of mind or add relaxation as well as positive attitude to everything you do. The smell identification awakens memories more than any other sensation ever. And it is quite natural.

Olfactory neurons are known to generate an impulse when they detect a scent. The olfactory nerve transmits an impulse to a part of the brain called the olfactory bulb. The signal then is processed and transmitted to the corresponding areas of the brain [1]. This is called the limbic system, which plays a predominant role in controlling person's cognitive abilities, mood, behavior and emotions.

Human memories are also stored in the part of the brain that processes scents, so they have an impact on human memory. "Nothing awakens memories like smell" [2]. It is known that "memory reproduces everything except smells, and nothing so completely recovers the past as the smell once associated with it" [3].

Rachel Sarah Hertz, a cognitive neuroscientist, being the author of the book "The Scent of Desire: Discovering Our Enigmatic Sense of Smell", dives deeper into the question of smell impact. After numerous experiments Dr. Rachel Hertz arrived at the conclusion that "odours do affect people's mood, work performance and behavior in a variety of ways but it is not because odours work on us like a drug, instead we work on them through our experiences with them. In order for an odour to elicit any sort of response in you, you have to first learn to associate it with some event. This explanation for how odours affect us is based on what is known as associative learning, the process by which one event or item comes to be linked to another because of an individual's past experiences. The linked event is then able to elicit a conditioned response to the original situation" [4].

However, smells not only reflect immediate olfactory sensations and everyday reality, but they are also responsible for a number of associations resulted and certain emotional images in a person's mind. There is a fact that odour preferences are cultivated through personal experience, cultural learning and emotional associations. To confirm this hypothesis, an associative study was conducted among first-year students of Herzen University. Respondents were offered 3 questions to ask: 1) What does the city of Saint Petersburg smell like? 2)What associations, images or emotions does these smells evoke? 3)Which smells are pleasant and which are not?

The results obtained during the survey could be interpreted in two ways. Most often, bakery and pastry evoke associations with a new day, tenderness, coziness and family circle. In addition, the smell of chocolate brings us back to the bright time of childhood. Most people associate it with winter evenings and New Year's Eve. The flavoursome waft of freshly roasted coffee is identified with warmth, happiness and energy boost. The alluring smell of shawarma on the streets of the city reminds of student life. More than half of people associate the strong odor of alcohol with the upcoming holidays or weekends and a cheerful company of friends. These were examples of food flavours.

Aside from attractive odours, there is also a variety of stench ones. For instance, many people find the smell of fish putrid and reeking, that is why they try to avoid it.

Nature smells like floral, woody or earthy ones were described as refreshing, crisp and stress relieving. The plethora of colorful nature scents lifts people's spirits and gives a sense of renewal. For some people, the smell of blossomed trees and spring water is connected with the image of summer, grandparents and fishing. The specific smell of the rain called petrichor is frequently associated with a pleasant feeling of freshness and new breath.

A range of urban odours brings out mixed emotions. The smell of the underground for many respondents seems artificial and suffocating, but there are people who associate it with sweet childhood memories of railway trips. The loathsome scent of cigarettes forms an association of disgust mostly. The choking smell of rubber and exhaust fumes is no exception. All the participants found those pungent industrial odors repulsive, which cause a desire to hide and run away as soon as possible. They have a negative effect on the human body.

When studying the smell issues, its specific and particular features, the term olfactory culture should be used. This term relates to the idea of personal education, which is characterized by "the level of development of abilities to comprehend, interpret and enrich the environment through smells, the degree of perception and use of them as a way of self-knowledge and world cognition" [5].

Each odor contributes to a complex landscape, unique for each city. The connection of scents with a certain space has been called the smellscape. The term was introduced by geographer John-Douglas Porteous in the 1980s, who assumed that the smellscape is closely related to the picture of space – olfactory and visual effects complement each other [6]. Currently, the definition of the smellscape is not just a relatively static phenomenon, but a human experience that includes the process of perception and the properties of the environment [7]. It is worth noting that the smellscape is formed mainly by people themselves since their actions are the source of scents variety.

Dr. Kate McLean, a researcher of smells, mentions peculiar scents of places on the Sensory maps platform: "Urban odours are largely generated as a result of human activity and so smells reveal the cultural practices, industries, commerce, culinary offerings and municipal services of our cities. My individually designed smell maps reveal these; shisha (Singapore), brewery malt fumes (Edinburgh), herring carts and fresh fish (Amsterdam), roti part and curry (Singapore), and newly-cut grass (Edinburgh). These smells are ephemeral, tied to the laws and practices of changing populations" [8].

Kate McLean works with human detected scents in the field of cartography and transmission of "invisible to the eye" data. Dr. Kate McLean has created a series of maps showing the "smellscapes" of various cities. It has been made possible by arranging international tourist routes and struggling to describe all the scents detected, and then, transfering the data obtained through digital design, watercolors, animation, olfaction and sculpture into scent landscape maps [9, 10].

Oksana Chernyshova, the President of the Perfumers Guild of Russia, is sure that the city should have its own and unique smell and knows the ingredients included.

O. Chernyshova even invented “creative pseudonyms” for each ingredient. For instance, to come up with the idea of what the city of St. Petersburg smells like, you need to mix the following ingredients: “evening Nevsky prospect”, chilling wind, wet foliage, cloudburst, night fog, floral fragrance and cold air [11, 12].

Thus, to get a vivid impression of a city you will have to use not only vision, hearing, taste, or touch, but smell. The latter, fixes the image of the city and intensifies emotions.

St. Petersburg has a huge historical and cultural heritage, as well as a magical atmosphere. It is a city of remarkable architecture, romance and inspiration, drawbridges and white nights. Thinking of the word *St. Petersburg* people not only draw a picture in their mind, but also feel the odors of certain objects.

In order to find out what smells make up the complete image of the city of St. Petersburg, we run the survey among first-year students of Herzen University. The only one question was asked: What does St. Petersburg smell of?

The results of the survey showed that respondents re-create the image of St. Petersburg with a combination of smells of wet asphalt and freshly baked Russian traditional doughnut; a pedestrian underpass; fruit, vegetables and greenery sold near the underground; rivers, canals and damp courtyards along with the smell of blossomed trees, gardens, sunny squares, and central streets of the city. Overall, one can say that participants provided us with three groups of smells connected with the image of St. Petersburg. These are food, nature, and urban odors.

Based on the results obtained, a walking route of St. Petersburg smells was created. It became possible by combining the variety of collected smells and matching them with particular images. We believe that such a route will add up to the complete image of the Northern Capital and its identity. The idea might be of interest for St. Petersburgers together with curious tourists.

The walking route extends from the Admiralty Embankment to the Mikhailovsky Garden. One can explore a great variety of smells.

Start from the Neva River and feel the smell of its water, staying on the Palace Bridge. After, walk along the Admiralty Embankment and the Bronze Horseman monument located on Senate Square. Next to it, there is the Alexander Garden, walk around its alleys and smell charming lilac, rowan, oak, and viburnum aromas as well as many floral scents. Leaving the garden, we find ourselves near St. Isaac’s Cathedral, around which there are carriages with horses, allowing us to plunge into ancient Petersburg. Moving towards Nevsky Prospekt, walk along Malaya Morskaya Street, which is full of mouth-watering aromas of restaurants (Schastye Bar-Restaurant; Kazan-Mangal; Khachapuri Tetushki Mariko), fast food chains (Burger King) and cafes with scrumptious smell of coffee, chocolate and fresh pastries (Factory store named after Krupskaya; Bushe; Coffit; British Bakery; Baggins Coffee). Turn right to Nevsky Prospekt and experience the “old house smell” of traditional Saint Petersburg buildings. There are also a lot of delectable flavors of delicious treats, for example, Opetit coffee shop, Shokoladnisa cafe, Bulochnaya № 60. Keep going along Nevsky Prospekt untill you get to the Moika River, stay on the Green Bridge and you can detect

fishy and sewage smells of water. Cross the bridge and enjoy the flavor of the traditional Russian doughnuts and the view of the Stroganov Palace. Move further along Nevsky Prospekt and keep experiencing food scents. Opposite one of the most famous sights of St. Petersburg, the Kazan Cathedral, there is the House of the Zinger company. Pass by this aesthetically pleasing building and get a whiff of just published postcards and books. Cross the Griboyedov Canal and on the corner of Nevsky Prospekt feel half good half bad smell of metro station which is similar all over the world. Walk along the embankment of the Griboyedov Canal, meet sushi bar Eurasia and pizzeria Italica. Go straight and be fascinated by the Church of the Savior on Spilled Blood, turn right to find way into the Mikhailovsky Garden with picturesque views and ponds. The garden has sweet floral smell of blooming lilacs, lime trees, cherry trees, oaks, willow and larch. All these trees and flowers are coalesced in a single bouquet of scents. It's possible to start this walk from the other end of the path, if you preferred.

Still, it's worth noting that this walking route will be relevant in spring or summer, when everything around begins to bloom and smell.

Working on the topic, we came to the conclusion that the sense of smell is a complex process of the human body. Different scents act simultaneously on the psychological and physiological state of a person. They influence people's emotions and perception of the world, their views.

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MECHANISMS OF PSYCHOLOGICAL PROTECTION IN ADOLESENCE

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Abstract. This work is devoted to the study of the mechanisms of psychological protection in adolescents. The paper examines the concept of psychological protection, its role and significance in the life of adolescence. The main purpose of the study is to identify the main mechanisms of psychological protection that are used by adolescents to cope with difficulties and stressful situations.

Keywords: adolescents, psychological protection, mechanisms, stress, personality development.

МЕХАНИЗМЫ ПСИХОЛОГИЧЕСКОЙ ЗАЩИТЫ В ПОДРОСТКОВОМ ВОЗРАСТЕ

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Аннотация. Данная работа посвящена изучению механизмов психологической защиты у подростков. В статье рассматривается понятие психологической защиты, ее роль и значение в подростковом возрасте. Основной целью исследования является выявление основных механизмов психологической защиты, которые используются подростками для преодоления трудностей и стрессовых ситуаций.

Ключевые слова: подростки, психологическая защита, механизмы, стресс, развитие личности.

There are different external of internal factors which negatively affect the human psyche. With the help of psychological defense mechanisms, a person is always protected from stress. It is like an airbag in a car, it opens in a collision and prevents a person from injury or death. So psychological defenses, are triggered at the moment when a person is faced with internal or external conflicts.

The relevance of this issue is expressed in the fact that understanding the functioning of psychological defense mechanisms contributes to the subsequent

correction of human behavior in a stressful situation, that is, increasing stress resistance.

Psychological protection is a system of mechanisms aimed at minimizing negative experiences associated with conflicts that endanger the integrity of the individual.

The term “psychological defense” was first introduced by Sigmund Freud in 1894, in the work “The Neuro-Psychoses of Defence” and was used in a number of his subsequent works to describe the struggle of the “I” against painful or unbearable thoughts and affects. Freud meant by this first of all “repression”, but later – in 1926 – in the appendix to the work “Inhibitions, Symptoms and Anxiety”, he argues that the concept of “defense mechanism” refers to all the techniques that the “I” uses in conflict and which can lead to neurosis.

Later, this term was developed in more detail by other psychoanalysts such as L. I. Antsyferova, O. A. Samylova and, Anna Freud.

At the moment this concept is used actively by psychotherapists regardless of the area of psychology and a certain set of defense mechanisms were discovered and described.

1. Repression

Z. Freud considered this mechanism as the main way to protect the infantile “I”, unable to resist temptation. Repression is a defense mechanism by means of which unacceptable impulses of desire, thoughts, feelings that cause anxiety are “expelled from consciousness” and transferred to the sphere of the unconscious. At the same time, they influence the behavior of the individual, manifesting in the form of anxiety, fear, and the like.

2. Substitution

This is a common form of psychological defense, which is sometimes called “displacement”. It is associated with the transfer of an action from an inaccessible object to an accessible one. Those feelings that should have been directed at the disturbing object are transferred to another more accessible and not dangerous. For example, aggression towards superiors sometimes takes out on family members of the employee. There is another type of substitution, when one feeling is replaced by the opposite. In TV reports about football matches, we often see how an attacker who did not hit the goal sends a bounced ball with a strong blow, and in any direction. Thus, the accumulated energy is discharged.

3. Identification

This is a defense mechanism in which a person identifies with someone else. In the process of identification, one person unconsciously becomes like another. Identification leads to imitation of the actions and experiences of another person.

Identification also has a positive aspect: with its help, an individual learns social experience, acquires new properties and qualities for him. In the practice of parenting, it has been noticed that in the family the son identifies himself with the father, and the daughter with the mother. In labor relations, a young specialist finds an example for himself, a role model, on whom he can orient himself, striving to master professional skills.

4. Denial

This is the process of eliminating, ignoring negative, alarming circumstances. As a rule, the action of this mechanism manifests itself in the denial of those aspects of external reality that, being obvious to others, are not accepted, are not recognized by the personality itself. This mechanism is known as the “ostrich position”. The first reaction of a patient who learns from a doctor about a serious illness will be: “I don’t believe it, it can’t be!”. In the case of the action of this protective reaction of the psyche, when any negative information occurs in a person’s perception zone, he unconsciously denies its existence.

5. Projection

When projecting, a person attributes his own undesirable traits to others, and in this way protects himself from realizing these same traits in himself. A miser, as a rule, sees greed in other people first of all, and an aggressive personality considers everyone around to be cruel. Sometimes there is another kind of projection in which positive thoughts or actions that can elevate are attributed to significant persons.

6. Rationalization

This defense mechanism serves to protect the individual from being consciously aware of their true motives for their actions, thoughts, and feelings, in order to maintain a sense of inner peace and to uphold a positive self-image. Often this mechanism is used by a person to prevent the experience of guilt or shame. This defense mechanism is known as rationalization, where a person tries to justify their actions or feelings by providing logical and acceptable reasons for them, in order to avoid facing the true underlying motives. This helps them maintain a positive self-image and inner peace. Such attempts can be perceived as an excuse to others or to oneself.

7. Regression

During regression, in order to avoid neurotic conflict, a person unconsciously returns to that period of the past, to early, childish types of behavior that were successful at that stage. That is, regression is the return of a person from higher forms of behavior to lower ones. Thus, an adult in difficult situations tends to avoid internal anxiety, loss of self-esteem. Regression is often assessed as a negative personality mechanism (for example, infantilism). In psychology infantilism is known as a feature of the mental makeup of a person. This defense mechanism, known as rationalization, involves justifying one’s actions or feelings with logical reasons in order to avoid confronting the true underlying motives. This helps individuals maintain a positive self-image and inner peace. It can also involve traits characteristic of an earlier age, such as instability, immature judgments, capriciousness, subordination, and lack of independence.

8. Reactive formations

In the case of this defensive reaction, a person unconsciously translates the transformation of one mental state into another (for example, hatred into love, and vice versa). This mechanism is very interesting, because it indicates that a person’s real actions are not important, because they can only be the result of a veiled distortion of his true desires. For example, excessive anger in other cases is only an unconscious attempt to disguise interest and good nature, and ostentatious hatred is the result of

love, which frightened a person who unconsciously decided to hide it behind an attempt to openly splash out negativity.

Psychological defense mechanisms are used for adequate self-assessment of the individual, but they are needed not only by professional psychotherapists. Almost all people use them unconsciously. Knowledge of the mechanisms of psychological protection helps to work with your consciousness, understand the behavior and consciousness of other people, as well as try to correct your actions and deeds.

The concept of gender plays a significant role in shaping social ideas and psychological characteristics related to masculinity and femininity. This can influence individuals' behavior and self-perception, leading to the use of defense mechanisms.

Gender is a social status, a psychological concept that characterizes social ideas about a man and a woman, about their psychological characteristics.

The socio-psychological essence of phenomena in human behavior related to gender is emphasized by the concept of gender.

Psychologically, being a man or a woman means having specific personal and behavioral characteristics that correspond to a given gender.

Gender is characterized by its essential features [1, 2]:

– Social characteristics of a person, formed in the process of development in accordance with gender.

– Socio-psychological relations – communication, interaction with other people.

– A set of personality conventions that reflect stereotypes, typical traits for men and women, roles.

– Socio-psychological construct, that is, the essence, the mechanism.

– Socio-psychological characteristics of a person based on biological sex.

– Socialization of personality depending on culture.

– Hierarchy of social relations between a man and a woman, inequality of opportunities.

– Awareness acceptance of one's own gender-conscious acceptance of gender-conscious meaning of gender.

Adolescence is an important stage of human maturation and development, lying between childhood and adulthood, it is a phase of transition from dependent childhood to an independent and responsible life, the completion of physical, in particular puberty, and the achievement of social maturity. The boundaries of youth are blurred: from about 15-16 years old to 18-21 years old. During this period, intellectual development provokes a rapid growth of consciousness and self-awareness, which leads to an expansion of the sphere of awareness and deepening of knowledge about oneself, people and the world around us. The consequence of this is the discovery of the inner world, as well as a change in the motivation of the main types of activities: that is, activities that previously played a leading role, for example, play, begin to fade into the background, new types of activities arise, their hierarchy changes, a new stage of mental development begins. The growth of self-awareness determines the growth of the demands of young people to others and to themselves, an increase in their degree of criticism and self-criticism, an increase in the requirements for the moral appearance and moral qualities of their microenvironment. As a result, boys and girls often have a feeling of loneliness. Against this background, there is a pronounced gender-role

differentiation, i.e. the development of forms of male and female behavior in boys and girls, which indicates the rapid assimilation of sexual social stereotypes of behavior by boys and girls. In communication, boys and girls develop communicative abilities – the ability to make contact with strangers, to achieve their location and mutual understanding, to achieve their goals. In the process of educational activity, there is an active formation of those practical skills and abilities that may be needed in the future to improve professional abilities. In the course of self-determination, attempts to understand the world around them and themselves, young people search for the meaning of life in general and their lives in particular. As a result, they form not only beliefs and views, but also a worldview – a view of the world as a whole, a system of beliefs expressing a person's attitude to the world and his main value orientations. In adolescence, the cognitive and personal prerequisites of a worldview mature. And how well this process proceeds depends on how well the worldview will correctly and deeply reflect the objective world, whether it will be true or false, scientific or religious, materialistic or idealistic, progressive or reactionary, optimistic or pessimistic, to what extent a person will be able to determine his social orientation. A high level of self-awareness encourages boys and girls to systematize and generalize their knowledge about themselves, which in turn leads to self-determination through self-education. The latter goes through a number of psychological obstacles peculiar to this age period: the desire to show strong-willed efforts in self-education and at the same time, not always a positive attitude towards specific self-education techniques recommended by adults; sensitivity, receptivity to the moral assessment of one's personality by the team and the desire to show indifference to this assessment, to act in their own way; striving for the ideal and integrity in big, responsible matters and unscrupulousness in small, insignificant things; the desire to form fortitude, self-control and at the same time the manifestation by high school students of childish spontaneity, impulsivity in speech behavior, a tendency to exaggerate personal grief, minor trouble [3, 4].

To diagnose various mechanisms of psychological defense, an experiment was performed.

It was conducted on the basis of Herzen University among first-year students aged 17-19, according to the methodology of the questionnaire of the Cheat Kallerman Conte, the method of the Lifestyle Index.

According to the results obtained, all types of psychological protection are present in adolescence, but the degree of severity is not the same.

Table 1 – Mechanisms of Psychological Protection (male students)

Mechanisms of psychological protection	*Percentages, %*
Displacement	22,1
Substitution	7,7
Identification	0
Denial	7,7
Projection	23,1
Rationalization	30,8
Regression	0
Reactive education	7,7

Among young men, protective mechanisms of inner orientation prevail, such as: displacement, rationalization. Is due to the fact that in our culture boys are taught from early childhood not to show their feelings, so young men learn to hide them and not show others (Table 1).

Over time, repression, as a type of protection that allows you to turn off unacceptable feelings and impulses from consciousness becomes one of the main types of protection. Boys use rationalization more intensively than girls as a mechanism of psychological defense. They are more likely than girls to build convincing (primarily for themselves) arguments to justify their own behavior, tend to use only that part of the information that represents their behavior as well controlled.

Table 2 – Mechanisms of Psychological Protection (female students)

Mechanisms of psychological protection	*Percentage, %*
Displacement	7,1
Substitution	7,1
Identification	7,1
Denial	7,4
Projection	21,4
Rationalization	7,1
Regression	28,6
Reactive education	14,3

Among girls, on the contrary, mechanisms of external orientation prevail (reactive education, regression), as it can be seen from Table 2.

Girls are more likely to use external protection mechanisms as in our culture, in the process of educating girls, it is explained that they should express socially approved feelings and emotions. Over time, girls learn to hide the condemned impulses and feelings, replacing them with the opposite ones. It is possible that girls often hide from themselves the motives of their own behavior than from others.

From all of the above, the following conclusions can be drawn: among boys the mechanisms of internal orientation (displacement, rationalization) prevail, and girls, on the contrary, prefer the mechanisms of external orientation (reactive education, regression). The active use of any protection mechanism affects the behavior of representatives of this age, however, the activation of mechanisms mainly occurs due to problems with adults or peers, as well as from upbringing and culture.

The analysis of protection mechanisms in adolescents allows us to draw important conclusions about their internal and external adaptation strategies to stressful situations. However, for a more complete understanding and effective support of adolescents, it is necessary to pay attention to the specific recommendations provided below.

The following recommendations may be useful in case of an attempt to correct behavior:

1. Regular physical exercise: Physical activity helps reduce stress, improves mood and promotes overall well-being.

2. Healthy nutrition: Proper nutrition, rich in fruits, vegetables, cereals and proteins, can positively affect the mood and emotional state of adolescents.

3. Regular sleep: Sufficient and high-quality sleep is necessary to restore energy and maintain the normal functioning of the brain.

4.Social support: Teenagers should strive to maintain high-quality relationships with friends and family, communicate with people who understand and support them.

5. Stress management: Teenagers should learn how to effectively manage stress using methods such as deep breathing, meditation, yoga or other relaxation techniques.

6. Limitation of time spent on the Internet and social networks: Too much time spent on the Internet can lead to isolation, lack of physical activity and deterioration of mental state.

7. Finding hobbies: Teenagers should find time for activities that bring them pleasure and help them relax, such as reading, drawing, playing a musical instrument or playing sports.

8. Seeking professional help: If a teenager is experiencing serious mental health problems, it is recommended to seek help from a psychologist or psychiatrist.

We hope that these recommendations will help to correct the behavior of the future adults.

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COMPARATIVE ANALYSIS OF THERMAL INSULATION MATERIALS FOR HEAT NETWORKS

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Abstract. This article is a comparative analysis of thermal insulation materials used in the construction of thermal pipelines. The article presents the results of the analysis, which allow to draw conclusions about the advantages and disadvantages of each type of thermal insulation material.

Keywords: heat power engineering, pipeline, mineral wool, polyurethane foam insulation, polymer mineral foam insulation.

СРАВНИТЕЛЬНЫЙ АНАЛИЗ ТЕПЛОИЗОЛЯЦИОННЫХ МАТЕРИАЛОВ ТЕПЛОВЫХ ТРАСС

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Аннотация. В статье приводится сравнительный анализ теплоизоляционных материалов, используемых в сфере строительства тепловых трубопроводов. Представлены также результаты анализа, которые позволяют сделать выводы о преимуществах и недостатках различных типов теплоизоляционного материала.

Ключевые слова: теплоэнергетика, трубопровод, минеральная вата, пенополиуретановая изоляция, пенополимерминеральная изоляция.

Climatic conditions of Russia impose special requirements on thermal insulation of heat pipelines. Reduction of heat loss during heat carrier transportation is the main means of fuel saving. These requirements apply not only to the use of efficient structural elements in construction, but also to the use of high-tech thermal insulation materials.

The main property of all thermal insulation materials is to reduce or eliminate heat losses during the movement of the heat carrier, to deliver heat of a given temperature to the consumer, as well as to protect pipes and equipment from high surface temperatures. First of all, the main technological requirement of heat network

insulation is to protect the structure from moisture penetration, mechanical damage to pipes and equipment. Thermal insulation should have some special characteristic properties. The main property of the material from which thermal insulation structures are made is low thermal conductivity.

Materials are categorized into three main groups:

– Group1 with thermal conductivity index up to 0.06 W/(m*^{0}C) – low thermal conductivity taking into account the average temperature of the insulation material 25 ^{0}C; and at 125 ^{0}C it is not more than 0.08 W/(m*^{0}C);

– Group 2 with average thermal conductivity from 0°.06 to 0.115 W/(m*^{0}C) at 25 ^{0}C and from 0.08 to 0.14 W/(m*^{0}C) at 125 ^{0}C;

– Group 3 with increased thermal conductivity from 0.115 to 0.175 W/(m*^{0}C) at 25 ^{0}C and from 0.14 to 0.21 W/(m*^{0}C) at 125 ^{0}C.

Water absorption and hydrophobicity are also very important properties of thermal insulation. When the thermal insulation is moistened, water pushes air out of the pores of the insulation, which increases the thermal conductivity index and leads to direct contact of the heat pipe surface with water. Corrosion can occur not only when exposed to water, but also when exposed to oxygen and carbon dioxide.

Thermal insulation structure should also be resistant to sudden, unregulated changes in temperature schedule, high temperatures (up to 200 ^{0}C) without losing its original physical properties and structure. Materials made for the thermal insulation layer should be environmentally friendly, which indicates the absence of harmful effects during decomposition, the absence of sulfur compounds in their composition. The next equally important property is air permeability. In this case, the material must meet the requirements of high tightness, in the absence of direct contact with moist air. Thermal insulation should be durable, not affected by living organisms, and resistant without changing its original properties.

Various types of thermal insulation are used for main heat pipelines. They should have all the above properties, including such properties as fire safety, mechanical strength, frost resistance [1]. Let us consider the main materials used in thermal insulation.

1. Mineral wool insulation

Mineral wool insulation has a number of advantages and disadvantages like any other type of thermal insulation. The majority of heat networks, including their current state, are insulated with mineral wool material [2]. The external view is shown in Figure 1.

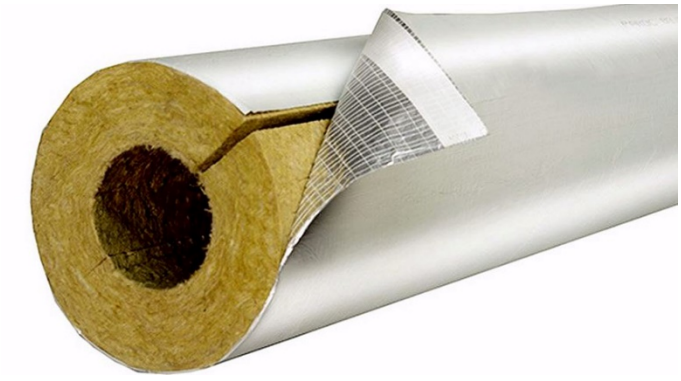


Figure 1. Mineral-wool pipe insulation

Table 1 summarizes the advantages and disadvantages of mineral wool insulation.

Table 1 – Advantages and disadvantages of mineral wool thermal insulation

Advantages	*Disadvantages*
1. Resistance to ultraviolet radiation	1. Reduced moisture resistance (low moisture barrier)
2. High fire safety	2. High heat losses during heat carrier transportation.
3. Installation does not require qualified personnel	3. No possibility of use for ductless laying.
4. When laid externally, easy recovery in case of emergencies.	4. High capital investment during construction and installation works and increased duration of the related works due to installation of the associated ducts.
5. Environmentally friendly	5. Low corrosion resistance.
	6. Lack of remote control of thermal insulation moistening.
	7. Low vandal resistance.

Thus, mineral wool is used in basement installation due to control of its safety, fire safety, in rooms with reduced humidity [3].

2. Polyurethane foam insulation

Since the 1990s of the last century, completely new technologies for thermal insulation using polyurethane foam have appeared in Russia. Pre-insulated pipes in polyurethane foam (PU) insulation were actively introduced into the sphere of new construction of thermal routes [4].

Polyurethane is a material produced by the reaction between liquid isocyanates and polyols. It is a polymer, rigid material, which provides excellent thermal insulation properties, maximum water absorption of 1-2 %, high adhesion of surfaces with other materials, heat resistance.

The insulation of the pipes themselves is produced in factory conditions, and the insulation is applied directly on the construction site at the welding site of the pipeline ends and after all tests have been carried out [5]. The external view is shown in Figure 2.



Figure 2. Polyurethane foam insulated pipe

Table 2 summarizes the advantages and disadvantages of pre-insulated FPU pipelines.

Table 2 – Advantages and disadvantages of pre-insulated FPU pipelines

№	*Advantages*	*Disadvantages*
1	Low thermal conductivity coefficient: 0.027 W/m*K	Pouring of joints requires qualified personnel and the use of special equipment, as well as an initial check of the tightness of the joints before installing the couplings
2	The range of temperatures at which FPU can be used is quite large: from -80 ^{0}C to 130 ^{0}C	The need to control the condition of the structure during transportation and laying of heat pipes, as the slightest spalling will weaken the strength and thermal characteristics of the insulation
3	Durability (25 to 30 years of service)	Special preparation of the pipe-laying site
4	Processability, thanks to the high level of quality provided by the manufacturing plant	Low fire resistance (material is fire hazardous)
5	Corrosion resistance influences	Weak resistance to mechanical effects (compressive strength is 0.3-0.4 MPa)
6	Chemical resistance (resistance to acids, alkalis, mold, rot)	The need for a high level of depreciation of manufacturing plants due to the use of complex specialized equipment and highly qualified personnel
7	Low water absorption (1-2 %)	High capital investments for organizing and setting up production of steel pipes in FPU insulation
8	No additional work during pipeline operation, thanks to the	Low temperature resistance, short-term increase in the temperature of the heat carrier

	ODK system, which allows to determine the degree of wetting of pipes during underground laying.	up to 150 degrees is allowed. But the use of FPU as insulation in the temperature schedule 150/70 ^{0}C and above is strictly prohibited without a special layer (thin polymer concrete), which is applied to the outer wall of the pipeline – steel pipe in combined FPU insulation.
9	The possibility of using FPU for underground laying at a depth from 0.5 (0.7 m) to the design depth (not more than 3 m), depending on its initial strength characteristics.	When moistened, the thermal insulation structures quickly lose their strength properties and aggressively attack the pipeline walls
10	Depending on the region there is a possibility to vary the thickness of the structure, which is determined by a thermal and hydraulic calculation.	It is necessary to urgently replace the moistened section of the heating network, which is not economically viable, since such a structure cannot be repaired
11	Trenchless laying (possibility to save on excavation works)	Requires high capital investments: 1.2 (1.8) times more expensive than mineral wool insulation

3. Polymer-mineral foam insulation

Another modern type of thermal insulation is polymer-mineral foam (PMF) insulation. The table shows the main advantages and disadvantages of this type of insulation construction. They are quite close to the properties of FPU insulation, but they also have special features [6]. The external view is shown in Figure 3.

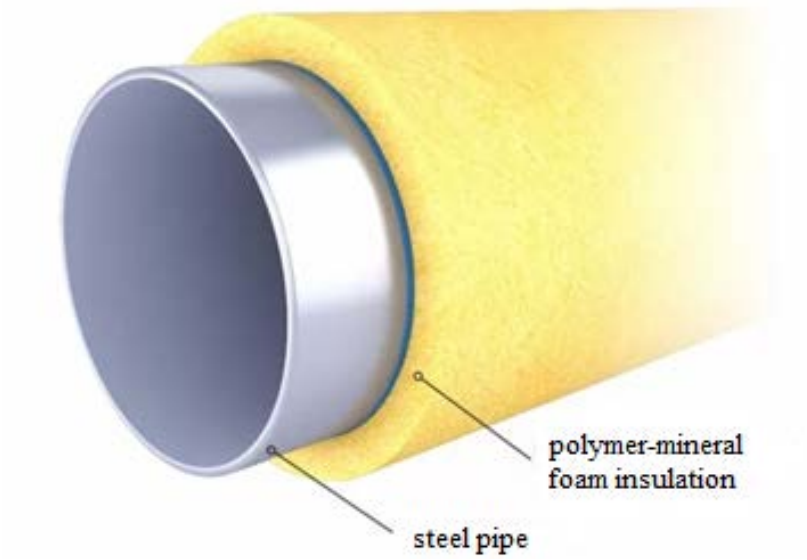


Figure 3. Polymer-mineral foam pipe insulation

Below is a table of advantages and disadvantages PMF pipe insulation.

Table 3 – Advantages and disadvantages of PMF pipe insulation

№	*Advantages*	*Disadvantages*
1	Vapor permeability (if the insulation is moistened, it gradually dries out)	Quickly loses its thermal insulation properties when exposed to ultraviolet light. It is necessary to protect heat pipelines for aboveground installation from UV rays
2	High thermal insulation properties	Low fire resistance for outdoor installation
3	Low water absorption	Additional costs for the construction of special shelters to protect the pipes from direct sunlight prior to underground laying before underground installation
4	Installation of heat pipelines in PMF is simple and does not require highly qualified personnel	The thickness of the thermal insulation layer with the same thermal conductivity values is greater for PMF than for FPU
5	Insulation of joints at the place of laying is not labor-intensive (additional sets of equipment for pipes of different diameters have been developed for applying insulation in the field, the quality of such insulation is not inferior to the factory, forming a monolithic structure on the pipe body)	Possibility of splintering at thermal insulation of U-shaped expansion joints and at bending angles, its brittleness in these places
6	There is no need for anti-corrosion protection of pipelines, as the crust layer obtained in one technological cycle fulfills this function	Lack of fixed norms, GOSTs
7	High compressive and flexural strength of the structure	Heat losses in moisture-saturated soils increase rapidly when the thermal insulation gets wet
8	High degree of adhesion of the material to the surface of the steel pipe, which allows such a structure to work as a single unit, evenly load bearing	
9	Repairability (no need to replace an entire section of the heating network in case of minor damage). The situation is solved directly in the field: only a few meters of pipe are replaced. When installing a new pipe in case of spalling: application of RPM foam on the damaged area	
10	Economically profitable. Organization of production costs 6-12 million rubles. It requires simple equipment and low level of depreciation. Accordingly, the cost of such a construction is not great in comparison with competitor of FPU insulation	

PMF insulation is one of the “representative structures of heat pipelines” that have proven themselves in the construction of heating networks. Pre-insulated pipelines are currently the optimum solution for pipe laying and pipe installation [7].

Heat networks are easily vulnerable link of the DH system. This was facilitated by the former state policy, which was oriented towards the construction of heat pipes in a short time with the use of energy inefficient materials: mineral wool. This resulted in an acute situation, wear and tear of equipment, high heat transfer to the environment due to the minimal speed of reconstruction and overhaul of dilapidated networks. The number of accidents per year is 70 per 100 km. Since the implementation of measures aimed at reconstruction of heat sources, revision of hydraulic regimes is rather labor-intensive, there is an opportunity to correct the current situation by means of construction with the use of modern types of thermal insulation.

According to the results of the analysis the following conclusions were made: pre-insulation of pipes is a simple and effective solution leading to reduction of labor costs and shortening of the time of works on heat pipes installation.

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WASTEWATER TREATMENT AT GATCHINA VODOKANAL TAKING INTO ACCOUNT THE BEST AVAILABLE TECHNOLOGIES

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Abstract. This article deals with the stage-by-stage wastewater treatment at the Gatchina waterworks. The necessary equipment and technical characteristics are given. After the description of the step-by-step wastewater treatment, a comparison on the achievement of BAT ITS 10-2019 is provided for the better assessment of the quality of wastewater treatment.

Keywords: wastewater treatment, treatment system, treatment facilities, BAT (best available technologies) requirements, ecology.

ОЧИСТКА СТОЧНЫХ ВОД НА ВОДОКАНАЛЕ г. ГАТЧИНА С УЧЕТОМ НАИЛУЧШИХ ДОСТУПНЫХ ТЕХНОЛОГИЙ

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Аннотация. В данной статье рассматривается поэтапная очистка сточных вод на водоканале г. Гатчина. Представлено необходимое оборудование и технические характеристики. После описания поэтапной очистки сточных вод приводится сравнение на достижение НДТ ИТС 10-2019 для лучшей оценки качества очистки сточных вод.

Ключевые слова: очистка сточных вод, система очистки, очистные сооружения, требования НДТ, экология.

MUE Vodokanal of Gatchina is engaged in the operation of water supply and wastewater disposal facilities. It supplies drinking water and provides sewerage services to 90 thousand residents.

Sewage treatment facilities of MUE Vodokanal of Gatchina are located at the address: Leningrad region, Gatchina district, near the village of Vaiyalovo.

The category of discharged waste water, includes drainage water-surface (rain and melt), industrial, domestic and household waters.

At the Gatchina Vodokanal, wastewater is biologically treated at the sewage treatment plant (STP) before being discharged through Outlet No. 1 into the Izhora River water body [1].

The structure of the sewage treatment plant includes the main sewage pumping station, an intake chamber, crusher grates, sand traps, primary settling tanks, aeration tanks, secondary settling tanks, contact tanks, blower station, mechanical sludge dewatering shop, thickeners, sludge pads, auxiliary buildings and facilities.

Wastewater from the city of Gatchina is supplied by pressure pipelines of the main sewage pumping station to the reception chamber of the treatment plant.

The intake chamber serves to damp the head and partially mix the incoming wastewater. From the intake chamber, the wastewater flows by gravity to the crusher grates, where the detention and crushing of coarse impurities takes place. Pollutants detained by the grids are collected manually in a container, then collected in a container and then transported to the landfill.

Figure 1 shows the scheme of wastewater treatment.

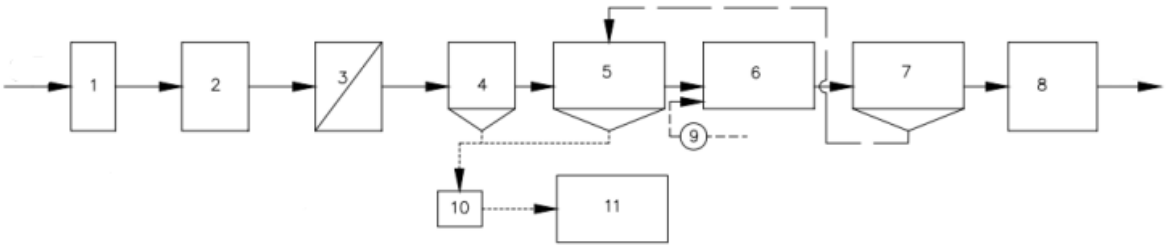


Figure 1. Wastewater treatment scheme of MUE Vodokanal of Gatchina:
1 – main pumping sewage station; *2* – intake chamber; *3* – crusher grates; *4* – sand trap; *5* – primary sedimentation tank; *6* – aerotank; *7* – secondary sedimentation tank; *8* – contact tank; *9* – blower station; *10* – thickener; *11* – sludge pads

After the crusher grates, the wastewater flows to the sand traps. Sand traps are used for extraction of large (more than 0.2 mm) fast-settling impurities, mainly sand (80-85 %) from wastewater [2].

Sand deposited in the course of water movement settles to the bottom of sand traps and is displaced by bridge-shaped scrapers into the pits at the beginning of the sand traps. Sand slurry from the pits is pumped by pumps to the sand classifier, where it is sedimented, and the dewatered sand is fed by an inclined screw into a mobile container with a capacity of 1000 dm^3. The settled water is discharged into a pit.

The drainage water collected in the pit from the press and classifier is pumped by a submersible pump into the distribution channel in front of the sand traps. Two blowers (one working and one reserve) are installed in the grids building to supply air for aerating the sand trap channels.

After passing the sand traps, the wastewater enters the collection channel and then is discharged through the existing 2.4 m x 2.0 m flume into the existing distribution bowl of the primary sedimentation tanks. The primary sedimentation tanks

are used to remove settling and floating suspended solids from the wastewater. Sludge is removed from the primary sedimentation tanks by plunger pumps installed in the raw sludge pump station.

Three eccentric screw pumps are installed on the first floor for pumping raw sludge.

The clarified wastewater after primary sedimentation tanks enters the aeration tanks. The principle of operation of aeration tanks is based on mineralizing ability of activated sludge, which is a suspension of aerobic microorganisms. For normal life activity of microorganisms in aeration tanks it is necessary to maintain dissolved oxygen concentration of 5 mg/dm3. The biological wastewater treatment process is based on biochemical oxidation of organic contaminants by microorganisms of activated sludge under aerobic conditions. In aeration tanks wastewater is purified from nitrogen – nitrification process takes place.

From the aeration tanks the sludge mixture enters the secondary settling tanks. They serve for separation of activated sludge from the treated wastewater. The operation of secondary settling tanks is similar to the primary settling tanks. The activated sludge is removed from the secondary settling tanks by sludge suckers under hydrostatic pressure into a common pipeline, from which the sludge is returned to the first corridor of each aerotank, or discharged into the receiving chamber of the treatment plant.

There is a sludge treatment unit as part of the sewage treatment plant.

According to the existing technological scheme, the raw sludge of primary sedimentation tanks and excess activated sludge after washing and thickening to 93 % moisture content is delivered to the mechanical dewatering shop, where two lines (working lines) are provided in the sludge dewatering apparatus scheme.

On each line, the sludge mixture is fed by a feed pump to a flocculator with an agitator, where it is mixed with a flocculant solution fed into the sludge pressure pipe just before the flocculator by a screw pump.

The sludge, dewatered to a moisture content of 75 %, is blown off with compressed air from the belt onto a screw conveyor, which is fed to a dump trailer.

The filtrate from the filter press and dirty washing water are drained by gravity into the on-site sewage system.

In the dry season the dewatered sludge is transported by specialized transport to the landfill for solid municipal waste disposal for reclamation as a recultivation layer [3].

After complete biological treatment, the wastewater is discharged into the Izhora River through the overflow weir through outlet No. 1.

BAT is the technology of production of products, performance of works, rendering of services, determined on the basis of modern achievements of science and technology and the best combination of criteria for achieving environmental protection goals provided that there is a technical possibility of its application [4].

In order to better assess the quality of wastewater treatment, it is necessary to make a comparison on the achievement of BAT ITS 10-2019. This comparison is summarized in the Table [5].

Table – Comparison of Gatchina Vodokanal with ITS 10-2019

MUE Vodokanal of Gatchina	*ITS 10-2019*
Crusher grates are used	Separation of floating coarse impurities – grids (sieves)
Sand traps are used	Removal of settling coarse impurities (sand) – sand traps
Sand sludge treatment is present	Sand sludge treatment – sand pads, sand hoppers, sand washing and separation apparatuses
There is a pit	Wastewater storage (flow averaging)
A primary sedimentation tank is used	Sedimentation of suspended solids (clarification, primary sedimentation). Removal of fatty floating contaminants
Aeration tanks are used	Treatment in biological treatment bioreactors
Blower station present	Compressed air supply. Mandatory sub-process for aeration tanks
A secondary settling tank and pumps are used	Separation of treated water from biomass removed from the bioreactor
No aftertreatment, direct discharge into the Izhora River	Pre-treatment with filters with loading or membrane disk filters
The thickener is present	Concentration of excess activated sludge (sludge) – thickener
Sand dewatering is carried out	Sludge dewatering
Sludge pads are used	Additional long-term conditioning of sludge dried on sludge beds or mechanically dewatered sludge under natural conditions
No composting	Composting of dewatered or dried sludge
No thermal drying of sludge	Thermal drying of sludge – complete thermal drying units

Analyzing the Table, we can conclude that Gatchina Vodokanal does not have additional treatment, i.e. discharge goes directly into the Izhora River, composting is absent and thermal drying of sludge is also absent.

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УДК 371

PROVISION OF MODERN MUSICAL, TECHNICAL AND COMPUTER EQUIPMENT FOR MUSICAL AND ANIMATION ACTIVITIES OF PRIMARY SCHOOL CHILDREN

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Abstract. In the modern world, children are increasingly turning to various forms of creativity and self-expression. Musical animation activities are becoming popular, giving children the opportunity to combine music and sand animation. In order to ensure the full development and involvement of children in such activities, it is necessary to use modern musical equipment, special technical and computer equipment. In this article, we will consider the importance of providing modern musical equipment, special technical and computer equipment for effective artistic and aesthetic education of younger schoolchildren by means of musical and animation activities. Providing modern special technical equipment for musical and animation activities of primary school children is an essential condition for achieving successful results.

Keywords: primary school children, sand animation, music, musical and animation activities, computer facilities.

ОБЕСПЕЧЕНИЕ СОВРЕМЕННЫМ МУЗЫКАЛЬНЫМ, ТЕХНИЧЕСКИМ И КОМПЬЮТЕРНЫМ ОБОРУДОВАНИЕМ ДЛЯ МУЗЫКАЛЬНО-АНИМАЦИОННОЙ ДЕЯТЕЛЬНОСТИ ДЕТЕЙ МЛАДШЕГО ШКОЛЬНОГО ВОЗРАСТА

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Аннотация. В современном мире дети все больше обращаются к различным формам творчества и самовыражения. Музыкально-анимационная деятельность становится популярной, предоставляя детям возможность сочетать музыку и, например, песочную анимацию. Чтобы обеспечить полноценное развитие и вовлечение детей в такую деятельность, необходимо использовать современное музыкальное оборудование, специальное техническое и компьютерное оборудование. В данной статье мы рассмотрим важность обеспечения таким оборудованием для эффективного художественно-эстетического воспитания младших школьников средствами музыкально-анимационной деятельности. Предоставление современного специального технического оборудования для музыкально-анимационной деятельности детей

младшего школьного возраста является неотъемлемым условием для достижения успешных результатов.

Ключевые слова: младшие школьники, песочная анимация, музыка, музыкально-анимационная деятельность, музыкальное оборудование, компьютерное оборудование.

Musical animation activity is a synthesis of using the possibilities of music and sand animation, which is effective in educational institutions working with primary school children [1]. This is an innovative method that will allow children to immerse themselves in the world of music and visual arts, developing them comprehensively.

Musical and animation activities are attractive among children of primary school age. It combines the use of music and sand animation in the educational process, which allows children to express their emotions, develop vocal and musical abilities, creative skills and imagination [2, 3]. To ensure the success of musical animation activities, it is necessary to use modern musical equipment, special equipment for sand animation and computer facilities. The following musical equipment is required: music speakers, music screens, a music mixer, a music amplifier, necessary sound cords, radio microphones (hand-held and headsets) according to the number of children, a synthesizer (or other musical instrument for learning the vocal part of a song), a studio microphone, musical headphones, a laptop with the necessary music programs. Equipment for sand animation includes light tables according to the number of children, blinds or blackout curtains to darken the audience, special sand, sand containers, electric carriers, a video camera (high-resolution webcam), a cord for connecting a video camera to a laptop, a laptop with necessary programs, video projector or TV (with the ability to connect to laptop).

Musical and animation activities contribute to the development of creative thinking in children [4]. They create their own musical and animated compositions using sand animation and music, and demonstrate them on the screen with musical accompaniment. This develops their imagination, ability to express themselves and creative thinking [5]. However, without the necessary equipment, younger students will not be able to reach their full potential.

An important component of musical and animation activities is sound equipment. Children should be provided with high-quality speakers, an amplifier, sound monitors, microphones and other specific equipment so that their musical compositions sound clear and distinct. This will allow them to hear their performance and feel satisfaction from the process of performing the vocal part. To ensure an optimal and productive process of musical and animation activities of younger schoolchildren, it is necessary to use modern musical equipment, special technical and computer equipment. Musical instruments such as keyboards, strings, wind instruments and percussion allow children to develop musical abilities and creative thinking. A musical instrument owned by a teacher is necessary for learning the vocal part of a song with a child. Special technical equipment includes sound systems,

microphones, amplifiers and audio recording devices, providing high-quality sound and music playback.

It should be noted that sound equipment is an integral part of musical and animation activities and plays an important role in creating an unforgettable atmosphere and an emotional impression on children and on the audience during the performance. It allows you to convey music, sounds and voices during rehearsals and performance by a child in the highest quality and understandable form for the listener.

One of the components of sound equipment is acoustic systems (speakers), which are responsible for high-quality sound reproduction in a hall or on an outdoor area. The quality of acoustic systems plays an important role in how high-quality the sound will be and will reach the listener and his perception from the sound source. Thanks to modern technologies, acoustic systems can provide high-definition sound, a wide frequency range and surround sound.

In the process of musical and animation activities, microphones are important, which allow you to capture the sounds and voices of performers, as well as transmit them qualitatively. There are different types of microphones, each of which is designed for talking, vocals, studio recording, but we are interested in vocals and studio recording. The quality of the microphone determines how accurately and naturally the sound will be transmitted to the audience.

However, sound equipment is not limited only to acoustic systems and microphones. It also includes a sound amplifier, a mixing console and other technical means that allow you to adjust sound parameters, create a variety of effects and ensure perfect sound matching between different sources.

Sound equipment is an integral part of a successful performance and affects the overall assessment of musical and animation activities. It is only thanks to high-quality sound equipment that you can achieve maximum effect and create unforgettable performances, concerts, video recordings and events. Thanks to the thoughtful technical component, the sound equipment helps the performers to convey their emotionality, which means to achieve a lively and rich sound that captures the listener and creates a unique atmosphere.

As pointed out above, to carry out sand animation, you must also have light tables, blinds or blackout curtains to darken the audience, special sand and sand containers, electric carriers, a high-resolution video camera, a cord for connecting a video camera to a laptop, a laptop with the necessary programs, as well as a video projector or a TV with the ability to connect to a laptop.

Light tables play a key role in creating a special atmosphere and emphasize the importance of each element, thus enlivening the work of children’s drawing. Blinds or blackout curtains help to create ideal working conditions, providing complete blackout of the audience. Special sand, sand containers and electric carriers are necessary for the proper organization of the creative process and the convenience of children’s work.

The use of a high-resolution video camera allows you to record all actions and broadcast them on a larger screen for easy familiarization with the results of work. The

cord for connecting the video camera to the laptop guarantees high image quality and the ability to instantly display the creative process on a large screen.

A video projector or a TV with the ability to connect to a laptop allows you to demonstrate the results of work on large screens, making the process more spectacular and interesting for viewers and children.

Computer equipment and special software are also required for music and animation activities. With the help of a computer, it becomes possible to display the results of musical and animation activities on the screen, organize sound recording of children and performance in headphones for children to hear themselves, it is possible to provide remote participation of children in competitions. Computer equipment also allows the teacher to record and edit musical compositions, create musical arrangements. This greatly simplifies the process of creating and presenting musical animation projects and allows children to learn new skills on their own.

Without access to modern technology, children will not be able to fully unleash their creative potential. In the modern world of technology, special technical and computer equipment is an integral part of musical and animation activities. It allows children to create unique sound effects, change the timbre and volume of music, and add special effects to the sand animation. This opens up additional opportunities for creativity and self-expression of children, helps them develop their imagination and creativity.

Computer equipment plays an important role in the musical and animation activities of younger schoolchildren. Computers, video cameras, projectors and specialized software allow children to create interesting and impressive animated works using sand drawings combined with music. This technology opens up endless possibilities for creativity, allowing children to bring their ideas and fantasies to life.

Providing primary school children with modern musical equipment, computer and special technical equipment is an important aspect of the organization of their learning process and the development of their creative potential, it also allows them to achieve success in musical and animation activities. This helps to broaden their horizons and promotes the development of musical hearing, imagination and coordination of movements.

As a result, modern musical, technical and computer equipment is needed to organize successful musical and animation activities of younger schoolchildren. Musical and animation activities, in turn, allow to stimulate the development of children’s creativity, contributes to the formation of a comprehensive perception of the world, opens up opportunities for their further development and the realization of talents. Thus, providing modern special technical equipment for musical and animation activities of primary school children is one of the important conditions that allows them to achieve the highest results in their comprehensive creative development.

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CLOUD TECHNOLOGIES AND THEIR APPLICATIONS

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Abstract. Cloud technology is an important tool to improve the efficiency of work and people's quality of living. This paper introduces the concept of cloud technologies and their application in various fields, and discusses their advantages and disadvantages, data storage security issues and application in the context of COVID-19 pandemic.

Keywords: cloud technology, software, cloud computing, online mode, data storage.

ОБЛАЧНЫЕ ТЕХНОЛОГИИ И ИХ ПРИМЕНЕНИЕ

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Аннотация. Облачные технологии являются важным инструментом для повышения эффективности работы и улучшения качества жизни людей. В данной статье представлено понятие облачных технологий и их применение в различных сферах, а также рассматриваются их преимущества и недостатки, вопросы безопасности хранения данных и применение в условиях пандемии COVID-19.

Ключевые слова: облачные технологии, программное обеспечение, облачные вычисления, онлайн-режим, хранение данных.

"He who owns information owns the world!" – this famous phrase by Nathan Rothschild, an English millionaire, later repeated by Winston Churchill, reflects the structure of the modern world in the best possible way. It is impossible to imagine modern life, and even more so modern business, without information technologies. The world is enveloped by information flows with different mediums for its transmission. Collecting, analyzing and storing information are the primary tasks not only of a modern person, but also of society as a whole, including business.

Volumes of information sometimes reach such scales that a fair question arises, where and how to safely store such amount of information? And this is where cloud technologies come to the aid of modern users.

Let us find out what these technologies are, consider the areas of application of cloud technologies and figure out whether they are really necessary for the modern world [1].

So, what are cloud technologies? Everyone is used to the fact that buying a new smartphone people do not even think about how the necessary data (contacts, banking, photos and videos, correspondence in WhatsApp, etc.) are transferred to the new gadget. And all this happens due to the fact that this data is stored in the cloud.

"Cloud" is a metaphor behind which a complex infrastructure with its own technical details is hidden. The advantage of this technology is that the user is able to have access to his data, but may not care about the software of the infrastructure he is working with (Figure 1). This is an explanation and application of the concept of cloud at the level of the common user. And already here it becomes clear how firmly cloud technologies have entered into everyday life [2].

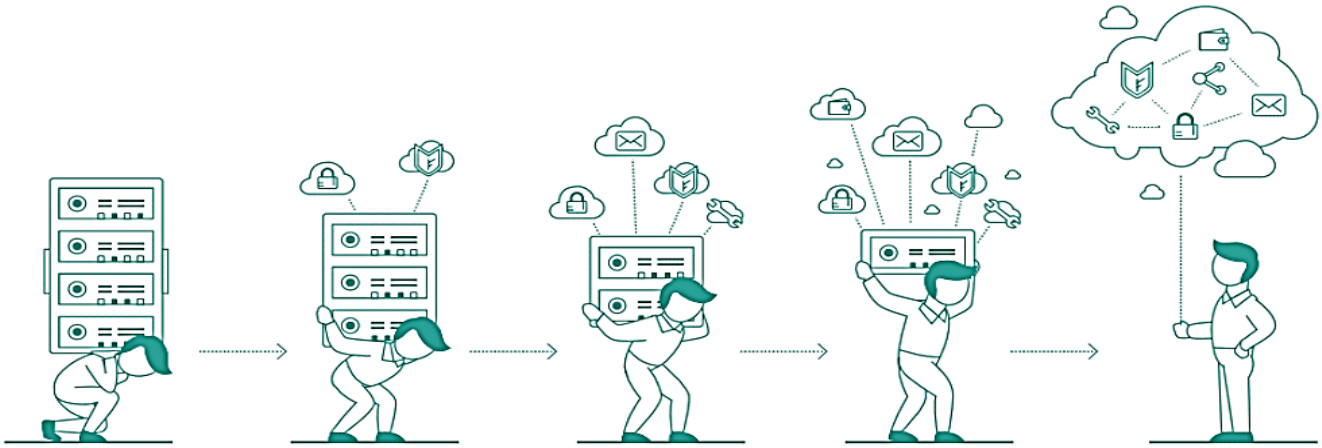


Figure 1. Simplifying life by moving to the cloud

Now let us consider what types of Cloud Technologies exist.

There are three main models of cloud computing.

1. Infrastructure-as-a-Service model, abbreviated as IaaS, is a set of basic elements to build a cloud-based IT system. Through this model, users have access to network services, virtual computers and data storage, which provides a high level of operation and management of enterprise IT resources.

2. The Platform as a Service model, abbreviated as PaaS, does not require the enterprise to manage the underlying infrastructure, but allows all resources to be directed to application development and management, which allows for a significant increase in operational efficiency without being distracted by labor-intensive application tasks.

3. The Software as a Service model, abbreviated as SaaS, involves the use of users of a ready-made product under the control of a developer. This model allows you to fully concentrate on the use of a certain software product, which is undoubtedly an undeniable advantage of this model. The most vivid example of this model is the

e-mail service (electronic mail), which allows you to send and receive e-mails without thinking about the software of this product, maintenance of servers on which it runs.

The concept of “cloud computing” includes on-demand delivery of IT resources via the Internet with pay-as-you-use, without the need to purchase, place and maintain servers, but with the ability to access computing services, storage and databases as needed thanks to the cloud service provider [3].

Let us consider the applications of cloud computing that have already made their way into our lives. Cloud computing is necessary for any business entity, regardless of ownership, size and industry in which a particular enterprise operates.

Cloud can be used for various purposes, such as backup and storage of information, disaster recovery of various databases, development and testing of various software, creation of virtual desktops and Internet applications, allowing the enterprise to improve the quality and efficiency of work and be more client-oriented.

Cloud technologies are used in all spheres of life of modern society: in science, education, health care, social sphere, industry, etc. (Figure 2). Such technologies allow one to reduce the cost of various research and production, simulate various situations, assess all kinds of risks, eliminate or correct production problems at a distance, start the production process or change the configuration of devices or systems in case of their failure without the need for personal presence [4].



Figure 2. Applications of cloud technologies

During the COVID-19 pandemic, many companies and organizations were forced to move their work online. Cloud technology became an important tool for smooth operations and communication between employees who worked from home.

For example, cloud-based video conferencing services such as Zoom, Microsoft Teams and Google Meet allowed people to conduct meetings and conferences online from the comfort of their homes. This helped maintain productivity and keep colleagues connected.

Cloud technologies have also been used to store and share information.

Cloud storage services such as Dropbox, Google Drive and OneDrive allowed people to save and share files online regardless of location. In addition, cloud technologies have been used in medicine to store and process medical data and to develop applications for health monitoring and virus control. Thus, cloud technologies have become an integral part of people's daily lives in the COVID-19 pandemic, helping to keep people connected and productive online.

Despite all the advantages of cloud technologies, of course, there are certain conditions and risks associated with their use. The main condition for the operation of these technologies is the presence of the Internet. Of course, in modern realities, this condition is not a problem, as the Internet is available almost anywhere on the planet and even in space.

But the main risk of using cloud technologies is the leakage of information to unscrupulous users who can use the data for their criminal purposes. Nevertheless, it should be kept in mind, that the companies developing such technologies care about their customers, so they work diligently on the security of data transmission and storage. Data is transmitted in encrypted form, access to certain data and services can be restricted by the user to a certain circle of people. Also the company providing cloud services ensures a high level of fault tolerance and redundancy, reducing the level of data loss to almost zero [5].

Thus, it can be concluded that the possibilities of cloud technologies are limitless. The demand for information storage and remote computing continues to grow, which leads to the emergence of new providers offering more affordable and financially effective tariff plans. Without cloud technologies, the development of the modern world, filled with a variety of information that needs to be stored, sorted, analyzed is simply impossible to imagine. And it is necessary to remember that "He who owns information, owns the world!"

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HOW BLOCKCHAIN IS A GAME CHANGER IN ENERGY MANAGEMENT

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Abstract. This article explores the implementation of blockchain technology in energy management through a case study of Power Ledger, an Australian company specializing in blockchain-based solutions for energy trading and microgrid management. Power Ledger's platform enables users to produce, store, and trade excess energy directly with others using smart contracts on the blockchain. The case study examines successful deployments of Power Ledger's technology in various parts of the world, showcasing its potential to enhance the efficiency and sustainability of energy infrastructure.

Keywords: blockchain, energy management, Power Ledger, renewable energy, microgrid, energy trading, decentralization, smart contracts.

КАК БЛОКЧЕЙН МЕНЯЕТ ПРАВИЛА ИГРЫ В УПРАВЛЕНИИ ЭНЕРГОПОТРЕБЛЕНИЕМ

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Аннотация. В статье исследуется внедрение технологии блокчейн в управление энергией на примере компании Power Ledger – австралийской компании, специализирующейся на блокчейн-решениях для торговли энергией и управления микросетями. Платформа Power Ledger позволяет пользователям производить, хранить и торговать избыточной энергией напрямую с другими пользователями с помощью умных контрактов на блокчейне. В работе рассматриваются успешные внедрения технологии Power Ledger в различных частях мира, демонстрируя ее потенциал в улучшении эффективности и устойчивости энергетической инфраструктуры.

Ключевые слова: блокчейн, управление энергией, Power Ledger, возобновляемая энергия, микросеть, торговля энергией, децентрализация, умные контракты.

Blockchain is a decentralized database that stores records (blocks) of transactions in chronological order and ensures their security and integrity through cryptography. Various industries are already using blockchain to provide transparency, security, and efficiency in record keeping, such as financial services, healthcare, logistics, and even the arts.

Traditional data management systems in the energy industry are often centralized and can be vulnerable to hacking or manipulation. Blockchain offers a decentralized approach to data storage, which provides increased security and resilience to attacks. In addition, blockchain technology simplifies transaction verification and auditing processes, which reduces the cost of administrative processes and increases transparency of transactions [1].

The benefits of using blockchain for energy management become particularly apparent when analyzing the challenges of traditional energy management systems. Existing systems often centralize data and control, which can lead to security vulnerabilities and inefficient distribution of energy resources. Moreover, the lack of transparency can create barriers to effective energy metering and control, as well as innovative management approaches. In this context, blockchain is a powerful tool to address these challenges. The creation of decentralized energy management systems based on blockchain enables higher levels of security and reliability through distributed data storage. Each block of data in the blockchain chain contains chronologically ordered information about transactions, which makes data manipulation difficult and ensures transparency of operations for all participants of the system [2].

Blockchain technology makes it possible to create decentralized energy management solutions that enable more efficient allocation of resources and reduce the cost of administrative processes. It also facilitates greater transparency and accounting of energy consumption, which in turn can lead to a reduction in unnecessary costs and optimization of energy use (Table).

Table – Benefits of blockchain in managing energy consumption in various aspects

Technological Advantages of Blockchain in Energy Management	Economic Benefits of Applying Blockchain in Energy Sector	Environmental Benefits of Blockchain in Energy Consumption
Decentralization of management systems	Reduction in operational costs	Encouragement of transition to renewable energy sources
High level of data security and reliability	Increase in enterprise profitability	Reduction of negative environmental impact
Transparency of operations and energy consumption tracking	Reduction of unnecessary expenditures	Optimization of energy resource utilization
Efficient resource allocation	Development of innovative management models	Improvement of quality of life and environmental conditions

In economic terms, the use of blockchain in energy management can bring significant benefits. Reduced administration costs and improved energy management efficiency contribute to lower operating costs and increased profitability for businesses. In addition, the use of blockchain can promote sustainable energy management models, encouraging a shift to renewable energy sources and reducing environmental impact.

Decentralized microgeneration networks are one example of the use of blockchain in the energy sector. These networks allow households and businesses to generate and consume their own electricity, exchanging it with other network participants via blockchain technology. This helps to increase the efficiency of renewable energy and reduce dependence on centralized energy systems.

Blockchain-based energy markets also represent a significant application of this technology. They allow energy market participants to directly buy and sell electricity to each other without intermediaries. This makes markets more efficient and transparent, helping to optimize energy distribution and reduce transaction costs. Energy origin tracking systems also make extensive use of blockchain technology. They allow consumers to receive information on how much of the energy they consume was produced from renewable sources. This helps increase transparency and support the transition to more sustainable energy sources [3, 4].

Analyzing the results and achievements of these projects reveals their impact on the efficiency, transparency and sustainability of the energy sector. Many studies show that the use of blockchain can reduce costs, increase efficiency and create a more sustainable energy management system. These examples confirm the potential of blockchain technology to transform the energy industry and facilitate the transition to a more sustainable and efficient energy infrastructure.

One example of a successful blockchain technology implementation in the energy sector is the Power Ledger project. Power Ledger is an Australian company that has developed a blockchain-based platform for energy trading and microgrid management.

They provide energy management solutions for decentralized grids, allowing users to generate, store and sell excess electricity directly to other users through smart contracts on the blockchain. This helps to improve renewable energy efficiency and reduce the cost of electricity transformation and distribution.

The Power Ledger project has already been successfully implemented in various parts of the world, including Australia, New Zealand, the US and other countries. For example, in Fremantle, Western Australia, the Power Ledger platform has created a microgrid where residents can share energy with each other using solar panels on their roofs. Such projects demonstrate the potential of blockchain technology to improve energy management and contribute to a more sustainable and efficient energy infrastructure [5].

The future of blockchain in the energy industry is an exciting prospect that promises to overturn existing standards and create a more sustainable, efficient and transparent energy infrastructure.

Predictions of blockchain technology in the energy sector indicate its potential to change the paradigms of energy management. Blockchain is expected to be actively used to create decentralized microgeneration networks, energy markets, and energy

provenance tracking systems. This will lead to increased transparency, efficiency and security in the energy sector.

However, the adoption of blockchain in the energy sector may face a number of challenges and obstacles. These can include difficulties in scaling the technology, the need to comply with regulatory requirements, and protection from potential cyberattacks. Despite this, there are ways to overcome these obstacles, such as developing security standards, collaborating with regulators and implementing innovative technical solutions.

In conclusion, blockchain technology is a powerful tool for energy management and transformation of the energy industry. Its importance lies in creating a more resilient, efficient and transparent energy infrastructure, facilitating the transition to a more sustainable energy industry and improving the quality of life.

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PSYCHOLOGY AND PHOTOGRAPHY: HOW DOES THE PHOTOGRAPHER INFLUENCE THE MODEL

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Abstract. This article describes the psychological aspects of photography and the question of the photographer's influence on the model during a photo shoot. The results of the research on the perception of a photographer by a non-professional model and the outcome of photo-shooting are presented; the methods used by photographers to evoke the right emotions and form an image and increase the self-esteem of the model are analyzed. The importance of the ability to find a common language with the model is also emphasized.

Keywords: psychology, photography, photographer, model, photo shoots, photo business.

ПСИХОЛОГИЯ И ФОТОГРАФИЯ: КАК ФОТОГРАФ ВЛИЯЕТ НА МОДЕЛЬ

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Аннотация. В данной статье рассматриваются психологические аспекты фотосъемки и вопрос о влиянии фотографа на модель в процессе фотосессии. Приводятся результаты исследования по восприятию непрофессиональной моделью фотографа и результата фотосъемки; анализируются методы, используемые фотографами для вызова нужных эмоций, формирования образа и повышения самооценки модели. Также подчеркивается важность умения находить общий язык с моделью.

Ключевые слова: психология, фотография, фотограф, модель, фотосессии, фотобизнес.

Photography has been included in the list of genres of contemporary art for a long time, and many museums and galleries provide huge spaces for photo exhibitions.

What is the reason for this? Why has photography acquired the same meaning and status that painting once possessed? The common idea of many researchers is to understand photography as an image, where the visual is by no means the main thing [1]. Now photography is not only art, but also business. A photo can bring money to someone, people will pay for it, but will it always be justified? This business is not so simple, it has certain nuances. For example:

– The customer may not satisfied with the work;
– There may be misunderstanding between the parties during the photo shoot;
– The price of the photo shoot does not correspond to its result.

And many other nuances can become a pitfall in this area. But what is the root of all the problems? The photo shoot itself is not only physical labor and creative activity, but also psychological work. The photographer should be able to communicate with the model, establish contact, reveal his or her advantages and show them from the best side.

A study was conducted during which people were interviewed as models to determine which aspects in the process of a photo session could confuse them and negatively affect the result of work, and which, on the contrary, would contribute to obtaining the best result that could satisfy them.

People of various ages took part in the survey, the main female audience was 18-24 years old. This audience most often uses the services of a photographer (Figure 1).

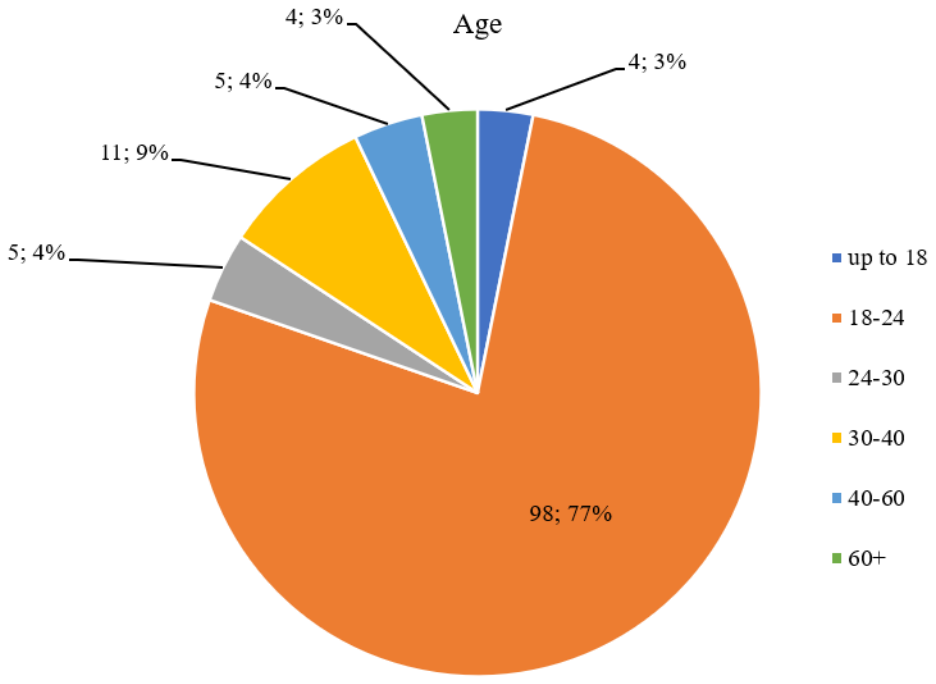


Figure 1. The age of the respondents

To understand the influence of the photographer on the model during the photo shoot, the following questions were asked:

– Is it important for you that the photographer tells you what to do and how you should stand?

– Are you comfortable with the photographer's comments about your posture/facial expression?

– Do confidence in the photographer and his skills/experience matter to you?

– An unsuccessful result of photo-shooting is:

– Photographer's blunder

– Your personal nonphotogenicity

– Poor lighting/location

– Combination of factors

The answers are presented in the diagrams (Figure 2 - Figure 5).

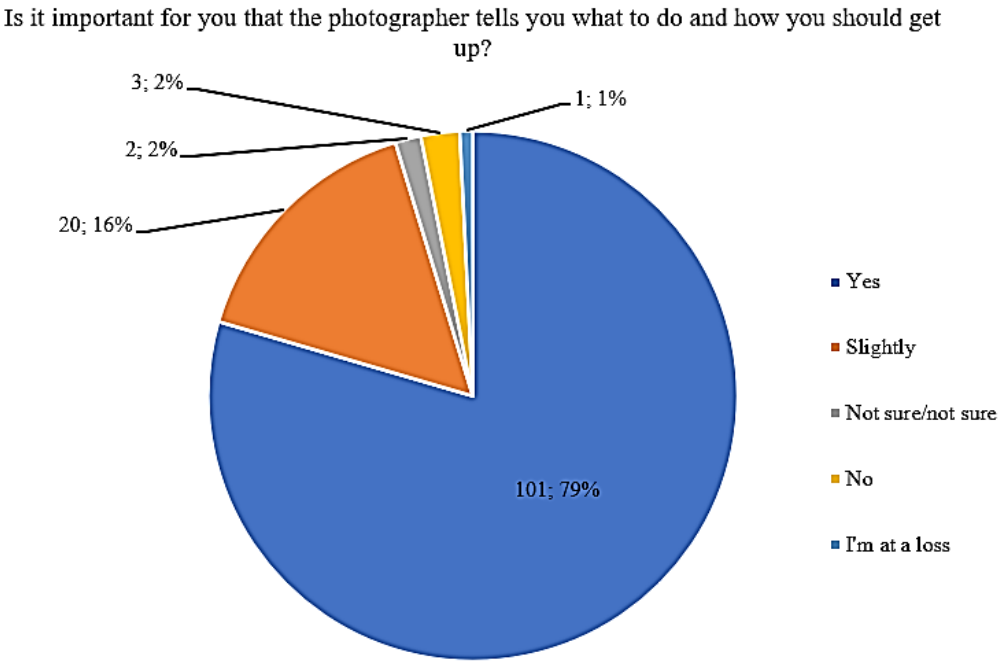


Figure 2. The significance of the photographer's instructions

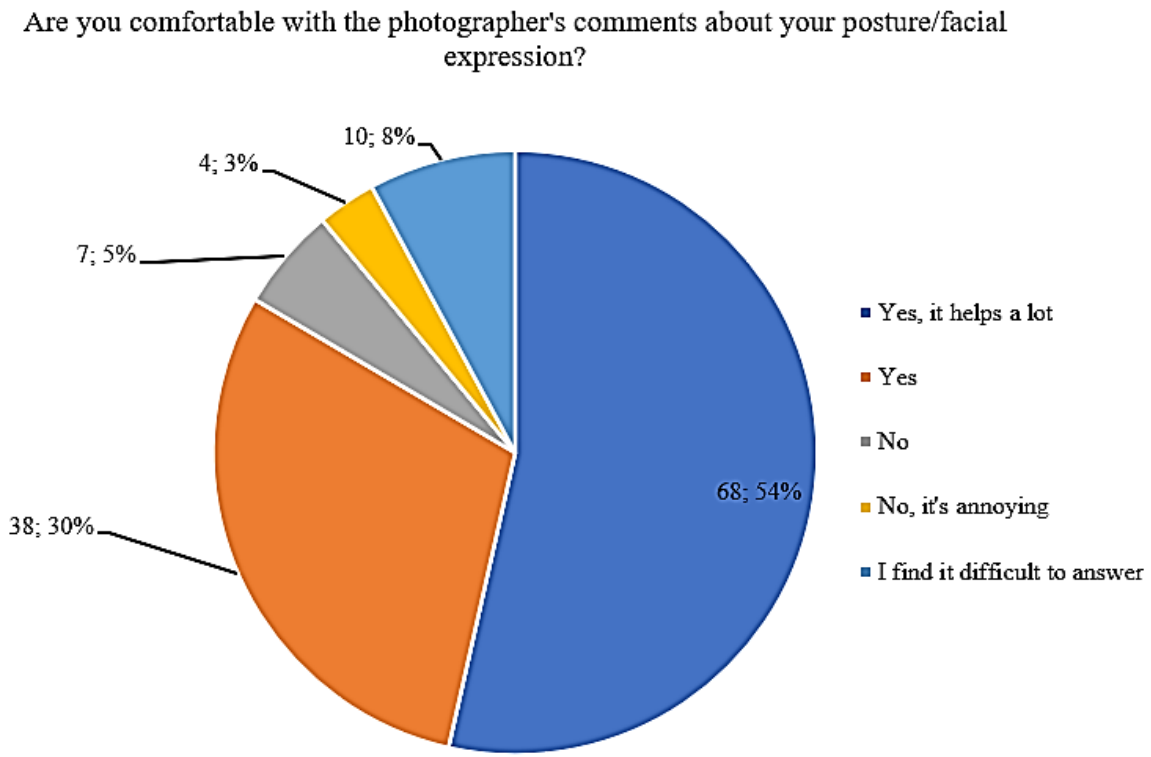


Figure 3. The significance of the photographer's comments

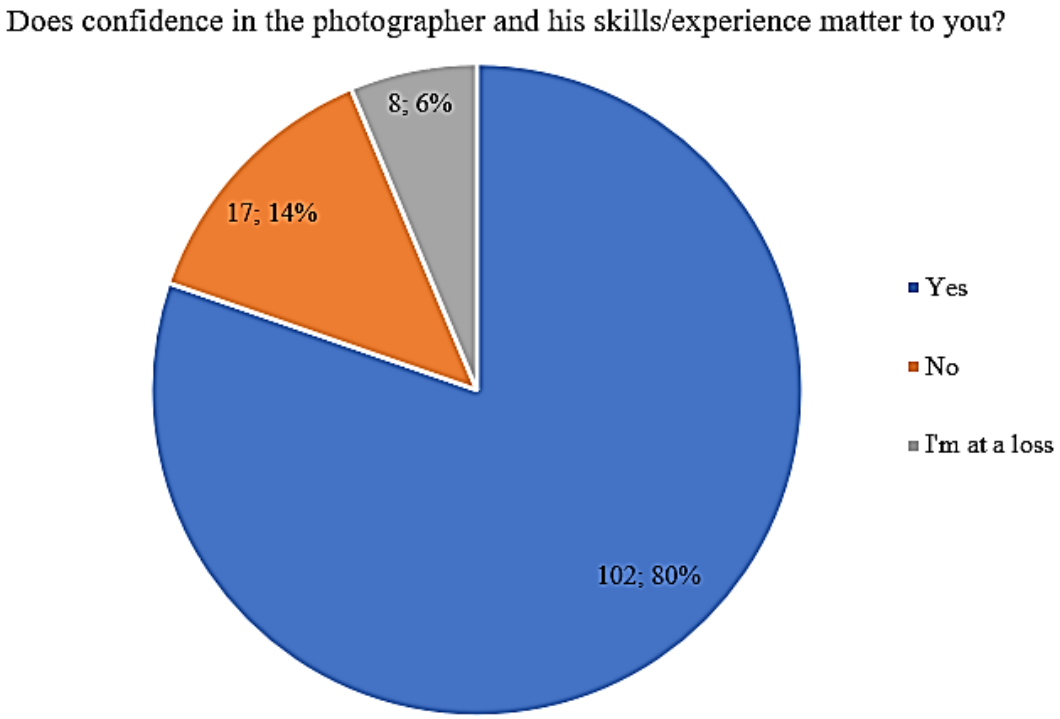


Figure 4. The importance of the photographer's skills and experience

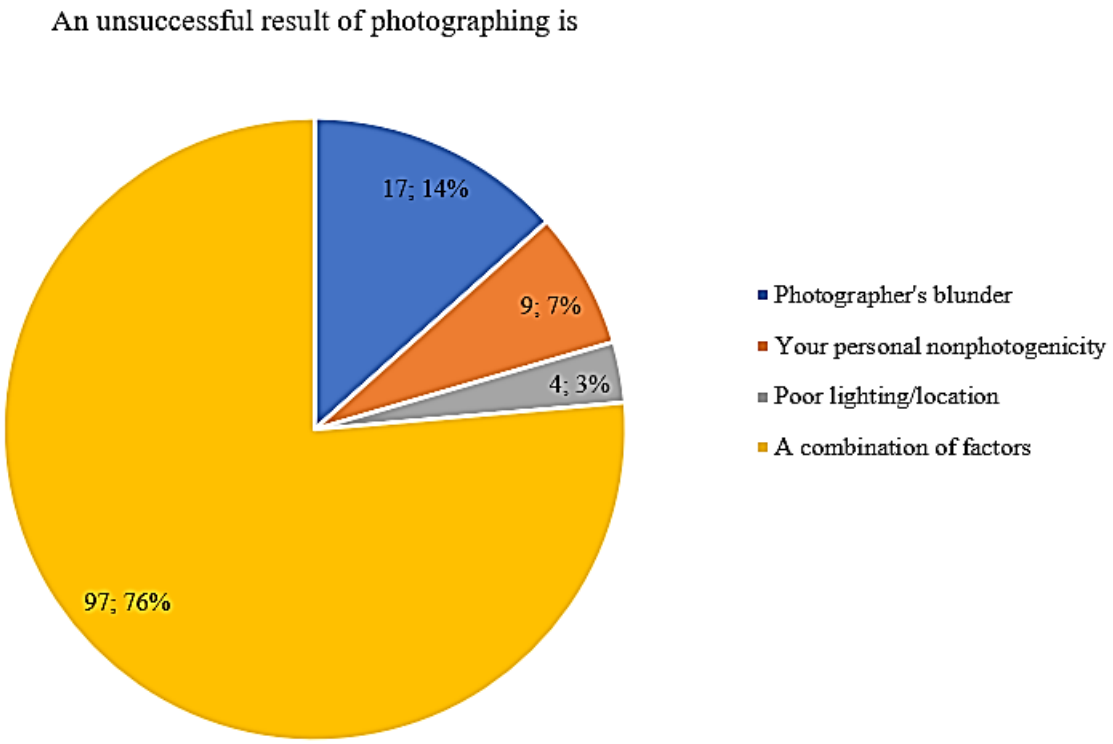


Figure 5. The reason for the unsuccessful result

The first two questions and the answers to them show that for a non-professional model, the photographer's tips, his opinion and comments are important. The third question reflects that a potential customer will choose a photographer he or she is confident in, whose experience he or she trusts. The fourth question makes it clear that there are some people who will blame the photographer for an unsuccessful photo shoot.

This survey proves that the photographer directly affects not only the result of photography, but also the model psychologically. How to find the right psychological approach to a model, we will reveal further.

Before shooting, you should definitely ask what the model expects from the photo shoot, what ideas and thoughts he or she has on this matter. It's good when a photographer already has a small portfolio, demonstrating what he is capable of. If there is no portfolio, then you can use photos of other photographers from magazines to understand what exactly the model wants to get.

Keep talking to the model during the shooting. The model should not wait for you to finally take the next shot with tension. To make the face in the picture look natural, you need to catch such a moment yourself. It is best to do this in communication, and here all ways are good: a joke, an anecdote, a simple interesting story – and a natural unstrained smile will surely appear in the picture. If you are taking photos of children, then stock up on chocolates and sweets that you can show the child from behind and cause his or her involuntary delight (and, of course, capture this delight in the picture).

Try to keep your pictures minimally staged. For example, you can invite a model to do something of her own and take pictures of her "in the process of work".

Thus, in portrait photography, you need to remember two main points. First of all, every portrait photographer is an excellent psychologist. Secondly, such shooting is always a tandem, a union of a photographer and a model, and only by their joint efforts is it possible to enjoy the shooting process, get an incentive for further work and, of course, make interesting portraits.

In order to capture a bright personality in the pictures – which is very important for an artistic portrait – not overshadowed by personal passions and problems, it is necessary to learn how to work with a model, no matter how "complex" he or she may be.

Often, a person in front of the camera is embarrassed, cannot relax and finds it difficult to be natural. The photographer's task is to help him or her "open up" in front of the lens. The work of a professional photographer is akin to the work of a professional psychologist: after a photography session with a real master, people forget their fears, stop feeling unattractive and insecure. The ability to emphasize the advantages of a person's appearance can have a therapeutic effect on the personality.

As a rule, getting into an extreme situation, a person does not have time for reflection and analysis and behaves naturally. But art photography is not shooting in extreme conditions. This is a process that requires preparation, which is sometimes quite lengthy. Unfortunately, during the preparation period, the model often manages to strain him- or herself to such an extent that the camera lens aimed at him or her causes a real thrill and even a state of stress – the so-called jitters, which may not be expressed explicitly, but will be present somehow.

Among the signs indicating that your model is panic-stricken, the following are obvious: there is a strong pallor (professionals tend to hide it under makeup), breathing becomes rapid, the forehead is covered with perspiration.

How to cope with this state?

Jitters can be removed quickly and effectively with the help of breathing exercises. For example one of them is square breathing with six seconds for inhaling, exhaling and pauses between them. You should also relax your muscles. The best way is to strain each muscle strongly, and then relax it. Special attention should be paid to the facial muscles. After a while, the model returns to his/her normal state.

The other extreme is overly confident models who believe that only they know which position of their body looks most advantageous in the photo and compulsively offer themselves to be photographed in this position. It is also not easy to win the favour of such a model: you can stretch yourself, convincing the stubborn woman that the needed pose is no less tempting [2, 3, 4].

In addition to the photo-shooting process itself, trust-based relationships between the photographer and the model are also necessary.

When performing any collaborative work, psychologists recommend following a certain sequence of actions.

At the stage of establishing a relationship, you should not spare any time or effort. Remember, you are laying the foundation for mutual understanding. At this stage, the model and the photographer drink tea, coffee or whiskey, study each other, find common interests – in a word, "nourish" the soil for the construction of subsequent relationships [5].

In order for the first contact to take place, a number of rules must be observed:

1. An unfamiliar model should be met only in an “open” pose, while showing the palms of the hands. You need to look straight into the eyes with a business look and be sure to smile sincerely.

2. In the first minutes of acquaintance, find out the name of the person and address him or her by name as often as possible. Remember to be careful when invading the private space, slightly adjust the details of clothing, makeup, build a pose. If possible, do not arrange a photo session during the first meeting, it is better to do it later. The level of communication will be completely different.

3. After establishing the first contact, jointly analyze the task before you. Also, make decisions on fundamental issues of work together.

4. Finally, leaving behind all the preparations and curtsies, you started shooting, with an immediate task to make the model smile. There are several simple ways to do it, the most banal being to ask him or her to say “cheese” in Russian or in English. However, over a century and a half, photographers have developed their own numerous ways of making models feel at ease.

We can conclude, that the photographer is responsible for the final result of photo-shooting, which is inherently related to his psychological approach to the model and ability to create a comfortable environment.

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OPTIMIZATION OF ELECTRIC DRIVES THROUGH FREQUENCY CONVERTERS WITH MULTI-ZONE SPEED CONTROL

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Abstract. This scientific article provides a comprehensive review and analysis of existing speed control methods in electric drives, with a focus on the study of frequency converters with multi-zone control. We examined the theoretical foundations of such converters, including the theory of multi-zone speed control, the principles of their operation, and the main parameters affecting system efficiency. Based on the literature review, optimization methods for control systems were proposed, including new algorithms aimed at improving the stability, accuracy, and energy efficiency of electric drives.

Keywords: electric drive, frequency converters, multi-zone control, optimization, energy conservation, speed control.

ОПТИМИЗАЦИЯ ЭЛЕКТРОПРИВОДОВ С ПРИМЕНЕНИЕМ ПРЕОБРАЗОВАТЕЛЕЙ ЧАСТОТЫ С МНОГОЗОННЫМ УПРАВЛЕНИЕМ СКОРОСТЬЮ

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Аннотация. Данная статья посвящена обзору и анализу существующих методов управления скоростью в электроприводах с акцентом на исследование преобразователей частоты с многозонным управлением. Авторы рассмотрели теоретические основы таких преобразователей, включая теорию многозонного управления скоростью, принципы их работы, а также основные параметры, влияющие на эффективность системы. На основе литературного обзора были предложены методы оптимизации системы управления, в том числе новые алгоритмы, направленные на улучшение стабильности, точности и энергоэффективности электроприводов.

Ключевые слова: электропривод, преобразователи частоты, многозонное управление, оптимизация, энергосбережение, скоростной режим.

In our time, where industrial processes are becoming increasingly automated, and energy efficiency takes the forefront, electric drives hold a crucial position in ensuring uninterrupted and efficient operation of many technical systems. They not only control the movement of mechanisms but also play a key role in the overall energy efficiency of enterprises.

In this context, attention to the optimization of electric drives, especially with the use of frequency converters featuring multi-zone speed control, becomes highly relevant. This technology provides the opportunity for a more nuanced and flexible adjustment of the operation of electric drives depending on the production requirements.

The research of existing speed control methods in electric drives involves analyzing various approaches and technologies used for regulating the rotational speed of electric motors. This includes evaluating the effectiveness of traditional methods, such as the application of frequency converters, PID controllers, as well as familiarizing oneself with innovative technologies, including vector and scalar control.

The application of frequency converters in electric drives offers significant advantages in the realms of energy conservation and efficiency enhancement.

One key advantage is the precise regulation of the rotational speed of electric motors. This enables the adaptation of drive operation to the specific needs of the system under various conditions, resulting in optimal performance with minimal energy consumption, especially in situations where the load is variable [1].

Furthermore, frequency converters provide the capability for smooth start-ups and deceleration of electric motors, contributing to the reduction of mechanical stresses and avoiding abrupt load fluctuations. This is crucial for extending the lifespan of the equipment and reducing maintenance costs.

However, it is important to note some drawbacks associated with the use of frequency converters. Firstly, they can be expensive in terms of installation and maintenance, which may be a significant factor when deciding to implement this technology. Secondly, frequency converters may generate electromagnetic interference, necessitating additional measures to protect the system from undesirable impacts.

Nevertheless, despite these limitations, frequency converters remain a crucial tool for enhancing the efficiency and stability of electric drives, especially in conditions with variable loads and production requirements.

Multi-zone control provides a more nuanced and flexible speed regulation based on different operating conditions. A key aspect of multi-zone control theory involves dividing the characteristics of the electric motor’s operation into several zones with varying control parameters. Each zone corresponds to a specific range of rotational speeds, allowing for more precise adjustments of the electric drive’s operation to meet the specific requirements of the production process [2].

One crucial concept in the theory of multi-zone control is the ability to switch between zones depending on the current load and operating mode. This ensures optimal

energy utilization and increased efficiency of the electric drive under changing production conditions.

Furthermore, the theory of multi-zone control addresses coordination and coherence issues among different zones to ensure smooth and stable system operation. This is essential for preventing transient processes and minimizing mechanical stresses in the electric motor.

Frequency converters implementing multi-zone control are based on advanced electric drive technologies, providing more precise control and adaptability to various operating conditions. The principles of their operation include the following aspects:

1. Semiconductor Components: Frequency converters rely on the use of semiconductor elements, such as transistors and diodes. These elements enable efficient alteration of the shape and parameters of the electrical signal, forming the basis for regulating the frequency and rotational speed of electric motors.

2. Multi-Zone Control: Frequency converters divide the speed range of the electric motor into several zones. Individual control is implemented in each zone, allowing the adaptation of the electric drive to different operating modes and load conditions.

3. Vector Control: Effective multi-zone control involves vector control, where both the amplitude and the phase of current and voltage are considered and controlled. This ensures more precise control of torque and the dynamics of the electric motor.

4. Zone Switching: Frequency converters automatically switch between zones based on current requirements and operating conditions. This enables the optimization of energy consumption and ensures stable operation under various loads.

5. Feedback Systems: To achieve high precision regulation, converters utilize feedback systems. These systems monitor current motor parameters and adjust control signals in real-time to maintain specified characteristics.

Such a comprehensive approach to multi-zone regulation in frequency converters provides efficient and flexible control of electric drives, significantly enhancing their energy efficiency and performance in various industrial applications [3].

Key parameters and characteristics that influence system efficiency are a crucial aspect of ensuring optimal operation and energy conservation. In this context, let’s consider the primary factors that impact system efficiency [4, 5]:

1. Motor Efficiency: The efficiency of an electric motor is represented by the ratio of useful output mechanical power to input electrical power. A high efficiency indicates that a significant portion of consumed electrical energy is converted into mechanical energy rather than being lost as heat.

2. Frequency Converter: The efficiency of a frequency converter is determined by its ability to efficiently convert incoming variable-frequency AC into the required frequency for controlling the motor’s speed. Modern converters ensure high efficiency across various operating modes.

3. Multi-Zone Speed Control: Multi-zone control allows dividing the overall speed range of the electric motor into zones, each of which can be individually regulated. This provides adaptability to different conditions and production requirements.

4. Feedback Systems: Feedback systems are employed for continuous monitoring of motor operation parameters. This information is relayed to the controller, which adjusts system parameters to maintain specified characteristics and minimize energy losses.

5. Mechanical Load: Precise matching of the electric motor to the mechanical load, including moment of inertia and rotational speed requirements, is a key factor. This ensures optimal power utilization and prevents unnecessary losses.

6. Thermal Management: Effective thermal management involves cooling and heat dissipation systems. Maintaining an optimal temperature in the system contributes to efficient operation and extends the lifespan of components.

Existing methods, such as PID control, have their advantages but are also limited in effectiveness under certain conditions.

The limitations of existing algorithms are analyzed, such as instability during rapidly changing loads or insufficient accuracy during sharp speed changes. It is crucial to consider the dynamic characteristics of the electric motor and the peculiarities of the operating process.

Enhanced versions of algorithms can also be utilized, incorporating:

1. Adaptive PID Control: Developing an algorithm capable of automatically adapting to changes in the operating load, preventing instability, and ensuring more precise regulation.

2. Load Prediction Models: Integrating load prediction algorithms for more accurate speed control in cases of abrupt changes in external factors.

3. Parameter Identification Systems: Using system parameter identification methods to refine control coefficients and improve regulation accuracy.

4. Neural Networks and Adaptive Systems: Designing smart control systems that leverage neural networks or adaptive algorithms to predict and correct load changes.

5. Considering Motor Dynamics: Integrating algorithms that account for the dynamic characteristics of the electric motor, ensuring more accurate control in various operating modes.

Such enhancements aim to improve the stability, accuracy, and adaptability of the speed control systems of electric drives, ultimately contributing to increased efficiency and productivity. Comparing the effectiveness of new speed control algorithms with traditional methods provides a crucial perspective on enhancing control system performance. The comparison results serve as key indicators for deciding on the optimal method.

Algorithms like adaptive PID control and neural network-based systems ensure stability and accuracy in speed regulation, surpassing traditional methods. This is particularly evident during abrupt load changes and rapid transitions between operating modes.

For responsiveness to load variations, algorithms utilizing load prediction models play a crucial role. They deliver faster responses to changes in external factors, effectively adapting to dynamic operating conditions and reducing the transition time to a stable mode.

The integration of feedback systems and the utilization of adaptive control algorithms contribute to reducing energy consumption during nominal operation and

partial load conditions. This leads to an overall improvement in the energy efficiency of the system. Control algorithms are designed to adapt to various operating modes, enhancing the system's flexibility. Traditional methods may be less effective in conditions of variable loads and frequent changes in rotational speed.

An essential aspect of the comparison is the simplicity of implementation and ensuring stable operation under various operating conditions. New algorithms should not only provide high efficiency but also be reliable and applicable in real industrial environments.

Within this article, an analysis of the advantages and disadvantages of using frequency converters in the context of energy conservation and improving the efficiency of electric drives has been conducted. The theoretical foundations of frequency converters with multi-zone speed control were explored, considering a review of multi-zone speed control theory, a description of the principles of frequency converters' operation, and an examination of key parameters and characteristics influencing system efficiency.

The developed concepts and proposals can serve as a starting point for further research and implementation in the field of energy conservation and optimization of electric drives using frequency converters with multi-zone speed control.

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