

ТЕОРИЯ И ПРАКТИКА СОВРЕМЕННОЙ НАУКИ: ВЗГЛЯД МОЛОДЕЖИ

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PROSPECTS FOR THE USE OF NANOMATERIALS IN AGRICULTURE

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Abstract. The paper deals with issues related to the prospects for the use of nanomaterials in agriculture. The ultimate goal of the introduction of nanomaterials into agricultural production is the creation of a friendly human environment and care for human health throughout life.

Keywords: animal husbandry, microfertilizers, nanomaterials, prospects for nanotechnologies, agriculture.

ПЕРСПЕКТИВЫ ИСПОЛЬЗОВАНИЯ НАНОМАТЕРИАЛОВ В СЕЛЬСКОМ ХОЗЯЙСТВЕ

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Аннотация. В работе рассматриваются вопросы, связанные с перспективами использования наноматериалов в сельском хозяйстве. Конечная цель внедрения наноматериалов в сельскохозяйственное производство – создание дружелюбной среды обитания человека и забота о его здоровье в течение всей жизни.

Ключевые слова: животноводство, микроудобрения, наноматериалы, перспективы нанотехнологий, сельское хозяйство.

Nanomaterials – what is it? For the first time, the concept of nanomaterials was clearly formulated by H. Gleiter [1, p. 50], who introduced this term into scientific circulation. Emphasis was placed on the decisive role of many interfaces in nanomaterials that change the structure and electronic structure. In accordance with these principles, the grain size (L) in nanomaterials was defined as being in the range of several nanometers, that is, when the proportion of the interface in the total volume of the material is about 50 % or more.

Nanomaterials have a complex of physical, chemical and biological properties that are radically different from the properties of the same substance in the form of continuous phases or macroscopic dispersions. Nanomaterials have the properties of highly efficient adsorbents, since they have a high specific surface area (per unit mass), which increases their adsorption capacity, catalytic properties, and chemical reactivity.

The terminology on nanomaterials and nanotechnologies has not yet been formulated and is just beginning to be established. There are several approaches to how to define what nanomaterials are.

1. The simplest approach is related to the geometric dimensions of the structure of nanomaterials. According to this approach, materials with an intrinsic microstructure size from 1 to 100 nm are called nanostructured.

2. The next approach is related to the rather high role of numerous interfaces in nanomaterials in the formation of their properties. In accordance with it, the grain size (L) in nanomaterials was determined in the range of several nanometers, that is, in the range when the volume fraction of interfaces in the total volume of the material is approximately $\Delta V \approx 50\%$ or more.

3. There is also an approach according to which, for nanomaterials, the largest size of one of the structural elements must be equal to or less than the size characteristic of a certain physical phenomenon [2, p. 33]. So, for strength properties this will be the size of a defect-free crystal, for magnetic properties – the size of a single-domain crystal, for electrical conductivity – the mean free path of electrons. The significant disadvantages of this approach are:

- firstly, the mismatch of the sizes of structural elements for different properties and materials;
- secondly, the difference in size for different states of the same material.

As factors determining the properties of nanomaterials, in addition to the initial assumptions associated with the decisive role of interfaces, size effects and the coincidence of the sizes of crystallites with the characteristic sizes for various physical phenomena are also noted.

Thus, we can conclude that a nanomaterial is usually called a natural, involuntary or intentionally produced material that contains particles in an unbound state, or as an aggregate or agglomerates, where 50 % or more particles are distributed in a size range of 1-100 nm [3].

Nanotechnologies can significantly affect all sectors of the agro-industrial complex and make the industry much more environmentally friendly. This is well understood in the USA its current growth rate of 25 %. Nanotechnology can be used in disease control, pesticide production and diagnostics, as well as in the development of functional foods, the production of packaging, agrochemicals, and so on.

At present, the extensive development of research on nanomaterials has found a rather serious response to their application in agriculture, for example, in poultry farming, animal husbandry, fish farming, and crop production. The use of nanotechnologies in agriculture is currently the most powerful prospect for a science-intensive solution of long-standing, complex, and urgent problems [4, p. 51] The

unique properties of nanoparticles, such as stable sorption of biomolecules, small sizes comparable to biomolecules, biocompatibility, and high surface energy, open up broad prospects for their use.

As for the methods for obtaining nanomaterials, they can be divided into a number of technological groups. Consider them in figure.

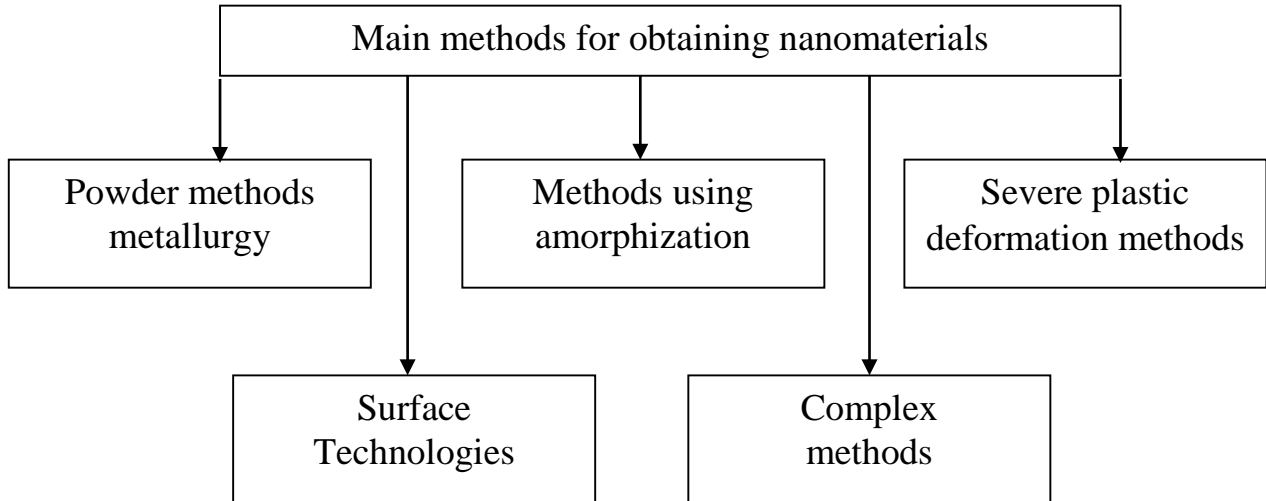


Figure. Methods for obtaining nanomaterials

As we see from the figure, there are a lot of methods for obtaining nanomaterials. Let's consider them in more detail.

1. Methods of powder metallurgy. These methods can be divided into two more groups – methods for obtaining nanopowders and methods for compacting products from them.

2. Methods using amorphization. Amorphous metal alloys are a promising new class of materials [5, p. 218]. There are the following methods for obtaining amorphous alloys:

- high-speed ion-plasma and thermal deposition of material on a substrate cooled by liquid nitrogen
- chemical or electrolytic deposition of metal ions on a substrate;
- melting of thin surface layers of parts with a laser beam;
- quenching from the liquid state.

3. Methods using severe plastic deformation. This group of methods for obtaining nanostructured materials is based on plastic deformation with large degrees of deformation under conditions of high applied pressures at relatively low temperatures. Under such conditions of deformation, a strong refinement of the microstructure in metals and alloys occurs up to the nanoscale range.

Methods using processing technologies are currently one of the most developing areas of materials science. These methods can be conditionally divided into two large groups – technologies based on physical processes and technologies based on chemical processes. Among all nanooriented surface treatment technologies, ion-vacuum coating technologies are by far the most promising.

The use of nanotechnologies in agriculture is a powerful prospect for a science – intensive solution to long-standing, complex and acute problems [6, p. 24]. The use of nanosized powders strengthens the immune system of suckling piglets and increases their survival rate, promotes better growth and development of young farm animals.

In agriculture, nanomaterials are mainly used to improve air quality, they are used to treat crops in order to better preserve them, both in terms of quality and time.

Nanomaterials are now such a common material that they are used to improve the growth and germination of various plants, as well as to treat certain animal diseases and improve feed quality. The unique prospects for the use of nanomaterials are largely determined by their extraordinary biological properties. Their small size, their ability to penetrate tissues and organs, and their high surface area form previously unknown biological effects, the use of which in practice makes it possible to create fundamentally new, unparalleled technologies.

Let us consider in more detail how exactly these materials are used in agriculture and animal husbandry.

1. In agronomy, nanopreparations are used as microfertilizers. This provides increased resilience to adverse weather conditions and a twofold increase in the yield of many food crops, almost all food and industrial crops, such as potatoes, grains, vegetables, fruits and berries, as well as cotton and flax. The result here is achieved due to the more active and rapid penetration of microelements into the plant. This is due to the nano-sized particles and their neutral status.

Nanomaterials are used in post-harvest processing of sunflower, tobacco and potatoes, storage of apples in controlled environments, air ozonation.

2. In animal husbandry and poultry farming, it is reasonable to use nanomaterials in technological processes, where they give additional results. When forming a microclimate in rooms where animals and birds are kept, the use of nanomaterials makes it possible to replace the energy-intensive supply and exhaust ventilation system with electrochemical air purification.

In the preparation of feed, nanomaterials provide an increase in productivity by 1.5-3 times, resistance to stress decreases by 2 times [7, p. 104]. Nanodevices that can be implanted in plants and animals make it possible to automate many processes and transmit the necessary data in real time.

3. Dairy industry. Here, nanotechnology is used to create end products of life. The use of nanotechnologies in agriculture is a powerful prospect for a science-intensive solution to long-standing, complex and acute problems. The use of nanosized powders strengthens the immune system of suckling piglets and increases their survival rate, promotes better growth and development of young farm animals. The direction of saturation of food raw materials with bioactive components (vitamins in the form of nanoparticles) is developing. Nanomaterials, in particular, nanosilver, nanocopper, are widely used in filters and other parts of dairy industry equipment to inhibit the processes of fermentation and souring of milk, disinfection of agricultural premises and tools, and packaging and storage of lactic acid foods.

Assessing the prospects for the use of nanomaterials in agriculture, it should be noted the growing interest in this type of materials. However, along with the undeniable prospects of nanotechnologies in animal husbandry, there are also constraining circumstances determined by the difficulty in predicting the properties of nanostructures and the presence of a large number of works on nanotoxicology. This became the rationale for taking special measures to regulate the nanomaterial market. Meanwhile, artificial microelement nanoparticles, if certain requirements for their manufacture are met, can be considered as a relatively safe class of nanostructures.

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ASSESSMENT OF LOSSES IN POWER GRIDS AND MEASURES FOR THEIR REDUCTION

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Abstract. The article touches upon the problem of distribution power losses in power grids. The work carries out their economic and technical assessment, physical and quantitative components, and also considers measures to reduce losses.

Keywords: electricity losses, electrical loss classification, electric power industry, reduction of electrical losses, power lines, electric power.

ОЦЕНКА ПОТЕРЬ В ЭЛЕКТРИЧЕСКИХ СЕТЯХ И МЕРОПРИЯТИЯ ПО ИХ СНИЖЕНИЮ

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Аннотация. В статье затронута проблема потерь распределительной мощности в электрических сетях. В работе проводится их экономическая и техническая оценка, физическая и количественная составляющая, а также рассматриваются мероприятия по снижению потерь.

Ключевые слова: потери электроэнергии, классификация электрических потерь, электроэнергетика, снижение электрических потерь, линии электропередач, электрическая мощность.

The main indicator of electric grid efficiency and electric power sales is electric power losses in grids during its transportation to the consumer. Every year scientific forums are held, the main agenda of which is reduction of electric power losses, reconstruction and technical re-equipment of power grids, modernization of electric power transportation and metering methods, and rationalization of monetary charges for it. Unfortunately, the trend in recent years remains the growth of losses, which,

although logically justified due to the development of the entire energy sector as a whole (growth of consumed reactive power and lagging grid capacity, concentration of production at large power plants), but still remains extremely undesirable [1]. Thus, in recent years, compared to pre-crisis values, their growth was one and a half to two times. Electricity losses are defined as the difference between the active power produced and supplied to the consumer and the reactive power that goes to work of electric appliances and is recorded by the meter. The International Commission has established that the most permissible value of electric power losses in grids can be considered 5 percent of the generated power, while losses at the level of 10 percent are the maximum recommended.

The main task both in the development of methods to improve the control of electricity consumption and in the prediction of losses in the short and long term is their economic and practical efficiency. Conventionally, we will not be able to replace copper wires with aluminum wires because of the uneconomical nature of this method, although silver is a more promising conductor. It is also necessary to consider the main peculiarity and uniqueness of power generation, which is the need for internal costs of the enterprise of the product itself to transport it to the consumer.

The main causes of losses are [2]:

1. Losses due to the physical properties of the conductor (losses in the elements of the power grid). They are caused by the physical properties of the material from which the conductive element is made and the heating of the element, when the electric current passes through it.

2. Losses for power generation directly at the enterprise and its needs. Recorded by means of meter readings installed at the enterprise itself.

3. Electricity metering losses (relative instrument error). They are caused by instrumental errors in their measurement.

4. Losses from the illegal use of electricity (theft losses).

5. Losses from payment delays.

Technical losses, which are related to the physical characteristics of power transportation, deserve special attention. This type can be classified as conditionally-constant losses and variable (load) losses. Conditionally-constant losses are technical losses that are virtually independent of load. Variable losses are losses of electricity in lines and power transformers, which depend on the transmitted load.

Conditionally-constant:

1. No-load losses in power transformers.

2. Losses at wire connections and busbars.

3. Corona losses in overhead power lines.

4. Leakage current losses on overhead line insulators.

5. Ice melting losses.

6. Losses in current and voltage measuring transformers.

7. Insulation losses in power cables Corona and leakage losses belong to the group of climatic losses, which depend on weather conditions.

Load losses:

1. Losses in power lines.
2. Power transformers.
3. Current limiting reactors.

Of the losses presented above, 64 percent are overhead transmission line losses, followed by corona losses, which account for approximately 17 percent of the total losses.

As you can see, power losses have different nature and different areas of their manifestation, and therefore it is impossible to find a universal approach to their solution. That is why many specialists carry out time-consuming work to develop and improve methods of loss reduction. It is possible to reduce costs by optimizing the technical and commercial component. In the first case it is necessary: to improve the quality of schemes and operating modes of the power grid; to conduct a comprehensive study of statistical stability and allocation of powerful load nodes; to try to reduce the total power due to the reactive component, which will lead to increased active power; to optimize transformer loads, to work on replacement or reconstruction of used equipment for power generation and transportation. Various methods of load balancing [3]. For example, this can be done by introducing a multi-tariff payment system, in which the cost of kWh is increased during peak load hours. This will make it possible to significantly consume electricity during certain periods of the day, as a result the actual voltage will not "drop" below the permissible norms [4].

Commercial costs can be coped with by: improving the automation of data collection and processing and verification of readings; conducting scheduled work to find unauthorized connections; and improving the work of the departments that perform control.

All methods presented above should be tested for economic and technical efficiency before use. Determination of the numerical value of technical efficiency from the introduction of measures to reduce power losses is carried out in order to [5]:

1. Comparison and analysis of the results of loss reduction obtained by calculation and the actual values achieved as a result of the implementation of the measure.

2. Accumulation of statistics on the numerical values of the effects of the implementation of measures and their further use in the development of measures for the next periods.

Analysis of the effectiveness and feasibility of the implemented methods to reduce losses based on the results of the event.

However, as mentioned above, the values of the actual power losses are influenced by a very diverse range of factors, many of which cannot be predicted and calculated. However, in order to account for the actual effectiveness of the implementation of the measure, we propose methods that take into account factors that can be numerically evaluated. The effectiveness of project implementation can also be characterized by a system of economic indicators and criteria reflecting the ratio of costs (one-time and current) and the results obtained during the implementation of

measures at the facility [6]. Depending on the scale and significance of the measures (new construction, expansion, reconstruction, technical re-equipment, modernization, rationalization proposal) simple (statistical) or integral criteria can be used.

As simple indicators and criteria used to evaluate the activities, with a period of investment of one year and unchanged over the years of operation current costs are proposed as follows: net income, payback period, return on investment, return on investment.

Carrying out complex works on quantitative assessment of arising losses, their nature, methods, that are offered for their decision and calculation of increase of work of electric power companies, it is possible to achieve reduction of electric power losses during its transportation up to tolerable values (5-10 percent). However, this requires time, which is used for experimental evaluation of the proposed methods and their widespread implementation.

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INTERNET ADDICTION: CAUSES, SYMPTOMS AND WAYS TO TREAT IT

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Abstract. Despite a number of advantages of Internet technologies in the professional and social life of each of us, these technologies can cause behavioral disorders that harm the psychophysical health of people and, in particular, children. This article discusses the methods and ways of the influence of the Internet on children, shows the causes of Internet addiction.

Keywords: addiction, Internet, technologies, cause, treat.

ИНТЕРНЕТ-ЗАВИСИМОСТЬ: ПРИЧИНЫ, СИМПТОМЫ И СПОСОБЫ ЕЕ ЛЕЧЕНИЯ

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Аннотация. Несмотря на ряд достоинств интернет-технологий в профессиональной и социальной жизни каждого из нас, эти технологии могут стать причиной расстройства поведения, что наносит вред психофизическому здоровью людей и, в частности, детей. В данной статье обсуждаются методы и способы влияния интернета на детей, показаны причины интернет-зависимости.

Ключевые слова: зависимость, интернет, технологии, причина, лечение.

Digital and new technologies are now part of the daily life of each of us; however, for some, internet use becomes a real mess, the so-called "internet addiction". The concept of "addiction", which is used to define addiction of a physical nature (for example, abuse of alcohol, drugs, tobacco, etc.), expands the boundaries of its essence by adding actions and behaviors to things. Today there is talk of "new addictions" or "new addictions" or addiction to gambling, work, sex, compulsive shopping and the internet. In this article, we'll look at internet addiction, the main symptoms, risk factors, and the most effective treatments. Technological innovations have led to a number of socio-cultural and economic changes. In some aspects, the technology associated with the internet has brought a series of benefits and improvements to the professional, school and social life of each of us; in other respects, it has been the cause of disorders and behaviors that harm the psychophysical health of people. The term "internet

addiction" is an Italian translation of the word "Internet Addiction Disorder" with the abbreviation IAD, coined in 1995 by the American psychiatrist Ivan Goldberg. As the term itself suggests, it is a pathological behavior that takes the form of excessive use of the internet; an abuse that generates negative consequences from a cognitive, emotional, relational and economic point of view [1, p. 15]. When a person with IIA does not have access to the Internet, he shows a pronounced state of irritation and anxiety.

It is a condition usually associated with impulse control disorders; a condition that causes anxiety and tension, or a series of diseases in which the subject finds relief through the use of the network. Loss of control, mood swings, social disorders are among the inevitable consequences for those who abuse the internet. "Internet addiction, also known as internet addiction (acronym for Internet Addiction Disorder in English; IAD), is an addictive disorder associated with the intense and obsessive use of the internet in all its forms, from browsing social networks to watching movies, online games. For about a decade, the disease on the internet has been the subject of a lot of research and analysis. According to the results noted by some scientists, internet addiction can affect various aspects of the web. Each individual will have their own source of satisfaction, depending on their individual characteristics, circumstances and circumstances, they can be online shopping, betting, chat, social networks, videos, etc. Then there are those that show a generalized dependence that is not related to specific areas or functions, but simply linked to the computer [2, p. 12]. The intense pace and daily commitments cause stress, the symptoms of which are often confused with internet addiction.

Therefore, it is not easy to understand that you have fallen into an addiction tunnel. So, let's try to understand what are the main signs that indicate dependence on the network. Irritability, depression, and mood swings are the most common symptoms. When the use of the internet is restricted for one reason or another, the addict shows clear signs of anxiety and dissatisfaction, and then there is a decrease in interest in any other activity that is not online. It is common to lie to yourself and others about the time you spend online (denying the problem) and feel the need to connect more. Attempts to limit the use of the internet are perceived as useless, as a result of which the level of discontent, which is suppressed only by connecting to the internet, grows. The consequences inevitably affect social life, but also school and work activities. The internet occupies an important place in people's lives; the importance that arises at the expense of relationships and really important actions.

At the physical level, network addiction is manifested by a feeling of chronic fatigue, as well as changes in appetite, vision and even affecting the immune system. In some cases, headaches, back pain, tachycardia, cramps, and carpal tunnel syndrome occur. We even face epileptic seizures caused by intermittent visual stimulation due to excessive standing in front of the screen. Digital addiction can affect anyone, young and old, men and women. According to recent studies and studies, there is no one type of person who is vulnerable to others. However, some categories that are at risk have been identified, that is, individuals with characteristics that identify a greater

vulnerability. Among the subjects at risk are single men, middle-aged women, university students and people with a low level of education in general. Another category of particularly vulnerable subjects is shy people and people "affected" by self-esteem. We conclude with psychological disorders; internet addiction is often determined by reasons related to a certain emotional fragility, anxiety and depression [3, p. 41]. Internet addiction can be treated, but it is important to choose the right remedies.

Contrary to what many think, psychiatric drugs cannot be considered a remedy for internet addiction. Addiction to situations in which therapy based on psychotropic drugs is required are situations associated with a pronounced and severe level of depression. The most effective treatment for those who suffer from internet addiction is currently psychotherapy, especially cognitive-behavioral therapy, that is, a psychotherapeutic line that aims to identify alternative behaviors that can gradually replace the excessive use of the internet. In addition, through psychotherapy, the subject who suffers from addiction can be helped to overcome any socio-relational difficulties caused by the addiction. Whatever therapy is taken, for it to be really effective, it must start from a basic basis: the person being treated must recognize their addiction. Advantages of the internet and technologies in the therapeutic field. So far we have analyzed the negative aspects related to the internet and the digital; we have talked about abusive behaviors that are as addictive as any other activity or substance. But instead, if used in the right way and with the right criteria, be careful not to demonize what is a very useful tool for the activities of many professionals. The field of psychology is one of those that unexpectedly benefits from the endless possibilities of the web and digital. For those who work in the psychology sector and intend to specialize in digital tools that can be used and applied in the clinical-therapeutic and rehabilitation areas, the master in digital psychology, activated by the telematic University of Niccolò Cusano, is available. It is a second-level postgraduate course aimed at training highly qualified profiles; professionals capable of establishing effective digital interventions [4, p.102].

In addition to providing education regarding technological/digital tools used in the clinical-therapeutic field, the program provides for an in-depth study of topics related to misuse and/or abuse of technologies and related psychopathological effects. So cyberbullying, cybertalking, cybersex, hikikomori and internet addiction phenomena such as:

Here are the topics of the detailed curriculum:

- Evolution of digital tools in psychology and artificial intelligence
- Rehabilitation of cognitive dysfunctions in developmental age through technology and video games
- Virtual reality and psychology: from technological aspects to areas of application
- E-therapy: criteria for effectiveness, possibilities and limits of technology-mediated facilities
- Biofeedback, neurofeedback and application fields

- Visual training and visuopostural reprogramming in neurodevelopmental disorders
- Hikikomori syndrome: social isolation of young people
- Meditation 3.0: benefits of using virtual reality on the path of meditation and consciousness
- Internet addiction: criteria and types of internet addiction
- Digital marketing strategies for psychologists, psychotherapists and health professionals. Create personal branding
- Cybersex: the relationship between sexual behavior and new technologies (cybersex addiction, sexting, cyberpornic addiction)
- Violence and discrimination via the internet (gender violence, cyberbullying, occupational violence, cybertalking)

At the end of the master's degree, the student will be able to treat various disorders with technological means; use immersive virtual reality as a therapy to overcome certain phobias; gain knowledge to establish new therapeutic electronic therapy parameters. Therefore, the acquired know-how can be spent in the clinical, social, corporate and educational sectors. The master's professional skills will be used in the framework of psychological and Scholastic support, in the prevention sector of disorders associated with the misuse of technologies, and in the treatment of specific phobias [5, p. 48].

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THE POSITIVE EFFECT OF THE OPERATION OF UNMANNED VEHICLES

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Abstract. The positive effect of the operation of unmanned vehicles (UVs) is considered in the paper. The purpose of the article is to show that this type of transport makes people's lives safer and more comfortable.

Keywords: unmanned vehicles (UVs), autopilot, operation, transport, types of UVs.

ПОЛОЖИТЕЛЬНЫЙ ЭФФЕКТ ЭКСПЛУАТАЦИИ БЕСПИЛОТНЫХ ТРАНСПОРТНЫХ СРЕДСТВ

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Аннотация. В работе рассматривается положительный эффект эксплуатации беспилотных транспортных средств. Цель статьи – показать, что такой вид транспорта делает жизнь людей более безопасной и комфортной.

Ключевые слова: беспилотные транспортные средства, автопилот, эксплуатация, транспорт, виды беспилотных транспортных средств.

The development of technology for unmanned vehicles (UVs) does not stand still. UVs in the modern world are used everywhere: in the field of transportation of goods and passengers in the air, on land, in space, in water (cars, rail transport, water transport), and are also used for military and civilian purposes (drones of various types).

An unmanned vehicle is a vehicle equipped with an automatic control system that can move without human intervention.

An automatic control system is an autopilot, a device or a software and hardware complex that drives a vehicle along a certain trajectory given to it.

Autopilots are most often used to control aircraft (due to the fact that flight most often occurs in a space that does not contain a large number of obstacles), as well as to

control vehicles moving along rail tracks. Modern autopilot allows you to automate all stages of the flight or movement of another vehicle [1].

By type of transport, unmanned vehicles are divided into: water, land, space, air. This figure clearly shows the classification of UVs [2].

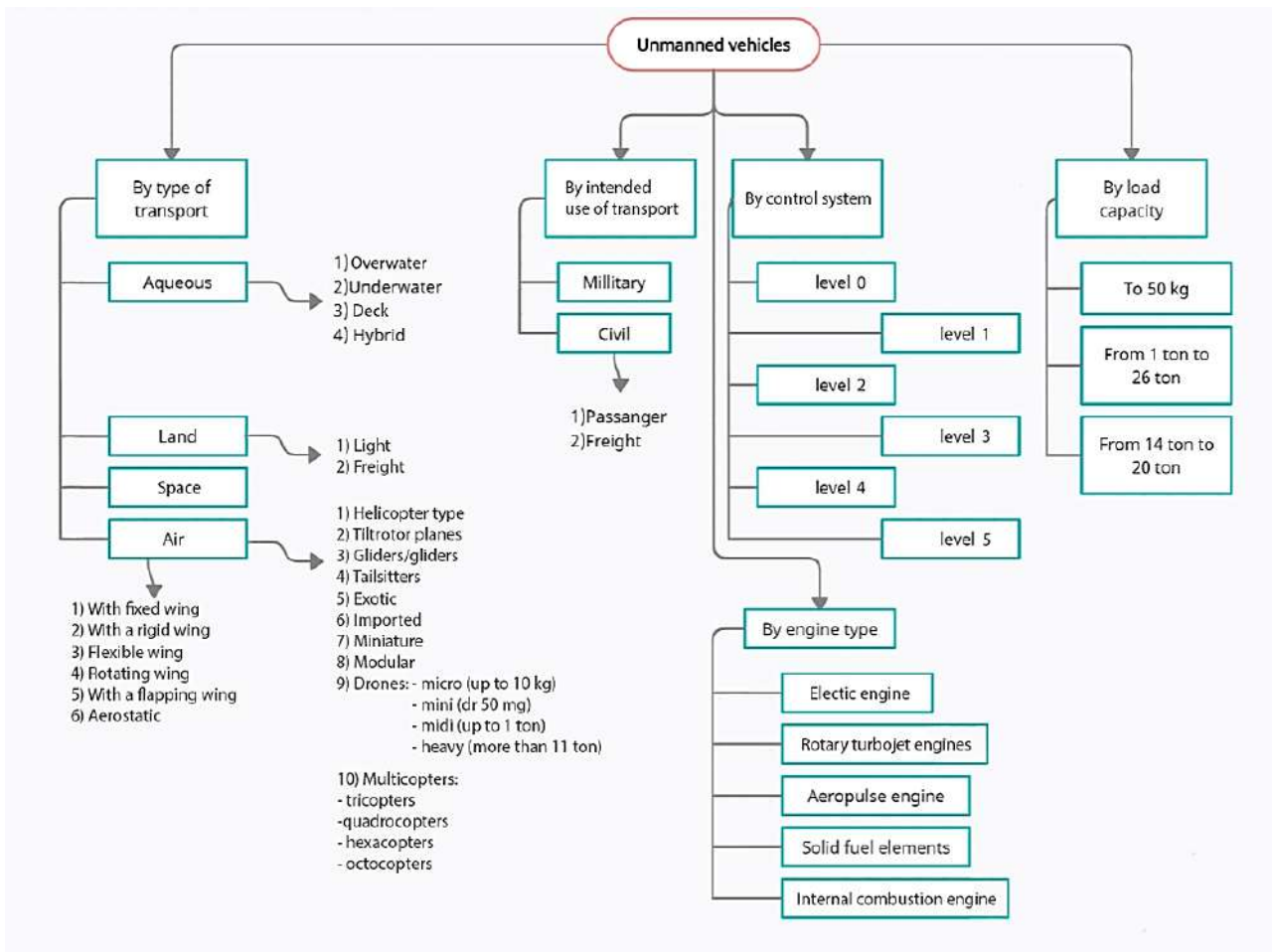


Figure. Classification of unmanned vehicles

Inventions in the field of avionics and radio engineering inspired the creation of the first automated street vehicles: in 1914, the first autopilot of an airplane on a gyroscopic stabilizer was demonstrated in France.

The radio-controlled car was first introduced by RCA in October 1921 in Dayton, Ohio. The three-wheeled vehicle was controlled wirelessly from radio equipment on another car. A similar radio-controlled car was demonstrated in 1925 on Fifth Avenue in New York. The unmanned vehicle was closely followed by a second car, in which there were radio transmitters and an operator.

Research on the creation of unmanned or robotic vehicles began in the late 1950s. Jameson Wetmore describes in detail the 60-year history of the creation of automated highway systems in America and the ideas behind them. You can read it here and here. In 1958, General Motors and the Radio Corporation of America (RCA) jointly tested automated prototypes of roads equipped with radio-controlled speed control and taxiing of the car. As it was written in 1960, magnets embedded in vehicles were attracted by a steel cable laid under the road, and control towers monitored the

general traffic flow. The onset of a new revolution seemed so inevitable that in 1960 the New York Times wrote that "we will come to full-scale use in 15 years" [3].

In the article, we will concentrate on the positive effect of the operation of unmanned vehicles in people's everyday life. At the moment, unmanned vehicles are used in agriculture, logistics, and industry.

In the agricultural sector there are a lot of applications of UVs. For example, in Russia testing began in the summer of 2020 in the fields of the Rostov region. They began to use unmanned harvesters for harvesting grain. They have an autonomous control system developed by the Russian company Cognitive Pilot. The results of the experiment were impressive. Direct crop losses are reduced by 8-13 %. Fuel consumption is reduced by 5 %. The influence of the human factor decreases – combine harvesters get less tired, perform other tasks better. The number of accidents and breakdowns is reduced.

In early November, the results of testing combine in 35 regions of Russia were published. From June to October 2020, machines equipped with the Cognitive Agro Pilot system processed more than 160 thousand hectares and harvested over 720 thousand tons of harvest. The scale of savings amounted to more than 500 million rubles. This result was achieved thanks to the reduction of fuel costs and related materials, reducing the time of the harvesting campaign. The reduction of the human factor has also had a positive effect: combine harvesters are not responsible for movement and pay more attention to other aspects of harvesting.

Having seen the economic benefits of using unmanned technologies already during test launches, agricultural enterprises began to put them on their combines. As of September 1, the Agro Pilot system was installed on 350 machines. Rusagro has made another large order – 242 sets of equipment for the modernization of combines. Thanks to this, drones will appear in the fields of the Belgorod, Tambov, Kursk and Oryol regions, in the Primorsky Territory.

The cooperation of Cognitive Pilot with the Russian-German agroholding EkoNiva also opens up great prospects. The three-year agreement implies the introduction of an unmanned system on equipment in 35 regions of the Russian Federation. So, the number of combines with autonomous control will only increase.

Also, there are great prospects for the use of drones in the field of logistics. The American company Amazon followed the path of drones, which presented the design of a new Prime Air drone designed to deliver goods from its online store directly to customers. This is a hybrid of a helicopter and an airplane: this design will allow the drone to make long-distance flights, while carrying out vertical take-off and landing, which is necessary for the delivery of goods to courtyards and roofs. The flight range of the new drone is about 24 km, it is able to "feel" obstacles in the air and on the ground and "avoid" [4].

In industry, the exploitation of unmanned vehicles is extensive. Back at the end of 2019, Russian company KAMAZ began testing an unmanned truck created as part of the Odyssey project. Its purpose is the delivery of components for assembled machines. He moves independently on the territory of the plant between the workshops.

After the April digest of Russian inventions and achievements, KAMAZ successfully tested its trucks in the Arctic. Cars with autonomous control overcame 2,500 kilometers without incident at the Vostochno-Messoyakhskoye field in the Yamalo-Nenets Autonomous Okrug. Trucks moved along a given route with high accuracy, recognized obstacles and predicted the trajectory of movement taking into account the road situation. At the end of 2019, KAMAZ with unmanned control began working at one of the Kuzbass mines. The truck is able to avoid obstacles, rebuild, recognize intersections, and identify road signs.

Autonomous cars are also being introduced abroad. For example, in Norway, Volvo trucks without drivers work at one of the quarries. They carry the breed on a closed territory – this does not require permission from the authorities [5].

If we talk about such a popular production niche as cars, many countries are currently implementing unmanned vehicles into everyday life. With the help of UVs, they are working to improve the infrastructure of cities and the everyday life of people in general. Russia took 22nd place among 25 countries in the rating of the audit company KPMG, which assessed the readiness of individual states to introduce unmanned vehicles. KPMG's research is based on an assessment of policy and legislation, technology and innovation, infrastructure development, and consumer adoption of self-driving cars. The top five in the ranking included: the Netherlands, Singapore, Norway, the USA and Sweden [6].

In Russia, 4 companies are developing unmanned vehicles, such as Yandex, SberAuto Tech, StarLine and KAMAZ. In the US, about 15 companies are developing this type of transport and 4 of them dominate the global market. These are General Motors, Tesla, Ford and Waymo.

Self-driving cars are considered the vehicle of the future. They have undoubted advantages, because the number of accidents on the roads is reduced. Many people suffer from accidents: they have to spend money on car repairs, improve their health, and in the most difficult situations, the case ends in death. Drones reduce the likelihood of their occurrence to a minimum, so this type of transport is safer for people.

Today, unfortunately, not all countries are ready for the active use of unmanned vehicles, primarily due to the low level of access to the latest technologies. Many countries lag behind in terms of regulatory support for technology, 4G and 5G network coverage, and partnerships between automakers and technology providers. At the same time, there is a maximum readiness of the world population for the operation of this type of transport, because the future belongs to it.

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**PEDAGOGICAL POTENTIAL OF PROJECT ACTIVITIES
IN THE FORMATION OF LEADERSHIP QUALITIES OF HIGH
SCHOOLERS IN THE CONDITIONS OF THE INTERNET NETWORK
COMMUNITIES**

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Abstract. This article uses the arguments in the use of Internet network communities as a means of forming the leadership qualities of high schoolers.

Keywords: leadership, project activities, Internet, communities, high schoolers.

**ПЕДАГОГИЧЕСКИЙ ПОТЕНЦИАЛ ПРОЕКТНОЙ ДЕЯТЕЛЬНОСТИ
В ФОРМИРОВАНИИ ЛИДЕРСКИХ КАЧЕСТВ СТАРШЕКЛАСНИКОВ
В УСЛОВИЯХ СЕТЕВЫХ СООБЩЕСТВ ИНТЕРНЕТА**

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Аннотация. В данной статье приводятся аргументы в пользу использования сетевых сообществ Интернета как средства формирования лидерских качеств старшеклассников.

Ключевые слова: лидерство, проектная деятельность, Интернет, сообщества, старшеклассники.

In accordance with the requirements of the Federal State Educational Standard of Secondary General Education, according to the "portrait of a school graduate", a student must demonstrate such qualities as creativity, the ability to think critically, be motivated for creativity and innovation; should be able to respect the opinions of other people, be able to conduct a constructive dialogue, reach mutual understanding and successfully interact.

The project method has now gained great importance in the educational activities of schoolchildren. It applies from elementary school to high school. The value of this technology is difficult to overestimate. Thanks to the project method, we can form a huge number of qualities. And its most important advantage is the personal interest of the performer in the result. The classification of school projects has a fairly large number of criteria, but we will recall the criterion for the appointment and the criterion for the number of participants involved. According to the first criterion, educational,

research, practical, creative are distinguished. According to the second criterion, group and individual projects are distinguished.

At the same time, according to Rosstat, the population aged 15-74 using the Internet in 2020 amounted to 87.2 % of the total population of Russia. It is noteworthy that every year this figure is growing [1, p. 476]. This suggests the idea of the expediency of using ICT in schools. According to our survey, which involved 67 high schoolers from different cities, the following answers were received to the question “how often do you use social media”:

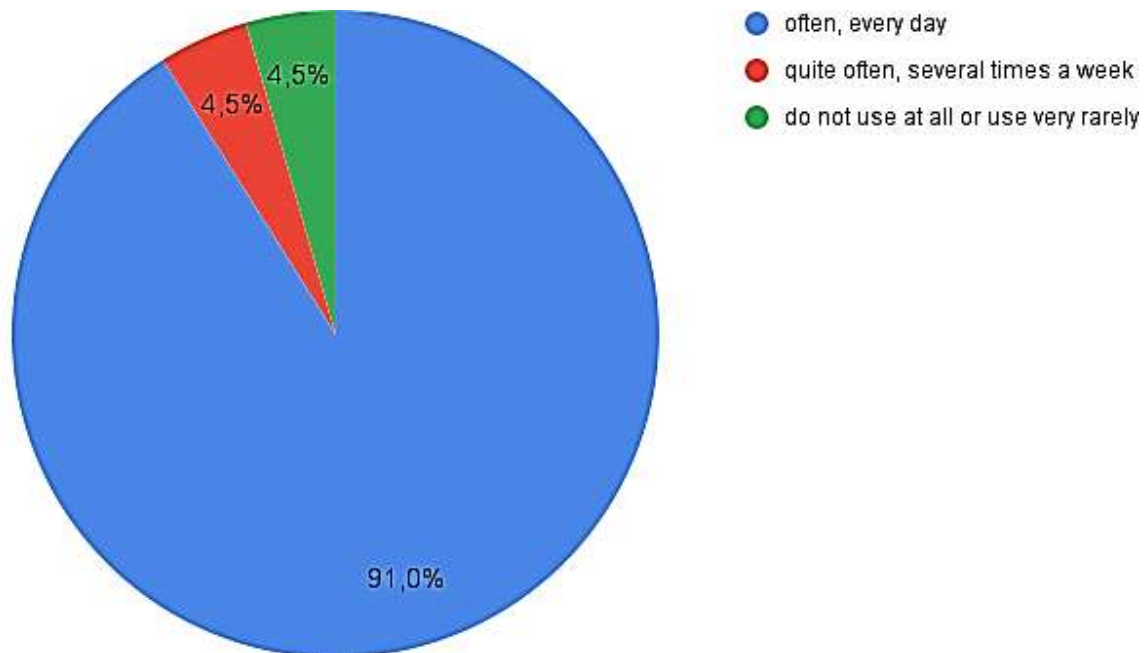


Figure. Results of a survey of high schoolers on the frequency of using social media

As you can see, social media occupy a large place in the lives of adolescents, which is why we decided to consider the potential of project activities in the formation of leadership qualities of high schoolers in the conditions of Internet network communities.

First, let's define what we mean by a network community. A network community is a group of people interacting on the basis of Internet communications, having common connections with each other, capable of manifesting joint forms of activity and self-reflection [2, p. 54]. In other words, to define the relationship between "network community" and "social media", let's clarify that an online community is a group of people interacting in the context of social media.

Why do we consider online communities as a form factor in the development of leadership qualities of high schoolers? It is obvious that the use of social media by high schoolers every day forms some of their social interaction skills in the Internet environment, the only question is what vector the school should give in order for these skills to become a trump card in the graduate's sleeve.

In order to more accurately scientifically substantiate the totality of qualities that determine a leader, in the course of the study, a content analysis of the views of

scientists (N. P. Belyatsky, L. V. Kartashova, N. K. Mikhailovsky, etc.) was carried out.

This research method, based on the principle of repeatability of different semantic units, made it possible to determine the frequency of occurrence of the same control functions in various pedagogical studies. To conduct content analysis, a matrix type table was used (Table 1), containing the parameters “quality”, “Names of scientists”, “frequency of occurrence of positions of scientists (number of matches)”, as well as a matrix type table (Table 2), containing the parameters “ability”, “Names of scientists”, “frequency of occurrence of positions of scientists (number of matches)”.

Table 1 – Qualities that characterize a leader

Quality	Names of scientists											Number of matches	
	O. Tead	B. Nanus	P. Drucker	J. Howell	R. Mann	A. Lawton	T.J. Neff	S. Ross	S. Kossen	N.K. Mikhailovsky	L.V. Kartashova		N.P. Bialiatyky
composure	+			+	+		+	+					5
having personal values	+	+		+									3
purposefulness	+	+					+		+				4
problem solving skill	+								+				2
knowledge of management approaches	+										+		2
focus on personal growth	+						+						2
insight		+				+		+					3
initiative		+	+			+	+		+		+	+	7
sociability				+	+	+	+		+				5
intellectuality		+			+		+					+	4
tolerance					+	+		+	+				4
determination		+	+			+				+		+	5
charm and charisma						+							1
creativity									+				1
ambition									+				1
self confidence									+		+		2

Table 2 – Abilities that characterize a leader [3; 4; 5; 6]

ability	Names of scientists											Number of matches	
	O. Tead	B. Nanus	P. Drucker	J. Howell	R. Mann	A. Lawton	T.J. Neff	S. Ross	S. Kossen	N.K. Mikhailovsky	L.V. Kartashova		N.P. Bialiatyky
ability to influence others	+				+					+		+	4
ability to lead	+			+					+		+	+	5
ability to train and develop others	+		+	+									3
ability to form working groups	+	+	+						+				4
ability for advanced learning		+				+							2
ability to understand relationships		+							+				2
the ability to value your time			+										1
ability to focus on results			+										1
the ability to use power for the benefit of others				+									1
ability to learn from criticism				+									1
adaptability				+	+								2
capacity for empathy					+								1

So, after analyzing the points of view of 12 different authors, we identified the most common:

a) qualities: self-control, purposefulness, initiative, sociability, intelligence, tolerance, determination;

b) abilities: the ability to influence others, the ability to lead, the ability to form working groups.

We would like to draw attention to the fact that each of the listed qualities is not only innate, but can be acquired, exactly the same as abilities.

In the 20th and early 21st centuries, group activities of students were carried out in real conditions. Now, having on hand services 2.0. new horizons for organizing joint activities are opening up for high schoolers. So, for example, a joint project was carried out in the environment of the network community already by graduates of 2017-2018. The main tools were social media VK, as well as Google Docs and Goggle Presentations and built-in group chats within Google. This combination made it possible to effectively organize brainstorming, discuss ideas, and jointly edit media

files in real time. It is noteworthy that all this was done by the participants on their own, without the participation of a teacher.

Consider several features of project activities in the conditions of network communities:

1. With an uneven distribution of leadership, that is, with situational leadership in a group in a network community, it is easier for participants to control the process of completing a stage by other participants. The product (i.e. the result of the project) is built "in front of" the situational leader, which allows you to quickly make changes in the course of the activity, and not after the completion of the stage;

2. Numerous brainstorming services allow you to quickly and efficiently generate ideas, involving all group members at once, and also allows the leader to track the behavior of each group member for further distribution of subtasks;

3. Online communities turn out to be quite effective in research projects. By participating in a particular community, you can quickly collect statistical data and subsequently combine them into a single whole. So, often, a class conversation on VK becomes a tool for numerous studies both inside and outside the network community.

Thus, the features listed above suggest that at present, teachers should pay great attention to the use of ICT both in the classroom and in extracurricular activities of students. Keeping up with the times, we not only provide comfortable conditions for raising a child, but also prepare him for life in the next generation, because soon networking skills will play a huge role in the labor market.

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TRANSLATION AS AN OPPORTUNITY TO UNDERSTAND THE ART OF CINEMA

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Abstract. The goal of the work is to analyse movies, movie titles, to determine the adequacy of the translation from English into Russian as an opportunity to understand the linguistic and cultural characteristics of a particular country. New movies appear very quickly, as a result of which translators do not always pay enough attention and effort to guarantee that their translation is exemplary.

Keywords: cinema translation tactics, extralinguistics (external linguistics), adaptation, adequate translation strategies.

ПЕРЕВОД КАК ВОЗМОЖНОСТЬ ПОНЯТЬ ИСКУССТВО КИНО

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Аннотация. Цель работы – проанализировать фильмы, их названия, определить адекватность перевода с английского на русский, чтобы понять языковые и культурные особенности конкретной страны. Новые фильмы появляются очень быстро, в результате чего переводчики не всегда уделяют достаточно внимания и усилий, чтобы гарантировать образцовость их перевода.

Ключевые слова: тактика киноперевода, экстралингвистика, адаптация, адекватные переводческие стратегии.

Just like literature, theatre and music, cinema is one of the art forms. Moreover, cinema is an excellent way to set off on a journey to uncover other cultures, languages and ways of life. One of the most significant achievements of cinema is that it is a fairly easy-to-understand art form, and it plays a leading role in the globalization of culture.

The interest in capturing other perspectives through the camera lens has produced many classic and modern movies. Most blockbuster movies are produced by English-speaking countries and distributed worldwide, necessitating the need for movie translation. Dealing with the subject of translation is far from being easy, it's a challenging and resource intensive process.

At present, a large number of (numerous) foreign movies have been imported to Belarus, Russia and other countries. Their original titles presented in a foreign language

must be translated. The title is a reference point in the choice of the movie by the viewer. To come up with a fulgent and exact title is quite an art. But no less art – correctly translate the name of the movie so that it is equal to the original name. This requires not only distinctive knowledge of a foreign and native language, but also certain extralinguistic knowledge, ingenuity, and creativity.

A movie is considered by many to be an important art form; movies entertain, educate, enlighten and inspire audiences. The visual elements of the movie don't need any translation, giving the movie a universal power of communication [1, p. 35].

Any form of audiovisual translation ultimately plays a unique role in the development of both national identity and national stereotypes. Movies can be an extremely influential and powerful vehicle for conveying values, ideas, and information.

In their work, the translator rarely relies only on his own knowledge. After all, the possession of the context is the basis for the accurate transmission of meanings.

For example, if the dialogue is about financial transactions, then you cannot rely on Google translator or a dictionary of general terms. You need to look for trusted sources of information in English, fill in the gaps in knowledge – and only then translate the phrase. For the translation of movies with a very highly specialized vocabulary, individual experts who understand this area are involved. Translators rarely risk reputation by trying to translate without context. After the translator completes the work, the draft version is necessarily analyzed by the editor. The translator and editor work in symbiosis – two heads are better. Sometimes the editor offers the translator obvious solutions that, for some reason, the specialist did not see. This helps to avoid stupid situations when communicating with the customer.

The title of the movie is the first thing a viewer pays attention to. A person's first encounter with the movie determines the interest in it. The success with the audience largely depends on how good the title is. Good movie names could convey the movies' content as well as arouse audience's interest to know more about it.

Movie titles are movies' eyes, having double effect of art appreciation and commercial advertisement, and directly playing the role of guidance and promotion. It is the title and its translation, in some cases 'retitling', that determines whether a person will watch the movie trailer and go to a cinema. Thus, the study of movies titles and its translation remains a vast field for research and discussion, it has gained wide interest among Russian viewers. In the name of every movie, an important role plays linguistic and cultural features that are understandable only to a native speaker, but which must necessarily be transferred to another language, while preserving the originality, attractiveness and capacity. All this force an interpreter to search for and use translation transformations or strategies more accurately than when working with other types of texts. This also makes movie titles the best material for studying translation transformations, which is a reflection of the linguistic and cultural specifics of the language. It can be argued that the title of the movie requires a special translation than other types of titles. The main translation transformations change according to the needs of a certain period of time and its trends, new translation approaches always correspond to the realities of a particular time. Overall, the following translation transformations can be observed: the use of literal translation, phrase calquing,

transcription or transliteration; in case of grammatical differences between the two languages, there are usually phrase structure changes; lexico-semantic adaptation, lexical addition, sentence structure changes and other translation strategies. The translation of movie titles often involves the use of several translation techniques and transformations simultaneously [2, p. 27].

The linguistic and cultural reinterpretation of the translation of movie titles allows us to identify the linguistic and cultural characteristics of a particular country, as well as to define new translation trends within a certain period of time. The main issue of this problem is currently the problem of compatibility of the cultural code and language, which is reflected in the level of translatability. Problems of misunderstanding, as well as certain cultural characteristics of ethnic groups, provide a wide field for the exchange of cultural aspects, but unprofessional interpretation of the transmitted information often leads to conflict situations, the solution of which may require further efforts [3, p. 80].

Problems of misunderstanding, as well as certain cultural characteristics of ethnic groups, provide a wide field for the exchange of cultural aspects, but unprofessional interpretation of the transmitted information often leads to conflict situations, the solution of which may require additional efforts.

The highest level in movie translation is, of course, full dubbing. Full dubbing is the work of a translator, screenwriter, director, sound engineer and actors. When the hero speaks to the camera in close-up, then any discrepancies between phrases and facial expressions will be perceived as hack-work. The allowable backlash between the length of phrases is 5%. Not only in the total length of the remark, but also in each part of the phrase separately. In the Soviet Union, the art of dubbing reached its highest point, when the translation was adjusted to the articulation of foreign actors so perfectly that it seemed as if they were speaking Russian. Take, for example, the name of a movie based on an animated movie well known to the American audience – “The Grinch”. There is no such character in the Russian fund of background knowledge, therefore, in the Russian translation, this gap is filled with a contextual extension: Grinch Stole Christmas. Compare the translation of the popular cartoon “Shrek”, in which there was no need for contextual support, since the name-title denotes a new character both for the translated and for the original popular culture.

The translation of feature movie titles containing a proper name also represents a variety of translation tactics focused on the pragmatic and national-cultural fullness of the name in the source language.

Translation times vary greatly, depending on the scope. In low-budget arthouse movies, one week may be allotted for the entire translation process, along with editing and voice acting. Working with major global studios is a little more comfortable. They often send materials a few months before the premiere. In some cases, even for six months, because edits and clarifications eat up a huge amount of time. For example, for the translation of the movie "Deadpool", the movie company "Twentieth Centuries Fox" sent materials 5 months before the start of the rental.

Separately, it is worth mentioning what kind of materials (sources) are dumped by moviemakers to translators. Well-known companies are very afraid of "leaks" – video leaks to the Internet before showings in cinemas, so materials for translators are

mocked quite strongly. Here are some of the ways – very often they are combined or even used all together [4]:

1. Cutting the entire video sequence into segments of 15-20 minutes, which are additionally protected from copying.

2. Low video resolution – often the quality of the material is not higher than 240 p. Just enough to see everything that happens on the screen, but not get any pleasure from it.

3. Color formatting. Often source files are given in black and white or in sepia tones. No color!

4. Watermarks over video. Most often these are static translucent or transparent volumetric inscriptions all over the screen. All this does not interfere with the translation process, but almost completely excludes the movie from being leaked to the Internet. In this format, even the most ardent movie lovers will not watch it.

There is an opinion that it is almost impossible to translate a Russian pun into a foreign language, however, in other countries there are fixed expressions, the meaning of which is extremely difficult to convey to a person who does not speak the language. Russian translators of Western movies sometimes have to use all their imagination to accurately convey the thoughts of the authors in Russian.

Some conclusions about the difficulties follow from this:

1) Difficulty in choosing an appropriate translation between many synonymous options;

2) The difficulty is that the Russian version is completely changed to make it closer to potential customers;

3) The difficulty that the official translation is not suitable as one of the possible translation options;

4) The difficulty that the official Russian translation differs in style from the original translation;

5) Difficulty that the translation of the movie title does not match the genre of the original title of the movie, and it must be adapted to this specific genre by some modifications.

6) The difficulty that the Russian translation is adapted to the audience with the help of Russian language expressions that are more understandable to people.

Particular challenges arise when one has to adapt jokes or various references. Especially for movies and series that are initially positioned as comedies. When adapting jokes, it is most often possible to retain either the original meaning of the joke or the sharp humor. Both are very rare at the same time. That is, you can explain the joke almost literally, but then it will be much less funny than in the original, or rewrite the joke, but make it funny.

With references, too, there are many questions. Sometimes it's even more difficult with them than with jokes. Indeed, in fact, the translator assumes the level of education and erudition of the audience. If, for example, the reference is replaced by a character more well-known to a particular audience, then the translator steps on thin ice – if you underestimate the audience, you can give a too flat and uninteresting analogy, if you overestimate, the audience simply will not understand the reference.

Another important part of the translator's activity, which cannot be silent, is the translation of curse words. Different studios treat the translation of obscene phrases differently. Some try to make the translation as "chaste" as possible, even at the cost of witticisms. Some translate obscenities in full, and in American movies they swear a lot. Still others are trying to find a middle ground. Translating obscene phrases is actually not difficult. And not because there are two and a half swear words in English, but because it is quite easy to find an equivalent that is adequate to the situation.

It should be noted that the transformational features of translation are associated in some cases with the fact that in Russia, when translating, quite often try to avoid the use of colloquial vocabulary, the use of obscene vocabulary, or vocabulary with erotic overtones [5].

The reason for this is the established traditions of the country's cinema and the accepted rules of public etiquette. An example of replacing lexical units of an obscene character is the translation of the French movie "Pour la peau d'un flic" – "For the skin of a policeman". Russian can be considered a formal equivalent of the word "ment" (cop), but this word is a linguistic and cultural reality exclusively of the Russian language, that is, it is incorrect to use it when translating the French title of a French movie. Thus, it is impossible to find a decent equivalent, since the jargon names of all elements in the criminal environment and the law enforcement system that opposes it are deeply individual in each language. In this example, the lexical transformation minimise the linguistic and cultural reality of the French name. Another interesting translation is the movie "Huge fish" the original title is "Big Fish", where the interpreters did not resort to a literal translation ("Big Fish"), but used the consonance with the phraseological unit in the Russian language. "Big fish" in the Russian mind is associated with the highest ranks or just management, but in this case, this translation does not convey the main idea of the movie.

So, translation is an activity involving the interpretation of the meaning of a text in one language, the source text, and a production, in another language, of a new, equivalent text or translation. The goal is to establish a correspondence relationship between input and output texts (which is to increase that both texts report the same attention), taking into account a number of constraints. These restrictions include the context, the grammar rules of the languages, their letter of agreement, their idioms, and also suggested.

To conclude, the success of a movie or TV show in a foreign country depends on various factors. But movie translation must guarantee that your target viewers understand the movie and the message you are conveying. The difference between movie translation and all other types of translation is due to the presence of significant extralinguistic factors: timing, lip-sing, mismatch between the semantics of spoken lexical units of the source language and the target language. It seems promising to reveal the influence of the genre and style of the movie on the choice of micro- and macro-strategies of translation. Also, detailed semiotic analyze of a feature movie as a complex of cultural links that connect it with a global informational context remained outside the scope of the study. In this study, an attempt is made to outline the specifics of movie translation, its linguistic features.

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THE EFFECTIVENESS OF USING DRONES FOR THE PURPOSE OF PRODUCT DELIVERY

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Abstract. The purpose of the work is to show what are the positive aspects of using drones to deliver products. The article discusses the concept of a drone, the existing practices of using drones for the purpose of delivery and the positive aspects of using drones.

Keywords: drone, unmanned aircraft, courier, delivery, last mile, logistics, cargo transportation, automation.

ЭФФЕКТИВНОСТЬ ИСПОЛЬЗОВАНИЯ ДРОНОВ С ЦЕЛЮ ДОСТАВКИ ПРОДУКЦИИ

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Аннотация. Цель работы – показать положительные стороны использования дронов для доставки продукции. В статье рассмотрены: понятие дрона, существующие практики применения дронов с целью доставки, положительные стороны использования дронов.

Ключевые слова: дрон, беспилотный летательный аппарат, курьер, доставка, последняя миля, логистика, грузоперевозки, автоматизация.

Automation and the introduction of technologies using robots can reduce costs and expenses, as well as increase the efficiency of delivery services. According to experts, the introduction of the latest technologies allows to reduce the cost of cargo transportation by 10-15 %. The use of automated delivery systems at the final stage of

the logistics chain allows to increase the transparency of cargo transportation and make them more attractive to the customer.

Due to the rapid economic growth and expansion of cities, there is a need for new ways of delivering goods to meet the needs of customers in a timely manner. Cargo drones minimize delays and offer fast customized delivery. They can significantly reduce the time of operations, and also eliminate the need to visit the post office [1, p. 1-2].

According to the Air Code of the Russian Federation, Unmanned aircraft systems are a complex that includes one or more unmanned aircraft, technical means and equipment used to control the flight of such an aircraft or such aircraft. Unmanned aircraft - an aircraft controlled, controlled in flight by a pilot who is outside the side of such an aircraft (external pilot) [2].

In the recent past, unmanned aerial vehicles had exclusively military applications, where they were initially used to destroy aerial targets and gather intelligence information. Now drones have received wide civilian applications, ranging from search and rescue operations, surveillance, weather monitoring, traffic, fire extinguishing, for personal purposes, business with an emphasis on photo and video shooting, in agriculture and even in cargo delivery services [3].

The use of drones in the logistics chain has become one of the main tasks of giant companies such as Google, Amazon and DHL. Each of them has already designed its own flying carrier and is already conducting tests. In Russia, pizza was delivered by drones, but this was quickly stopped.

"Last mile" is a term used to describe the final stage of the supply chain. Its essence is in the delivery of goods from a warehouse or distribution center to the final recipient, which is the buyer, the store.

Last mile is one of the most important elements of the logistics chain. Due to the increase in the number of online orders and the development of the e-commerce industry, the work of carriers has become much more complicated. At the same time, the quality of service at this stage is extremely important for the shipper. After all, the level of service provision directly affects customer loyalty.

Often, the last stage in the logistics chain has the most problems. More precisely, if the last 10 % of the work is poorly organized, the probability of successful completion of the operation tends to 0. In the case of logistics, the most common problems are:

- long waiting time for delivery, for example, downtime due to insufficient traffic congestion;
- the courier's arrival is not on time, but with a significant delay;
- the inability to deliver the first time (for example, due to the fault of the courier or recipient);
- boorish attitude of the delivery service staff;
- lack of route optimization;
- accidents on the road, traffic jams, difficulties with the entrance;
- lack of return logistics;
- irresponsible approach to the organization;

- improper condition of the parcel due to non-compliance with the conditions of transportation and other things.

It is because of problems with delivery on the "last mile" that about 60 % of online stores lose customers. Through the fault of the transportation service, an angry person writes a negative review about a product or a website without understanding the reasons for dissatisfaction. In such a situation, all efforts to promote the product and promote the store are reduced to zero.

Now the delivery at the last mile stage is carried out by courier delivery services. Delivery of products by courier is strongly related to the human factor, the transport situation in the city, etc. Illiterate transport planning, as well as the physiological and psychological state of the courier service employee significantly affects the speed of delivery [4].

The factors described above can create situations that affect the speed of delivery for the worse. Among them, one can distinguish such as traffic jams, the complexity of the entrance, bad weather conditions, fatigue of the courier [5].

Delivery of goods by drones is able to solve the problem of illiterate transport planning, due to the lack of need for movement on the roads. Drones are also not subject to the human factor. Contrary to popular belief that drones cannot carry out delivery activities in bad weather conditions, this is not the case. Modern UAV models, for example from the Russian company COEX, are able to move in the air not only in good weather, but also in rain and strong wind [6].

According to experts, the use of drones will not only shorten the delivery time of products – Amazon promises that the service will take no more than half an hour – but also reduce transportation costs of companies, increase logistics efficiency and eventually serve as a driver of online sales growth.

According to Cooper Smith, an analyst at BI Intelligence, reducing delivery time will increase online and retail sales of companies. The retailer that achieves a significant reduction in delivery costs will be able to both increase customer loyalty and increase its market share, since the high cost of delivery remains the main reason why customers refuse to order, he believes.

The main goal of all companies is to reduce costs at the "last mile", the last and most expensive stage of logistics when delivering goods to the final consumer. The maintenance of a group of UAVs (unmanned aerial vehicles) is much cheaper than the maintenance of a fleet of ground vehicles.

According to Raffaello D'Andrea, co-founder of the UAV developer Kiva Systems, the cost of drone delivery of a parcel weighing 2 kg on the "last mile" is \$0.1. Ground delivery of similar packages on the "last mile" is \$2-8. It was his company that Amazon bought in 2012 for \$775 million. Estimates of the research company RAK Investment Management are more modest: delivery within 30 minutes using drones should cost \$ 1. The indicator takes into account variables such as the cost of deploying and supporting the UAV grouping, as well as the percentage of orders that can be processed using drones [3].

The problem of ecology is important, because it is this problem that calls into question the existence of humanity as a whole. Most of all, transport affects changes in the environment. He, working on fossil fuels, causes great harm not only to nature, but

also to human health. The harmful emissions it produces exacerbate the problem of global warming, and in humans lead to various diseases, including respiratory and nervous system, so we think that reducing emissions from transport plays a crucial role in the fight against climate change and drones, in this difficult task, can just be its solution.

The use of unmanned aerial vehicles for the delivery of small loads turned out to be much more profitable in terms of reducing greenhouse gas emissions into the atmosphere – their "carbon footprint" turned out to be significantly less than that of conventional trucks with the same total weight of cargo. This was proved by scientists led by Joshua Stolaroff from Livermore National Laboratory: The assessment of the environmental friendliness of drones for cargo delivery was carried out using the method of calculating the carbon footprint – the amount of carbon dioxide that is generated during the production of electricity consumed by drones at all stages of transportation and necessary to ensure its operation. The authors note that such a calculation should take into account the type of energy sources that are used in this region. If the energy comes from renewable sources (in particular, from solar and wind power plants), the amount of carbon dioxide produced at the same time is significantly lower than if the energy is obtained, for example, by burning coal. It turned out that the delivery of light parcels on small quadcopters is in any case more environmentally efficient than traditional ground delivery, for example, using trucks [7].

The use of drones for the purpose of delivering products allows you to reduce the costs and expenses of companies at the last mile, which will increase efficiency and make delivery more attractive to the customer. Also, the use of unmanned aerial vehicles for logistical purposes is less harmful to the environment than existing delivery mechanisms. Based on the above, it can be concluded that the use of drones has a number of advantages and most likely this direction will develop in the future.

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DEVELOPMENT OF ATTENTION AS A PEDAGOGICAL CONDITION FOR IMPROVING THE ACADEMIC PERFORMANCE

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Abstract. The article deals with the development of attention, improving the performance of children. From a psychological point of view, the object of educational activity is the child himself, who becomes smarter and more competent in the process of educational activity.

Keywords: formation, development of attention, psychology, pedagogy.

РАЗВИТИЕ ВНИМАНИЯ КАК ПЕДАГОГИЧЕСКОЕ УСЛОВИЕ ПОВЫШЕНИЯ УСПЕВАЕМОСТИ

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Аннотация. В статье рассматриваются вопросы развития внимания, повышения успеваемости детей. С психологической точки зрения объектом учебной деятельности является сам ребенок, который в процессе учебной деятельности становится более умным и компетентным.

Ключевые слова: становление, развитие внимания, психология, педагогика.

Primary school age usually refers to the period from 6-7 to 10-11 years. During this period, there are significant changes in the functioning of the child's brain. This leads to the fact that the child is increasingly autonomous and voluntarily able to control his behavior and activities. In the same period, the dominant manifestation of one or another hemisphere begins, depending on whether the child is right-handed or left-handed. In children of this age, growth is accelerated, and permanent ones replace even milk teeth. At this time, the child begins to go to school and, regardless of age, gets used to it, adapts to new living conditions. This process occurs individually. Each child has different difficulties, regardless of whether he is psychologically ready to start learning activities or not, and such difficulties are expressed in different ways. However, most people experience some form of stress response. According to B. A. Sosnovsky, the latter are for the most part the objective requirements of effective schooling, but there are also those that embody the preferences or habits of the teacher.

For a child, they are all equally important and immutable [1, p. 557]. The length of time it takes to adapt to a new situation varies from 3-4 weeks to 3-4 months. Otherwise, psychologists already talk about school maladjustment.

The child's relationship with adults and peers before entering school and after is significantly different. When a child begins to go to school, according to L. F. Obukhova, the system of his relations with adults is divided into two: "the child is the teacher" and "the child is the parents", and the first becomes dominant, defining both the child's relationship with parents and his relationship with peers.

When a child comes to school, he immediately becomes part of the system of social relations, where he has his own rights and duties, which he must fulfill independently. The teacher becomes the standard of all norms and rules. It also monitors their implementation, verifies and evaluates them. Children begin to literally copy the behavior of the teacher, and their attitude towards peers comes from how they behave according to the standards introduced by the teacher and in relation to the teacher. At this early stage, the child is not yet able to single out the more or less significant requests that the teacher makes. Moreover, the teacher can make requests not only to students, but also to their parents. It is she who determines the relationship between the child and the teacher and between the child and his peers [2, p. 47]. From a psychological point of view object of educational activity is the subject itself, that is, the child, changing in the process of learning activity, becoming more intelligent and competent. At the same time, a certain contradiction is noted: subjectively, the child's activity is aimed at the generalized experience of humanity, differentiated into separate sciences, while objectively, changes must occur in the subject himself. According to B. A. Sosnovsky, a child entering school (even after seven years old) is not, as a rule, capable of such reflection. Thus, at present, with different ways of teaching younger students, there are several ways of dividing the components of educational activity among its participants. The process of developing learning activity is the process of transferring an increasing number of its links to the student himself.

During the period of primary school age, a significant increase in cognitive development is recorded: the formation of theoretical thinking and an internal plan of action are observed. B. A. Sosnovsky explains this as follows: the child should form his own educational activity, including a theoretical and cognitive attitude to reality, the ability to formulate cognitive tasks, that is, at least distinguish the known from the unknown, which is already the beginning of reflection. By the end of elementary school, the transition from visual-figurative thinking to logical-verbal thinking should be completed. Children are already able to independently draw the simplest conclusions. Now they are not so subject to the field of view. They are quite far from the operations performed by adults; they are fragmented and often need external support, but they already talk about the presence in children of an internal plan of action, their ability to operate with certain ideas "in the mind", and, accordingly, about the rudiments of abstract theoretical thinking. All mental processes become under the control of the child himself and become intellectualized. Thus, memory, attention and perception become arbitrary mediated processes. Children learn to systematically observe objects and phenomena, first following the instructions of the teacher, and then only maintaining the set goal. Performing increasingly complex educational tasks with gradually weakened control by adults, the child learns to control his own actions. This

is how attention is formed [3, p. 45]. At the same time, the peculiarity of this period also lies in the fact that the child lives in two systems of relations, respectively, in two evaluation systems, where the criteria are different. At school, both the teacher and classmates are evaluated primarily the results of educational activities. Parents still treat him as a son, unique and inimitable, but they also react to his success or failure at school. The latter, in turn, significantly affect both mental and personal development. The reason is that younger students are not yet able to adequately self-assess themselves. In this regard, they perceive the teacher's assessment as the only true and transfer it from school to all other spheres of life. In addition, other students and their parents treat the teacher's assessment in the same way. Subsequently, this affects the attitude of others towards the child. That is why academic performance in the primary school period plays an important role in the development of the child's normal self-esteem. When a younger student successfully completes school assignments, he naturally arouses the disposition of the teacher first, and then his peers. Parents of such children praise and have no demands or claims to them. Therefore, by the end of the fourth grade, children with high academic performance have adequate self-esteem, are confident in themselves and their abilities, are able to overcome difficulties and go all the way to the goal. If such children do not receive constructive criticism or too easily achieve school success, then very often self-esteem becomes overestimated, which causes a lot of problems both in this and in later periods of life.

Incapacitated children of the primary school period face many problems. At first they can not earn the respect of the teacher or receive approval and praise, so classmates draw the appropriate conclusions, the proportion of sympathy for this child decreases. Often the situation worsens as parents are unable to provide much-needed support to their child. Most parents unsuccessfully try to stimulate the child by creating external motivation or limiting him in some way. However, this is not successful only because the child has not yet learned to cope with difficulties. In addition, very often parents bring even greater emotional discomfort. If parents blame the teacher and other circumstances for the failure of their child, while justifying the child himself, they deprive him of the opportunity to live and develop normally, freely functioning in society. All this leads to the appearance of low or low self-esteem of children. Motivation to learn and succeed weakens, interest in learning and communication with peers disappears. Children often close in on themselves. It also happens that they reveal their potential in other industries. However, this is deviant behavior, therefore, at the next stage of development, these adolescents are already characterized by low self-esteem and lack of confidence in their abilities and meaning. As already mentioned, the entrance to school plays a significant role in the development of the emotional sphere of children. The number of objects that evoke an even wider range of emotions is increasing. The emotional sphere of a younger student is greatly influenced by the results of educational activities, as well as the attitude of others around them.

Despite the pronounced emotional reactions of children of this age, over time they learn to show only what they want or need to show. Thus, they have the ability to manage their emotions, i.e. improve emotional self-regulation skills. Exploring the characteristics of younger students, O. O. Gonina notes that the emotional sphere is characterized by a slight emotional reactivity to ongoing events and emotional coloring of perception, imagination, thinking, mental and physical activity; immediacy and

frankness of manifestation of their emotional experiences: joy, sadness, fear, pleasure or displeasure; different degrees of readiness to experience the emotion of fear in the process of learning activity as a premonition of difficulties, failure, lack of confidence in their abilities, inability to cope with the learning task; feeling a threat to their status in the class, in the family; high emotional instability, frequent change of emotional states against the general background of cheerfulness, cheerfulness, cheerfulness, carelessness; a tendency to; intense emotional response to games and communication with peers, academic achievement and assessment of their progress by the teacher and classmates; imperfect understanding and awareness of their own and others' emotions and feelings; often misperception and interpretation of facial expressions and other expressions of emotional states by others (except for the basic emotions of fear and joy, in connection with which children have formed clear ideas that they can express verbally, naming synonymous words denoting these emotions), which causes inadequate responses to younger students [4, p. 52].

During the primary school period, children do not always understand what emotion they themselves or others are experiencing; it is still difficult for them to distinguish between certain emotions. They usually find it much easier to experience and express their emotional states in circumstances already experienced or similar, but still have difficulty describing their emotional experience. Since children perceive only positive emotions in preschool age, it is still much easier for them to identify emotions of joy even at school age, while it is difficult for them to identify many other emotions, for example, stupor, dislike or guilt. However, now they become more susceptible to oppressive circumstances and can empathize with others. Since younger students have not yet fully mastered the whole range of emotions and feelings, as well as their manifestations, it is not uncommon for them to be very similar in their behavior to their relatives or teachers. During the primary school period, children are still at the stage of development of emotional self-regulation, so they are not always able to control the manifestation of certain emotions. Because of this it is still difficult for them to observe complete silence and order during the lesson. However, very soon they become able to control themselves and show or not their feelings and experiences according to a particular situation. The level of ability to manage one's emotions gradually increases and improves [5, p. 96].

The transition from kindergarten to kindergarten is characterized by a fundamental change in the child's place in the system of social relations and in his whole way of life. Entry into the school is a turning point in the life of a child, a transition to a new way of life and conditions of activity, a new position in society, new relationships with adults and peers. A distinctive feature of the student's position is that his study is an obligatory and socially significant activity. A person is responsible to the teacher, school, family. The life of a student is subject to a system of strict rules equal for all students. The main thing that changes in the relationship of the child is a new system of requirements for the child in relation to his new responsibilities, which are important not only for himself and his family, but also for society. The child begins to be seen as a person who has entered the first rung of the ladder leading to civic maturity.

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SMALL MODULAR REACTORS AS AN ALTERNATIVE TO MODERN POWER REACTOR PLANTS

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Abstract. In today's world, the subject of using small modular reactors (SMRs) is very relevant. Due to the small size of reactors, their mobility and the ability to be located anywhere, there are many options for their application both nowadays and in the near future.

Keywords: small modular reactors (SMRs), nuclear waste, nuclear power plants (NPP), electricity, nuclear industry.

МАЛЫЕ МОДУЛЬНЫЕ РЕАКТОРЫ КАК АЛЬТЕРНАТИВА СОВРЕМЕННЫМ ЭНЕРГЕТИЧЕСКИМ РЕАКТОРНЫМ УСТАНОВКАМ

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Аннотация. В современном мире тема использования малых модульных реакторов (ММР) очень актуальна. Благодаря малым размерам реакторов, их мобильности и возможности располагаться в любом месте, существует множество вариантов их применения как на сегодняшний день, так и в ближайшем будущем.

Ключевые слова: малые модульные реакторы (ММР), ядерные отходы, атомные электростанции (АЭС), электроэнергия, атомная промышленность.

In today's world, we are beginning to face a shortage of space to live in. Every year the number of people on earth is increasing and increasing, cities are beginning to grow more and more, and there is less and less space. And we need to support this life somehow, with the help of powerful power plants, because life without electricity is impossible. Unfortunately, modern NPPs occupy a lot of space, but fortunately, modern science does not stand still and small modular reactors were created. Small modular reactors (SMRs) are small nuclear power plants. This is a relatively new technology that has the same essence as nuclear power plants, which use nuclear fuel to generate power. The essential difference between these plants is size and capacity.

The International Atomic Energy Agency (hereafter IAEA) has defined small size plants (SMRs) as reactors with an electrical capacity of up to 300 MW. SMRs are compact, mobile and easily accessible in places where there are problems with the installation of a full power plant due to lack of proper infrastructure and climatic conditions. Since SMRs are modular reactors, they can be connected to the grid, which will also include renewable sources, and part of the SMR at the right time (when there is no wind or sun, for example) to turn on or off.

In today's world, with many nuclear power plants producing billions of KW per year, it seems that one can simply improve the system already in operation and produce energy further. Unfortunately, a single nuclear power plant complex requires huge areas, high maintenance costs, and no small number of personnel. Fortunately, research reactors, as well as reactors for nuclear submarines, were studied in parallel with large power plants. All of this helped give life to modular reactors. The essence of such reactors is that they can be built in places where it would be impossible to build a nuclear power plant, for example. Reactors can be placed in, independent of each other, or they can be built in a modular form. In the case of modular construction, the reactors can be added to the power as it is needed. Thus, it can be characterized that modular reactors are not only a cost-effective project, but also a project that has recently become evident in the global energy industry: the increasing demand for electricity needed for economic growth, as well as the growing demand for energy security and low-carbon energy in the fight against climate change.

Unfortunately, there are downsides to this industry as well. For example, studies show that water-, salt-, and sodium-cooled small modular reactor designs will increase the amount of nuclear waste that needs to be disposed of by a factor of 2-30. The excess waste is due to the use of neutron reflectors and/or chemically active fuels and coolants in the small modular reactor designs. Also, the fuel used for SMRs will contain high concentrations of fissile nuclides, which means that new approaches to criticality assessments for waste disposal storage will have to be devised.

Having dealt with the disadvantages, we can move on to the pros of small modular reactors. The pros are that, according to the World Nuclear Association, which represents the nuclear industry, because of their small size, most of them could be fully assembled in a factory and installed module by module, which would make construction faster, more efficient and theoretically cheaper. Initial costs, in particular, would be lower because modules could be added as needed, rather than paying for everything at once. Another feature that is predicted to reduce cost is that SMRs are easier to cool because of their larger surface area to volume ratio. This means that their

security systems don't have to be as complicated. Most of them can rely on "passive" built-in safety features in case of failure, rather than special systems that need to be activated.

Also, an important part of SMRs is the waste that needs to be disposed of later. And it is SMRs that have attracted attention because of the requirements of their inherent characteristics: safety and reduced cost. Yet surprisingly little research has analyzed their management and disposal of nuclear waste. A team of researchers from Stanford University and the University of British Columbia studied the SMRs of NuScale Power, Toshiba and Terrestrial Energy. The researchers studied modular reactors designed today have a ratio that produces 2-30 times more radioactive waste per unit of produced power than conventional water-moderated 1100MW reactors. All elements of a small nuclear reactor – the main components and equipment - become radioactive during SMR operation, so they cannot be disposed of - exactly the same storage facilities are needed as for spent nuclear fuel.

One of the main factors in any power industry is safety. Looking at the different systems of SMRs, I would like to say that each country working on SMRs approaches safety in completely different ways. Using the example of the NuScale Plant project (USA), we would like to note that the reactor is placed under an additional stainless-steel layer, and then this structure is placed in the pool, and then the heat removal process itself takes place through the heat extraction system. There are two types of heat extraction in the system, main and emergency, and they are not connected with each other.

Having analyzed some data on MMR, we can make conclusions about their application in the near future. For example: the IAEA issues a review report on existing SMR projects every two years. In the 2011 review there were 45 projects, in 2016 48 were considered, and in 2018 there were 56. The latest 2020 review looked at more than 72 projects being developed in two dozen countries, by both large corporations and small companies. At the same time, 17 of the 72 projects are Russian.

But there are few working SMRs yet. Only two projects are in operation: the Russian floating nuclear power plant Akademik Lomonosov with two KLT-40S units and the Chinese dual reactor power unit HTR-PM. Several other projects are still under construction. KLT-40S (Figure 1) is a reactor designed for reliable power and heat supply to isolated consumers in remote areas without centralized power supply and where expensive fossil fuels are used. HTR-PM is a commercial demonstration plant for generating electricity. The twin reactor modules powering the single turbine configuration were specially selected to demonstrate its feasibility. After the HTR-PM demo installation, commercial implementation of HTR-PM based on mass production is planned.

Also, four more floating power units with RITM-200 (Figure 2) reactor units with a capacity of 55 MW and a service life of up to 60 years are currently under construction. Unlike the KLT-40, where there was a block layout (the elements of the first circuit are located next to each other, but not in the same case), the RITM-200 already has an integrated layout, so it is almost twice as light and compact, and at the same time more powerful. The RITM series reactors are the latest development in the SMR generation III+ line, developed by Afrikantov OKBM JSC and incorporating all

the best characteristics of their predecessors. Floating power units (FPU) with RITMS will be commercially available in the medium and long term. The RITM-200M refueling cycle is up to 10 years.

In addition, small modular reactors are used in underwater and surface transport. Historically, the first low-power reactors were designed in the USA and the USSR for the nuclear fleet, and later for civilian purposes. The KLT-40 and RITM-200 reactors mentioned earlier are used on nuclear icebreakers and submarines. A feature of marine reactors, both KLT-40 and RITM-200, is the ability to operate in maneuverable mode, with a rapid increase in power and discharge, as well as fuel enrichment greater than conventional PWR – up to 20 % instead of 5 %. Large enrichment allows you to overload the fuel less often. This increases the autonomy of installations, which is especially important for submarines, for which the predecessors of such reactors were developed.



Figure 1. KLT-40



Figure 2. RITM-200

Another of the most well-known and promoted land-based water-water SMR projects is the American NuScale project of the company of the same name. This is the first SMR project to receive design approval from the U.S. Nuclear Regulatory Commission in 2020. The power unit has an electrical capacity of 60 MW, although the latest version assumes an increased capacity of 77 MW. The reactor, like most SMRs, has an integral layout, i. e. the entire first circuit of the reactor, including two vertical steam generators, is located inside the 19.5 m high and 2.7 m in diameter housing. The case, in turn, is placed in a module with a height of 22 m and a diameter

of 4.5 m. The first NuScale module at the new VOYGR nuclear power plant in Idaho should be operational by 2029. With the help of the US administration, the company has already signed more than 20 agreements of intent for the construction of nuclear power plants in 11 countries besides the USA, including Canada, Japan, Great Britain, Poland, Ukraine, Kazakhstan, Romania and others.

Because of its size and complexity, an ordinary nuclear power unit is designed and built in at least 5-10 years and costs at least \$5-7 billion. It is planned to build small NPPs several times faster, within 2-3 years, since most equipment will be mass produced in factories and delivered to the site as separate modules. It is the modularity, i.e. the high degree of factory-assembled equipment in the form of separate modules, that is an important feature of SMR. As a reactor decreases in size, its power decreases in the cubic proportion, and the surface area through which neutrons leak through decreases in the quadratic proportion. Hence the conclusion – it is possible to call SMRs high-tech, safe and efficient, but not clean and environmentally friendly.

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THE NEED TO INTRODUCE DIGITALIZATION AND DISTANCE LEARNING ELEMENTS INTO THE EDUCATIONAL PROCESS

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Abstract. This article discusses the need to introduce digitalization and elements of distance education in the modern educational process. The paper pays attention to the advantages, difficulties and disadvantages of introducing these innovations into the education process. As a result of the analysis, it will be summed up whether such a direction in the development of education is really relevant and to what extent it can be implemented.

Keywords: education, education system, digitalization, digital technologies, digital education, distant learning.

НЕОБХОДИМОСТЬ ВНЕДРЕНИЯ ЦИФРОВИЗАЦИИ И ЭЛЕМЕНТОВ ДИСТАНЦИОННОГО ОБУЧЕНИЯ В ОБРАЗОВАТЕЛЬНЫЙ ПРОЦЕСС

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Аннотация. В данной статье рассматривается необходимость внедрения цифровизации и элементов дистанционного образования в современный образовательный процесс. В работе уделяется внимание преимуществам, сложностям и недостаткам внесения данных нововведений в процесс образования. В результате анализа подведен итог о том, на самом ли деле актуально такое направление в развитии образования, и в какой мере оно может быть реализовано.

Ключевые слова: дистанционное образование, образование, система образования, цифровизация, цифровые технологии, цифровое образование.

At the beginning of the third millennium, there was a transition from an Industrial to an Information Society type, where knowledge and information became the main productive forces. The era of computer science has come. It can be characterized by stages of interpersonal communication, information sharing and knowledge acquisition. Distance learning appeared as a natural thing to complete wishes of people in the modern era. It makes it possible to create the best conditions

for self-learning, universal information exchange, regardless of the presence of time and time zones. The emergence of digitized learning is considered to be not a sudden event. The need for education has always remained at a high level. With the advent of the Internet and the acceleration of scientific progress, this request is becoming more and more widespread. It means that distance learning became a new way of getting an education that has received an additional acceleration in development due to external factors.

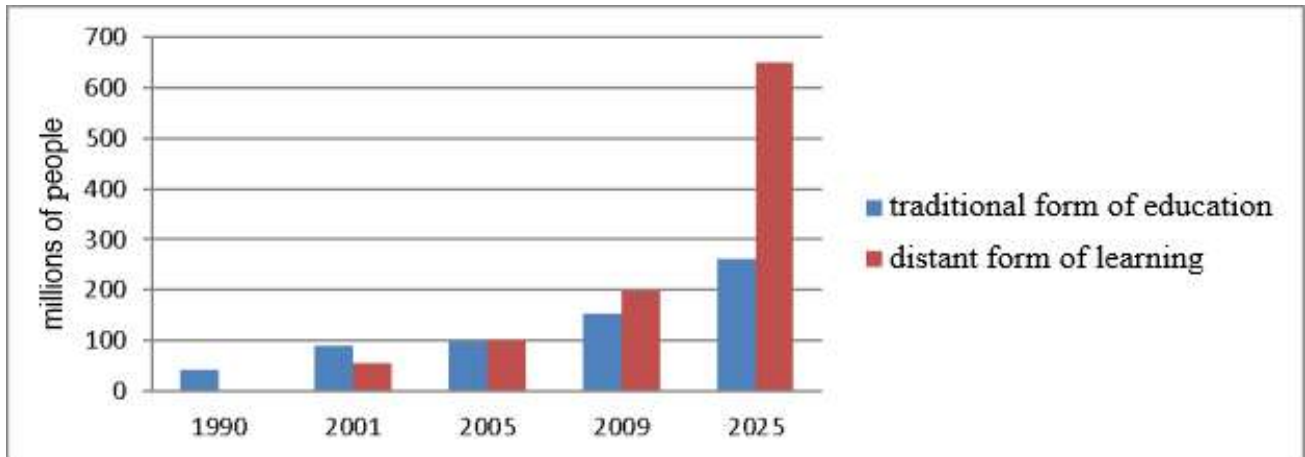


Figure 1. Dynamics of the growth of students in traditional and distance learning [1]

In the Information Society, the strategy of education is changing significantly. Its feature is the widespread use of information technologies. The main task of higher technical education today is the formation of future employees and researchers of scientific thinking, skills of independent assimilation and critical analysis of new information, the ability to build scientific hypotheses and plan an experiment to test them. The solution of this problem is not possible without the extensive use of new information technologies. Information resources have become a new economic category determining the next rise of scientific and technological progress. Intellectual processes are becoming widespread in the information society. Half of the workers in developed countries are engaged in intellectual activity. In addition to high professional competence, an employee of the 21st century should be not only proficient in modern information technologies but also be able to use them actively at work. Due to the fact that knowledge in modern society is rapidly becoming obsolete, a modern employee needs to improve his qualifications constantly. At the same time, professional development and retraining of personnel in most cases should be carried out in the job, which becomes possible with the use of open education technologies. Consumers of educational services are not only schoolchildren and students, but also a significant part of the adult population of the country. As a result, there is a sharp increase in demand for educational services in the modern world.

So, the need for distance learning will grow. With this kind of training, people who are burdened with family and business worries and do not have the opportunity to attend traditional classes have a chance to receive high-quality training services.

The characteristic features of distance education are flexibility – students in the distance education system work in a convenient place and at a convenient pace and

time. Modularity – each course creates a comprehensive view on a specific subject area, which allows one to form a curriculum for individual and group needs. A teacher in distance learning is a coordinator of the student's cognitive activity and a manager of his educational process. Another characteristic feature is specialized quality control of training – remotely organized exams, interviews and project work. There are a lot of consumers of distant education nowadays: children and youth. This type of students cannot attend educational institutions due to physical disability or in the case of geographical remoteness from educational institutions. Those people who live far from educational centers or in places where access to curriculum in certain disciplines is limited or complicated can take advantage of distance education. For example, this category can include people who want to get an education in another country, the so-called international education. In this case, the Internet plays an important role, providing the student with access to educational resources.

The same category includes people who do not have enough time or opportunity to get to the educational institution. For example, people who want to improve their skills. In such cases, distance education helps to save a lot of time for those who decide to start studying. Besides, there are people who wish to improve their level of education. Such students may be partially or fully engaged at work. These people might be temporarily unemployed or be at the stage of changing their jobs. The training schedule for such people may differ in a variety of ways. Also, this group of students requires different approaches in the educational process. For many of them, it is not possible to gain knowledge in the traditional way by attending lectures, seminars or practices. Most of them prefer to work with improvised educational material, to take online training courses with automatic testing and verification of the acquired material. Since distance education should cover, and it does cover, various information environments for the presentation of educational information, this niche of people is interested in receiving such services [2].

It should be said that distance learning is effective for almost anyone who wants to improve their educational level, regardless of age, employment status and opportunities. However, along with the advantages, there are disadvantages of distance learning. With all the attractiveness of distance learning, a theoretical basis is necessary for its formation and development. This includes all forms of self-education, distance learning and externship.

Distance learning assumes the presence with communication of a teacher and students in the process. Therefore, it can be concluded that it is necessary to create a unified information and educational space that includes all kinds of electronic sources of information: virtual databases and libraries, electronic textbooks, etc. The characteristic features of distance education are the possibility of organizing discussions such as joint work on projects and other types of group work during the course. Another characteristic is the modularity, a change in the role of the teacher (associated with the separation of functions of course developers, tutors, etc.), the use of specialized technologies and learning tools. Peculiarities advantages of distance education are constant contact with the teacher or tutor, the possibility of prompt discussion of issues that arise in a convenient online environment. One more characteristic is the transfer of theoretical material to students in the form of printed or

electronic textbooks which allows completely abandoning the sessions with arrival at the university, or significantly reducing their number and duration.

The disadvantages of the distance learning system today include narrowing of the potential audience of students that can be explained by the lack of technical possibility of inclusion in the educational process. Besides, mandatory computer usage experience is a necessary condition for entering the distance education system. What is more, the lack of adaptation of educational and methodological complexes to distance education courses (in particular electronic textbooks). Another disadvantage is the insufficient development of educational process administration systems and, as a result, a decrease in the quality of distance education in comparison with full-time education.

The possible pros and cons of digitalization of education in various fields of education are given: cognitive, affective, in student performance, in adult education, in changes in pedagogy, in improving the technological skills of a teacher and in technological integration. Having analyzed scientific works on digitalization in education, they can be divided into two components.

Numerous advantages of the digitized learning process are actively used by digital technologies in education. The advantages of digitalization of the education system include cost savings. Since the educational process will switch to an electronic format, this will save significant students' funds. Educational institutions will no longer need to spend money on educational infrastructure such as buildings or classroom equipment. Students will not need to spend money on textbooks and chancellery. In addition, transportation costs for both teachers and students will be reduced. The next one is lack of paper document flow. The transition to digitalization of the education system will significantly reduce the number of paper documents, textbooks, and notes. The significant part of document flow can be transferred to an electronic format that might be convenient to students. Another plus is time saving.

Thanks to the digitalization of the educational process, it will be possible to save time significantly. First of all, this concerns the time spent on the road to the place of study. In many large cities, students and teachers have to spend several hours a day to get from home to an educational institution and back. Finally – reducing harmful emissions into the atmosphere and reducing the load on the transport system. This plus follows from the previous one. With a remote format, you do not have to drive to an educational institution every day. This, in turn, will reduce the load on public transport, on the road system and, in general, may reduce harmful emissions from cars into the atmosphere [3].

There are also some disadvantages that should be mentioned: a cognitive decline. The use of digital technologies, including the Internet, can negatively affect one's cognitive abilities. A person simply stops remembering the necessary information, gets used to writing it down, because it is easier to find it on the Internet later. This all leads to a decrease in mental and creative abilities. In addition, it is worth mentioning the lack of socialization that kids receive. With distance education, the possibility of live communication and interaction between the students themselves, as well as between students and the teacher, is absent. A person is a social being by nature. It needs live communication for comprehensive development of their personality and character.

Digital technologies can deprive a person of such interaction. Moreover, it is detrimental for one's physical health. The transition to digital education implies that the learning process will require using a computer. A person's prolonged stay at the computer can lead to health problems: deterioration of vision, posture, you name it. One more con a probability of a quality drop in education. With digitalization being introduced to the education system, there is a high chance that the quality of education may significantly fall. This is especially true for technical areas where it is necessary for students to attend laboratory classes where specialized equipment is used in the process. The next problem was implicit before the introduction of digital technologies. The use of a variety of pedagogical methods for better memorization and assimilation of the material becomes more dependent on technical means and ways of organizing contact with students. It is worth noting that with any technology of interaction, the teacher has to learn to present the material more concisely and clearly or answer questions. Therefore, in this situation, constant and continuous self-improvement of both the teacher and the student becomes necessary.

Nevertheless, the process of digitization in the education system abroad is actively underway. It has particularly affected higher education levels; many Western educational institutions have already developed a system of distance education (the so-called "open universities"), including additional education and retraining. In Russia this process also started, but relatively recently, at the end of the 2010s. It is worth mentioning that if in Western countries the digitalization of the education system began with higher education institutions, then in Russia, as a pilot project, the digitalization of the education system began with school education. Moscow Electronic School (MES) can be considered such a project. It was launched in 2016 as an experiment, and since 2018 it has been implemented in all Moscow schools. The MES consists of four main elements of digitalization of education:

1. Introduction of information technologies into the educational process;
2. Increasing the level of Information and Communication Technology competence of the teaching staff;
3. Creation of new forms of educational content;
4. Updating the IT infrastructure of the city in terms of education.

In 2017, the "Strategy for the Development of the Information Society in Russia for 2017-2030" was published. This strategy affects all elements of society, including education. It defines digital education as an educational activity based primarily on the digital form of presenting information of an educational and organizational nature, as well as on current technologies for its storage and processing, which can significantly improve the quality of the educational process and its management at all levels [3].

Also, starting in 2019, within the framework of the federal project "Personnel for the Digital Economy" of the national program "Digital Economy of the Russian Federation", centers for the development of digital university models have started functioning numerous Russian universities [4]. By 2024, elements of the digital university models are planned to be implemented in all Russian universities; each student should have access to educational content that is most in demand, effective learning technologies, and digital support services. The main element of the updated

model of a digital university should be Big Data, with the help of which universities will be able to manage the educational trajectories of students.

The topic of digitalization has become especially important due to the COVID-19 pandemic. Since it started, most of the educational processes were switched to a distant form and there were often problems experienced both by students and teachers. The vast majority of teachers were not professionally prepared to work in such conditions, same goes for the students. Difficulties arose due to their individual characteristics, learning conditions, ability to use computer technology and Internet resources. Currently, there are no distance learning programs that would take into account certain conditions of each student. If we actually consider distance learning as the next stage in the development of education, then the prospects that it has undoubtedly make us think about its significant advantages over the classic form of education. It should not be forgotten that there is also a skeptical attitude towards this form of education, primarily in its effectiveness. A survey was conducted on the topic "Learning via the Internet – learning of the future?"

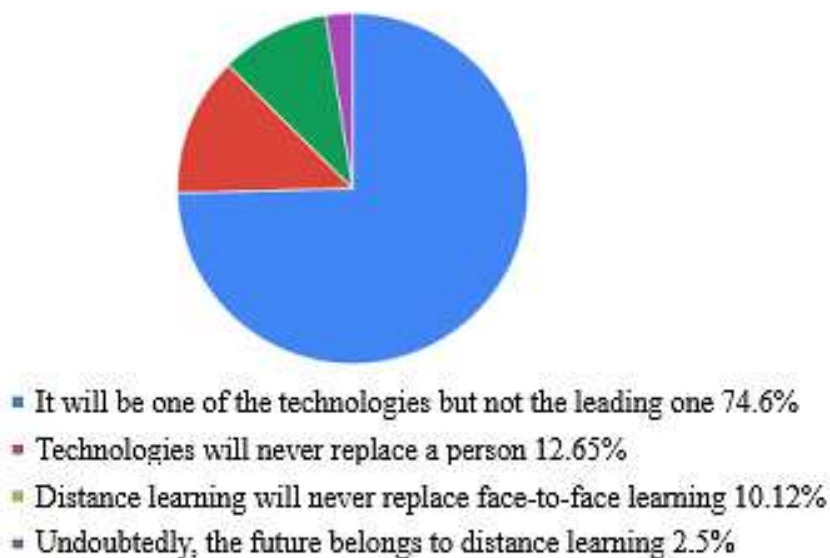


Figure 2. Learning via the Internet – learning of the future

The majority of respondents (74.6 %) considered that it will be one of the technologies, but not the leading one. 12.65 % answered that technologies will never replace a person. Only 10.12 % of surveyed people answered that the future lies in personal communication between the teacher and the student. Other 2.5 % respondents claimed that the future belongs to distance learning [5].

In this regard, the following steps are suggested that will improve digital education without loss of quality, bringing to the minimum the previously described disadvantages of the digitization process of the education system: development of material digital infrastructure. It is necessary to build specialized data centers to store more information, and to develop communication systems; development and implementation of digital programs. Creation and application of teaching materials using neural network technologies. These programs can help the teacher, and even partially replace them in the future; development of new learning management systems.

SLA is a program for the management of educational courses. These programs allow students to ensure free access to knowledge, as well as learning flexibility; improving the skills and abilities of teachers in the field of digital technologies. Today, the big problem is the digital literacy of the teaching staff. Older teachers often experience difficulties dealing with modern digital technologies. It is suggested to improve the skills of teachers through computer competence courses that will allow them to work in a digital educational environment.

The transition to digital form of the education system is inevitable. Despite all the cons and possible inconveniences of the transformation to a digital environment, digital education now can be considered a necessity. It goes without saying that it will not be possible to completely replace the traditional education system with a digitalized one, but a significant part of the process will still be changed. And this transition will be rapid.

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USE OF ROBOTIZATION IN THE FIELD OF AUTOMATIC FIRE EXTINGUISHING

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Abstract. This article describes the feasibility of an innovation such as robotics in the field of fire extinguishing, the classification of the systems and how they work. The paper presents and analyses the most relevant, safe and economical complexes used both in industrial plants and in countryside areas.

Keywords: complex, fire extinguishing, robotics, automation, substance, safety.

ИСПОЛЬЗОВАНИЕ РОБОТИЗАЦИИ В СФЕРЕ АВТОМАТИЧЕСКОГО ПОЖАРОТУШЕНИЯ

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Аннотация. В данной статье описывается возможность применения такой инновации, как роботизация в сфере пожаротушения, классификация систем и принцип их работ. В работе приведены и проанализированы наиболее актуальные, безопасные и экономичные комплексы, используемые как на промышленных предприятиях, так и на загородных участках.

Ключевые слова: комплекс, пожаротушение, роботизация, автоматизация, вещество, безопасность.

Year after year, fires are a huge problem, causing significant damage and taking lives. In some cases, the loss is determined more by the loss of valuable information or communications than by the loss of expensive equipment. For example, a bank server crash will take away the ability to make payments and telecommunication equipment failure will result in a lack of communication. In such cases, the damage would be many times greater than the cost of the hardware itself. Such facilities definitely need automatic fire extinguishing systems.

Watching a foreign documentary about the development of a fire in which a burning candle was placed on a sofa in a test room and the burning process was filmed, it became clear to me that after 4 minutes the intensity of the fire was such that extinguishing it with fire extinguishers was out of the question.

Therefore, the latest technology for fire extinguishing must not only meet requirements for more efficient and quicker extinguishing methods taking all factors into account, but also find application of modern addressable fire alarm systems, for faster fire detection. Synchronisation with fire extinguishing systems will multiply the safety of people, facilities and, in general, minimise the potential for damage [1].

The robotic fire extinguishing complex is an automatic means of extinguishing and containment of a fire or cooling process equipment through remote control, or without human intervention. The robotic fire extinguishing complex is capable of synchronising with a fire alarm system. The robot system identifies the location of the fire in space by means of infra-red scanners on the robot body. The system then selects a robot to extinguish the fire, opens the butterfly valves of the solenoid valves and starts feeding an extinguishing agent into the fire zone.

Throughout the fire extinguishing process, the fire extinguishing software – the fire-finding software – is in operation. This makes sure that there are no second fires and that the fire does not spread around. Only the dispatcher stops the fire spotting programme. When a signal is received that a piece of equipment or structure has overheated, the operator gives a signal to one or two robots to cool the heated objects [2].

With a robotic stationary extinguishing unit, the user can increase the effectiveness of the extinguishing agent because of the precise application of the agent directly to the fire, and reduce the time for identifying a fire, deploying the unit, and extinguishing the fire. And most importantly, it can remotely control fire extinguishing and fire detection, and increase the safety of firefighters.

During the firefighting process, often four robots are involved, two of which extinguish the fire and two others cool the burning object. Stationary robots can be remotely or automatically controlled, using foam, water or powder as a fire extinguishing agent, and work to target fires. They are suitable for applications where the extinguishing process can be life threatening. All stationary units are equipped with a software module to control the fire extinguishing process [2].

The latest robot-assisted fire extinguishing technology aims at avoiding possible catastrophes and loss of life. The first fire-fighting units with horns were installed at The Leningrad Nuclear Power Plant (LNPP) and afterwards, almost immediately at most Russian thermal power plants. Their purpose was to irrigate roof structures in engine rooms with water in order to cool them down and prevent their destruction. Each unit was programmed for its specific area. Each unit was programmed to operate automatically upon receiving a signal from the control panel.

This innovation has already been tried in our country. Russian engineers developed a fire extinguishing system based on a mobile robot. The robots go to the seat of fire and extinguish the fire at the initial stage without human intervention. It is installed during the construction or renovation phase as the main automatic fire extinguishing system – it puts out fires as soon as they break out before the fire brigade

arrives. Each robot is mounted on a mobile base – a trolley. As soon as an alarm is sounded by fire detectors, the robots start searching for the seat of fire. They then dock with a pipeline and direct a jet of foam or water at the source of the fire. In addition, each robot has a search and homing system, with a 360-degree rotation angle and a 90-degree vertical rotation angle. The new technology has already been tested on test fires. "The response time of the system, from the alarm to the start of extinguishing, on the maximum path of the complex – 400 metres – was 1.5 minutes, which corresponds to the regulations. The spillage area of one robot is 7.5 thousand square metres [3].

Fire tests of the robotic fire extinguishing installation were carried out on a class A model fire with a fire load of 2402 MJ, corresponding to the fire hazard category B1. The model hearth with a total weight of 115 kg is made of a bar 40x40 mm in size, 800 mm long. The number of bars in a stack – 180 pcs. The surface area of the hearth is 18.66 m².

The robotic fire extinguishing system includes 2 fire robots. In accordance with the methodology, the source of fire was allowed to flare up for a specified time. During the tests, fire robots detected a fire in less than 20 seconds and started fire extinguishing. The pointing error during scanning in accordance with GOST R 53326 did not exceed 5°. The extinguishing time was 1.5 minutes with a standard time of 60 minutes for group 2 premises.

Robotic fire extinguishing installations have the ability to control fires, so the duration of water supply can be determined by the actual fire extinguishing time. In the absence of combustion, extinguishing automatically stops. Creating a high intensity in a small area in the initial stage of a fire allows you to quickly extinguish and save water. This is many times more efficient than the flow of water according to the standard time.

In conclusion, it should be noted that to date, technologies based on fire robots have been used to protect hundreds of objects from fires. In this regard, there is an urgent need for the new version of set of rules 5.13130 to reflect the regulatory requirements that take into account the wide technical capabilities of the robotic fire extinguishing system. Since the robotic fire extinguishing system according to set of rules 5.13130 refers to water-foam automatic fire extinguishing installations, they should be subject to the same approaches and rules for irrigation intensity and costs as for water-foam installations. This will greatly help designers to correctly evaluate and choose the most suitable robotic fire extinguishing system for protecting objects [4].

The use of a robotic fire extinguishing installation for the protection of individual houses and cottages.

Quite often the question arises of how to secure and choose the right fire protection for cottages and individual buildings.

Currently, fire robots are increasingly used to solve this problem. This is one of the most effective systems that can serve as both primary and secondary fire protection [5]. The main plus of fire robots is the ability to work without human intervention, and the minus is expensive equipment, but there is the possibility of reducing the cost by truncating the functionality, which slightly reduces efficiency [6].

Several robots included in one system are called a robotic fire extinguishing installation. It is, in fact, the whole system. Without human assistance, a robotic fire extinguishing installation is able to independently detect a fire, calculate the

coordinates and direct the barrel while the fire has not yet spread (especially true for wooden structures). The company "POZHTEHSPAS" has many years of experience in this area.

The high efficiency of these fire robots is that:

1. Fire robots are able to independently detect the source and direct the barrel to the desired location with an interval of up to 20 seconds.

2. A powerful jet is used to extinguish a fire (from 20 liters per second or more). Most often uses the fire monitor LS-S20U.

3. The possibility of extinguishing the source of fire with both water and foam.

4. Operation of the fire extinguishing installation in sub-zero temperatures (-40...-50 °C) [7].

A robotic fire extinguishing installation needs a special location so that the irrigation zone of the water jet of each fire monitor is maximally covered and every point of the object is protected.

The ideal option is to protect each point with two fire robots.

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ANALYSIS OF THE REPRESENTATION OF HISTORICAL REPLICAS

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Abstract. This paper discusses replicas of the characters from the book “Prince Serebrenni” by A. K. Tolstoy and the film “Tsar Ivan the Terrible”. As a result of the analysis, features in the representation of the era of Ivan the Terrible in the replicas of the characters were revealed and compared.

Keywords: Ivan the Terrible, the oprichnina, Igor Talkov, Prince Serebrenni, Aleksey Konstantinovich Tolstoy, Tsar Ivan the Terrible.

АНАЛИЗ РЕПРЕЗАНТАЦИИ ИСТОРИЧЕСКИХ РЕПЛИК

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Аннотация. В работе рассматриваются реплики персонажей книги А. К. Толстого «Князь Серебряный» и фильма «Царь Иван Грозный». В результате анализа произведений были выявлены и сравнены особенности в репрезентации эпохи Ивана Грозного в репликах персонажей.

Ключевые слова: Иван Грозный, опричнина, Игорь Тальков, Князь Серебряный, Алексей Константинович Толстой, Царь Иван Грозный.

In October 1862 the magazine “Russian Herald” began to print “The Story of the Times of Ivan the Terrible” written by Alexey Konstantinovich Tolstoy [1]. Both the era itself and the ensuing struggle of ideas were bound to revive interest to the past in order to find in it answers to the urgent questions of our time [2, p. 1]. The historical movie “Tsar Ivan the Terrible” was released in 1991. The original idea of adapting the work of A. K. Tolstoy was not fully realized due to the change of the heads of the movie (instead of Alexey Saltykov, Gennady Vasilyev directed the movie) and insufficient funding. A little later, in 1992, work was finished on the version of A. Saltykov, which got the name “Storm over Russia”, but did not get such popularity among viewers as “Tsar...”. Overall, the movie received negative reviews and the actor who played the role of Serebrenni, Igor Tal’kov, was extremely negative about it [3].

The new wave of popularity both the movie and the book was given recently. The book due to its anniversary of publishing and the “Tsar...” for the videos in the Internet with the actor of Fyodor Basmanov Dmitri Pisarenko.

A. K. Tolstoy as the author of a historical artistic work had to choose the language of the work. The choice of certain one language XVI was difficult, because then coexisted several variations of the Russian language: spoken, church Slavonic, Ancient Russian literary, folk-spoken, business [4, p. 2].

A. K. Tolstoy in the novel clearly reflected the grammatical changes in the Russian language, giving the characters of different layers and origins a speech peculiar to them. This gives the opportunity to talk about the mastery of A. K. Tolstoy not only from a historical point of view, but also the plot. Ideological confrontation of Ivan Terrible, who widely uses in his speech the fifth and second types, described above, and people of the village, Serebrenni or Morozov (who most often use the other types), as we see, is emphasized due to the speech features of the characters.

In this case, it's not just the language that the characters use, but individual words. For example, puns. In the chapter "Alexandrovskaya Sloboda" in the speech of the historical narrator, which should be distinguished from the author proper, is said that the people, in a mockery, replaced the word “sloboda”, meaning in the past freedom [1, p. 37-39] to “nevolya” (captivity). Here Tolstoy, creatively transforming the corresponding fragment of the text of the original source, draws the reader's attention to the key word of captivity and immediately reveals its punitive meaning, sarcastically characterizing the epoch of Oprichnina and based simultaneously on paronomasia and pseudoanthonymy: sloboda – svoboda (freedom), nevolya (captivity) – sloboda.

It is noteworthy that A.K. Tolstoy also actively uses in the novel the lexical historicism of the oprichnik, and no less authentic pun his synonym kromeshnik. The noun “oprichnik” is formed from archaic adverb – “oprich” (except). Therefore, oprichnik was called also kromeshnik (the adverb “krom” also means “except” or “extreme”). As the historian B. V. Kobryn claims, kromeshnik as a form of the name of oprichnik for the first time named disgraced prince Andrei Kurbsky in a letter to Tsar Ivan the Terrible. Because in hell, “as it was believed, the darkness was kromeshnaya (extreme) <...>, oprichniks became under the feather of the Kurbsky hellhost” [5, p. 54]. N.M. Karamzin confirms the punitive semantics of the word kromeshnik, but says nothing about it being first used by Kurbsky (writes only about the synonymous use along with the oprichnik: “Oprichnik or kromeshnik – so people began to call them as monsters of darkness of the extreme – could safely crush, rob the neighbor, and in case of complaints took foam from him for disgrace” [6, p. 259]. This point of fact is shared by the historian S. B. Veselovsky: “It is not known who the first, speaking of oprichniks, called them “kromeshnik”, but this witty game with words and concepts firmly took place in the Russian language and lived to our days. <.. .> Expressions “kromeshny” and “kromeshnik”, formed by analogy with the words “oprich”, “oprichny” and “oprichnik”, were not only a game of words, but also stamped oprichniks as a descendant of hell, as servants of Satan” [7]. A. K. Tolstoy also takes into account the punitive semantics of the synonym kromeshnik, using it as an insulting ironic word in the speech to the Tsar of positive characters: Prince Serebrenni, boyar

Druzhina Morozov, the old mother Anufrievna. In the striking by his artistic power chapter “Execution” Vasily (the Blessed Basil) looking gently into the eyes of Ivan the Terrible, calls him Tsar the Kromeshny (i. e. devil) and compares with Tsars Saul and Herod [1, p. 287] – biblical characters, which became symbols of despotism. The chapter “Jester’s kaftan”, in which the proud boyar Morozov was dressed on the order of the Tsar by oprichniks in the jester’s kaftan. He says the keyword “kromeshnik” angrily several times along his speech to Ivan. The author emphasizes the courage, fearlessness, truthfulness, sincerity of the hero and his contempt for oprichnina.

As from individual parts assembled puzzle, and from individual details and thrown words assembled image of the depicted epoch. An example of this can be called chapter “Pir”. L. V. Uspensky notes respectful appeals to boyars, which is pronounced by Fyodor Basmanov. He explains the prefixes “-su” and “-sta” with the meaning of polite and respectful treatment, was formed from the words “sudar” (“sir”) and “stary” (“old”). “But it is happened because such messages were repeated day after day, constantly, not caring about the meaning, but only trying to make the greeting polite in form. So, the endings of the deferential words, on which the accent does not fall, little by little began to become less clear, they have become indistinct, and finally they have completely fallen away.” – notes L. V. Uspensky [8, p. 3].

The widespread use of episodic narrators in the novel allows the writer to depict the past from the perspective of participants of the events, their eyewitnesses, in the speech of co-authors much wider than in the author’s text, used archaic and spoken language, typical for the depicted epoch, one or another social environment. All this significantly deepens the historicism of the narrative, makes it internally more dramatic, expressive, allows a wider reflection of the element of oral folk speech. Tolstoy widely uses folklore in the historical narrative, in the stories of co-authors and dialogues. Thanks to the playwright’s skill, the documentary language with archaic elements, colloquial, folklore organically combined in the text of the novel, creating a stylistic duality that meets, on the one hand, the aesthetic requirements of the literary literature of the middle of the XIX century, and with another - reflects the characteristic features of the language of the Ivan the Terrible’s era [9, p. 4-5].

The composition of the original work, as is often the case with the movies, was disrupted, so some episodes occur in the wrong chronologically specific A. K. Tolstoy place, and therefore the overall picture is slightly changed in the movie “Tsar Ivan the Terrible”. Our analysis will not focus on common episodes or everyday life scenes of the time, but on private words and expressions used in the replicas of the characters, and how they respond to the demands of the original text and the era of the work.

The movie, like the book, does not hesitate to use historical sources to make scenes realistic, but sometimes it goes against the original text. So, the three-hearted storyline with Kolychev becomes, albeit a small episode, but with an accent on Metropolitan Philip himself. Accordingly, from the first minutes of the movie appears a character who not only suffers from the cruelty of the tsar, but also opposes him.

There was a replacement of the monologue of Metropolitan, which can be seen in “History of the Russian State” by N. M. Karamzin [6, p. 268], with a dialogue is used to simplify viewing. However, one can also notice the simplification of the church

Slavonic language itself, which is spoken by Metropolitan Philip in the work of N. M. Karamzin.

The change of the church Slavonic to a more modern language is also taking place in the speech of Ivan the Terrible. In written sources left by him and in the text “Prince Serebrenni” Ivan often used allegories from the Bible. However, in movie formidable monologues of Ivan IV, turned on negligent boyars (for example, in scene with interrupted execution of Serebrenni). At the same time, it would be a mistake to believe that the change of lines occurred as a result of the movie’s creators’ desire to reduce the influence of the Church on the movie’s characters. In the movie more than once shown the prayers of the Tsar, which pleases «every day new sins» according to Anufrievna. In parallel with the whisper of Ivan the Terrible, the replicas of the same prayer of Ivan the boy are heard in the background. And in the next scene of dream there is an image of the murdered on the order of Ivan who says “Zdrav budi, Ivane, izhe pogubil esi mya bezvinno” (“Long live Ivan, who killed innocent me”) in old style, which almost literally copies the phrase from the book.

Speaking about the language of the Church at that time it is impossible not to mention the speech of Blessed Basil. His lines to Nikita Serebrenni or during executions are almost unchanged from those in the book. It is much more interesting to see the transformation of the author’s words from the book into a dialogue form, which manifests itself in the scene with “sleep” Ivan.

Instead of more modern construction “ne on vinovat v svozey bolez’ni” (“he is not to blame for his illness”) there used “ne on povinen za bolez’n svoyu” (“he is not responsible for his illness”). The diminutive-hypocoristic suffixes in naming people, characteristic of the Blessed, are preserved. The transition from laughter to crying is also consistent with the character’s image. The idea of Tolstoy that tyrants are begotten by a silent crowd here takes a form of enlightenment characteristic of the blessed. And if in the episode with “dream” speech of Basil seems to be close to the modern, although it is not burdened with those constructions that are used in the original text, but it is in this monologue of Basil the Blessed his words are immersed to the maximum in that epoch, leaving the viewer with an understanding of what is happening.

An important component of the world of Oprichnina and the text of A. K. Tolstoy is also a people. The most representative shades of speech of ordinary people are Mikheich, miller and robber Mitya.

The first part of the movie everyone refers to Nikita Serebrenni “knyaz” (“prince”), while in the book he most often appears in the speech of strangers as “boyar”. Stephne of Serebrenni is one of the first characters who in the course of the movie use the appeal “boyar”. It is important to note here that in the hierarchy the prince is above the boyar. And accordingly, if people saw a rich man with warriors and lackeys, they could use the word «boyar» as a more generalized reference before they knew his name. Mikheyich adds the word “batyushka” (“father”) to this, considering that he, though older, is his subordinate. Explicit obedience, manifested in words-appeals (boyar, prince, prefixes -su, etc.) are important markers of the epoch.

The miller Davydich, who engages in witchcraft, is essentially the opposite of the Church. So, his replicas should be filled with simple words, meaningful for

conducting various rites and conspiracies, which is the opposite of the Church Slavonic language with its sentiments and sacral stable combinations.

In the scene with the salvation of the Vyazemsky, the character's speech is almost indistinguishable – separate unhurried sounds interspersed with a whistle and turn into repetition of the same words several times (for example, the words “many heads sticking out”, which attract the attention of Fyodor Basmanov). The miller, when communicating with people, uses plain words: “cho” instead of “chto” (“what”), “kaka” instead of “kakaya-nibud” (“any”); sayings; does not soften consonants next to ioted vowels. The character of the sorcerer is also influenced by his worship in front of the guests. He often uses the appeal “batyushka”, many times thanks for mercy by the form of the word “blagodarstvuyte” (“thank you”), expresses readiness to help, but every time he hints that for his work there is a reward. Because the movie does not show Mikheyich's dialogue with the miller, we see only Davydich's relationship with people above him by status and we cannot judge whether these conversations are indicative of obedience according to hierarchy (like in the speech of the aspiring of the Serebrenni) or professional habit (which appears in the text of A. K. Tolstoy).

And finally, the most vivid representative of the “language of the people” is Mitya. The book repeatedly emphasized his narrow-mindedness, combining with original puns, straightforward and characteristic saying “a” instead of “o”. In the movie, the role of this character is reduced to a minimum – a couple of words when rescuing Serebrenni from prison, appearance in the group of village soldiers and the battle for the Druzhina Morozov.

Even when he fights with Homyak (Hamster) and people laugh at him, he asks “Cho gorlo-to deryete?” (“Why are you throat-wrestling?”). The vowel “o” or “a” is not as clearly expressed in this case as it is seen in the text. Due to the loss of the “a” soundness, the loss of the character's backstory, and most of the lines, Mitya is nothing more than a casual character in a smerd's outfit. The image of a truly national character, comparable to the hero, is lost, obtains some flat and destroys the built picture of that era.

But if some characters are deprived of their lines, then there should be some that will spend the time left on the screen. Due to the director's idea (and, according to some versions, due to circumstances during filming), the central figure becomes not Prince Serebrenni, but Ivan the Terrible. Therefore, not only the tsar, but also his closest associates get the main roles in this movie. This, for example, happens with Fyodor Basmanov. His speech, with constant changes in intonation and the selection of words necessary for a particular purpose, is itself of great interest to study. He belongs to the very top of the government, but he is distinguished by his femininity, bordering on shamelessness. Those words that in the 1990s or in our time could have been turned a blind eye, in the era of Ivan IV, where almost everyone was deeply devout, were considered unacceptable and terrifying.

Fyodor Basmanov does not use colloquial words, but in the same time there is no high syllable in his speeches. Lexical repetitions and rows of homogeneous members are used by him not as well as in replicas of a people, but because of the desire to arouse at the interlocutor feeling of pity for him (or, as some characters claim, because of “feminine appearance”). References to the Church in Basmanov are not

used to make his speech literary, but to influence the Tsar, for whom this topic, as already said, is very important. Although there are some discrepancies with the lyrics, in general, Fyodor Basmanov's lines in the movie remain largely unchanged, although the character has a marked increase in screen time compared to other characters. It can be assumed that due to the peculiarities of their speeches, which were unusual for the 16th century, but slightly old-fashioned for the late 20th century, it was decided to keep them: the character's speech is understandable to the viewer and at the same time does not distract from events.

The characters of "Prince Serebrenni" not only use archaisms in their speech, but also use appropriate grammatical constructions, references to religious sayings or folk wisdom related to their role in society and plot. Church Slavonic and literary languages undergo great changes. The most untouched figures in lines remained the characters Basil the Blessed and Fyodor Basmanov. Their speeches were in their own way different from the way other estates were expressed, and therefore they seemed more than modern when adapting. Despite all the changes, in the replicas of each character there is a word-marker or construction, that represents the period of the end of Medieval Russia.

Last but not least, we were not able to examine in detail the lines of every more or less primary character in just one work. There was also mentioned another adaptation of "Prince of Serebrenni", which can be made in a similar way. These factors create prospects for further research in this area.

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SOLAR WIND AS AN ALTERNATIVE ENERGY SOURCE

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Abstract. Every moment, the Sun radiates into space a stream of ionized particles emitted by the outer layer (solar corona) at a tremendous speed, reaching 1200 km/s. This phenomenon is called the "solar wind". Its endless "whirlwinds" surround the Earth, permeate the space of the solar system, and even go far beyond its limits. The purpose of this work is to consider a new alternative energy source, its positive and negative aspects and its impact on the ecology of the earth.

Keywords: solar wind, solar sail, alternative energy source, energy.

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Аннотация. Каждое мгновение Солнце излучает в космос поток ионизированных частиц, испускаемый внешним слоем (солнечной короной) на огромной скорости, достигающей 1200 км/с. Данное явление носит название «солнечный ветер». Его бесконечные «вихри» окружают Землю, пронизывают пространство Солнечной системы, и даже выходят далеко за ее пределы. Целью данной работы является рассмотрение нового альтернативного источника энергии, его положительных и отрицательных сторон и влияние его на экологию земли.

Ключевые слова: солнечный ветер, солнечный парус, альтернативный источник энергии, энергия.

In today's world, alternative energy sources (AES) that use inexhaustible or renewable resources are gaining in popularity. It is necessary to develop AES, because

the main current sources of energy: oil and gas are finite and not environmentally friendly in production.

One such, inexhaustible, source of energy is solar wind (Figure 1).

The solar wind is a continuous stream of ionized particles emitted by the solar corona (outer layer) at a speed of up to 1200 km/s. The solar wind radially fills the solar system to distances of about 100 AU, so it can be called the stellar wind.

The solar wind appears due to the plasma generated inside the Sun, which results from fusion reactions that heat the center of the star to several tens of millions of degrees. The pressure of the upper layers cannot balance the gas pressure of the corona matter, and then the heated ionized gas is ejected into interplanetary space [1].

The solar wind consists of 96 % hydrogen (protons), with the remaining 4 % consisting of neon, argon, oxygen, iron, silicon, and sulfur ions, as well as helium isotopes (α -particles) and electrons.

At the Earth's orbit, the solar wind speed reaches 400 km/s and the proton temperature – 50,000 K.

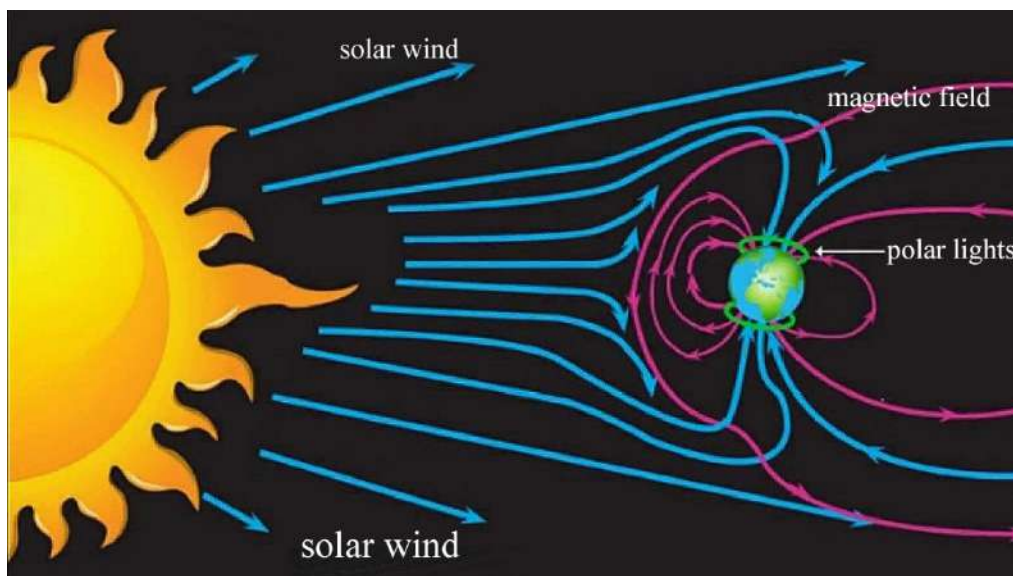


Figure 1. Solar wind

The character of the ionized flux of the Sun is ordered and is subdivided into two kinds:

- Calm (slow or fast);
- Perturbed.

1. Calm – Slow.

The slow solar wind occurs in the interior of our luminary's equator, during periods of thermal expansion of ionized gases. The dynamic process accelerates the coronal plasma to supersonic speeds of approximately 400 km/sec. In its structure, the slow flow is denser and wider than the fast flow.

2. Calm – Fast.

The birthplace of the fast-solar wind is coronal holes. Streams of this wind can flow for months, "attacking" the Earth with the periodicity of the Sun's rotation lasting 27 days.

3. Disturbed

Disturbed streams are caused by: the manifestation of the coronal emission itself, as well as the appearance of compression sites in interplanetary space before the oncoming coronal mass ejections or the rapid solar wind.

The Earth is protected from the destructive effects of constantly changing solar wind streams by the magnetosphere (a region of near-Earth space whose physical properties are determined by the Earth's magnetic field).

The solar wind, flying around the Earth, causes various natural phenomena: magnetic storms, auroras, radiation belts of the planet. Recently it was found out that as the flux of ionized particles of the Sun increases, the number of lightning increases.

In addition, the solar wind generates such geophysical phenomena as an increase in the yield of radon gas from the earth's surface, leading to increased radioactivity in the atmosphere; an increase in the number of earthquakes; and abrupt changes in atmospheric pressure [2].

Powerful emissions from the surface of the Sun disrupt radio communications, interfere with computers, cause malfunctions in engineering networks, and generate unwanted electrical current flow in metal structures and appliances.

Despite the negative impact of solar wind on the planet, this phenomenon has been used.

The idea for solar sails dates back to the twentieth century. In the 1970s, NASA began funding research on solar sails. A solar sail is a device that propels a spacecraft using the energy of charged solar wind particles. The main advantage of such a design is that there is no need for fuel [3].

The solar sail is a very thin membrane (7.5 μm) of a large area (Figure 2), which can reflect microparticles and due to this receive acceleration (Figure 3).



Figure 2. Solar sail

By 2013, two projects had been conducted with the successful deployment of solar sails in space. In 2010, the interplanetary IKAROS satellite mission was the first to successfully deploy and accelerate the sails. An experimental control system using liquid crystal films on the membrane surface capable of changing the light reflection coefficient was tested. This makes it possible to change the light pressure in different parts of the sail [4].

Six months after the launch of the IKAROS satellite, on November 19, 2010, the NanoSail-D2 satellite was launched into orbit. It took only a few seconds to unfurl its

sails. The satellite had a large reflecting surface area, which made it visible from Earth as a bright dot.

These experiments proved that it is possible to use similar technology in Earth orbit to perform a rotation around an arbitrary axis of the vehicle without fuel and unwanted jerks in motion.

The energy generated by solar sails can be used to detect geomagnetic storms, illuminate parts of the Earth, make telecommunications and radio communications, make interplanetary flights, explore the solar system, and create antennas in space for mineral exploration.

In Russia, there is a community "Space Regatta", which has conducted several experiments with solar reflectors (sails) to illuminate areas of oil and gas production [4].

There are also other applications of solar wind. For example, using coronal matter streams to transmit information or creating "ionostations" in planetary orbits to generate electrical energy.

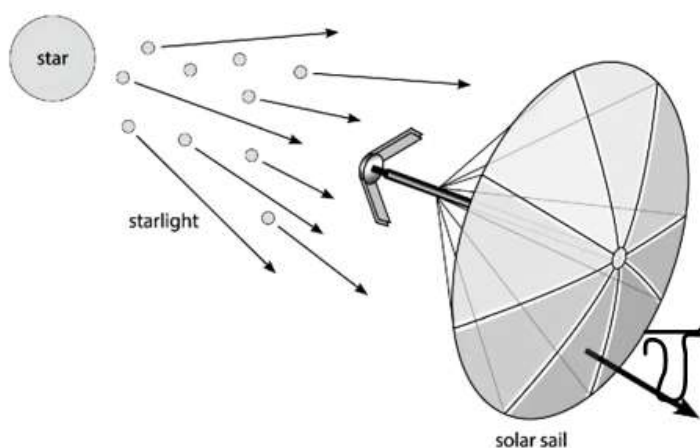


Figure 3. Diagram of the movement of the solar sail

Let's consider the positive and negative sides of the alternative energy source under study.

Advantages:

1. Equipment operating with this technology does not need any fuel;
2. The energy of the sun is an inexhaustible resource;
3. Billions of gigawatts of electricity can be generated by solar wind;
4. Equipment located in orbit, working thanks to the solar wind, can be used around the clock.

Disadvantages:

1. The production of equipment that uses solar sails requires large material costs;
2. Due to the enormous distance between the satellite equipped with a solar sail and the planet, a large part of the transmitted energy is lost.
3. Contributes to geomagnetic activity (e.g., magnetic storms)

In conclusion, we can say that the "solar wind" is not yet fully studied phenomenon, so it has not found a wide application in the energy sector. At the moment, the only technology for the use of solar wind are solar sails. Only a few

experiments have been conducted with their use to illuminate the area. However, in the future, this technology can be used as an alternative energy source.

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**STUDY OF THE HEAT EXCHANGER AND IDENTIFICATION
OF THE BEST QUALITIES BASED ON A COMPARISON OF SHELL-
AND-TUBE AND PLATE HEAT EXCHANGERS**

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Abstract. This paper discusses heat exchangers, their types, properties and advantages, as well as the most common heat exchangers and their areas of application.

Keywords: equipment, heat exchanger, heat, transfer, exchange.

**ИЗУЧЕНИЕ ТЕПЛООБМЕННОГО АППАРАТА И ВЫЯВЛЕНИЕ
ЛУЧШИХ КАЧЕСТВ НА ОСНОВЕ СРАВНЕНИЯ КОЖУХТРУБЧАТОГО
И ПЛАСТИНЧАТОГО ТЕПЛООБМЕННИКОВ**

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Аннотация. В данной работе рассматриваются теплообменные аппараты, их виды, свойства и преимущества, а также самые распространенные теплообменники и области их применения.

Ключевые слова: аппарат, теплообменник, тепло, передача, обмен.

Heat exchangers are devices made to transfer heat from a coolant heated to a certain temperature to a less heated coolant. The process of transferring heat from one coolant to another is one of the most important and frequently used in many engineering fields. Heat exchangers are used in many processes, such as: heating, cooling, evaporation, condensation, melting, crystallization and others [2].

Currently, heat exchangers are an important part of modern heating technology. Heat exchangers are used in the power industry and public utilities, as well as in many technological processes: oil refining, petrochemical, chemical, nuclear, refrigeration, gas and other industries.

In addition to industrial heat power engineering, heat exchangers play an important role in the heat power industry throughout the country. There are a lot of types of heat exchange equipment [1].

The design of the heat exchanger depends on the application conditions. There are devices in which, along with heat transfer, some other processes occur, such as phase transformations, for example, condensation, evaporation, mixing.

Heat exchangers have many advantages:

- it is possible to reuse the energy that is in gases and is lost in the form of waste heat if it is not used;
- heat exchangers are used in the housing and communal services sector to heat water for heating;
- increase the efficiency of the system and reduce heating costs, as they have the greatest potential during interaction with a thermal installation with a high calorific value.

Ventilation systems of buildings for various purposes, as a rule, have a significant energy saving potential, which can reach 30 % of the total energy consumption of the system [3]. The desire to intensify the processes of convective heat transfer and create the most technologically advanced and economical heat exchangers has led in recent years to a rapid improvement in the design of heat exchangers.

Heat exchangers are classified according to the method of heat transfer and their application. Let's take a look at these classifications one by one.

There are several types of heat transfer equipment: surface and mixing [4]. In surface heat exchangers, the circuits are completely sealed, since heat exchange between different media is carried out through walls made of a heat-conducting material intended for this. In mixing heat exchangers, heat transfer is achieved by mixing the two media. This type is used much less frequently than the above.

At the same time, surface heat exchangers are divided into recuperative and regenerative. In recuperative heat exchangers, the exchange of heat between bodies is carried out with the help of thin walls of the circuits, and the flow of the medium has a certain direction. Regenerative heat exchangers differ from recuperative ones in the possibility of changing the flow direction.

There are a lot of types of heat exchangers for use, so listing them all is simply pointless. Consider the most popular heat exchangers used at heating points, namely the surface type [5]:

- shell-and-tube heat exchangers – they are in the form of tubes, which are assembled in one bundle, and it, in turn, has a grid-like connection. To connect such a beam, welding and soldering are used (Figure 1);

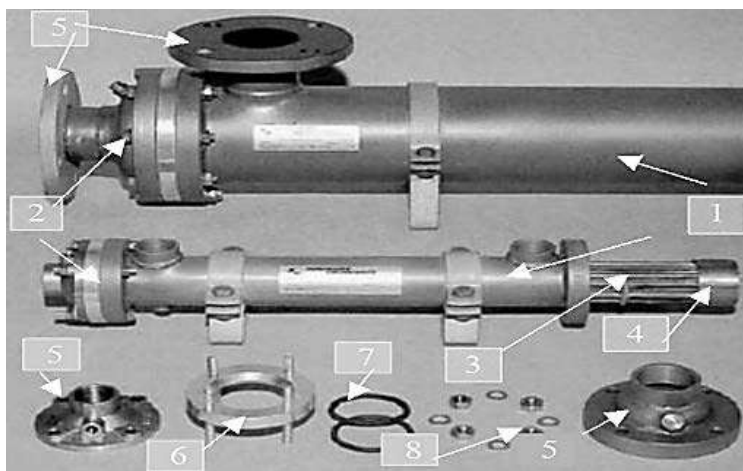


Figure 1. The device of a disassembled shell-and-tube heat exchanger: 1 – casing, 2 – covers, 3 – heat exchange tubes, 4 – tube sheet, 5 – flanges, 6 – connecting ring with studs, 7 – gasket, 8 – fasteners

– plate heat exchangers are heat exchangers having a heat exchange area consisting of plates connected by heat-resistant seals (Figure 2).

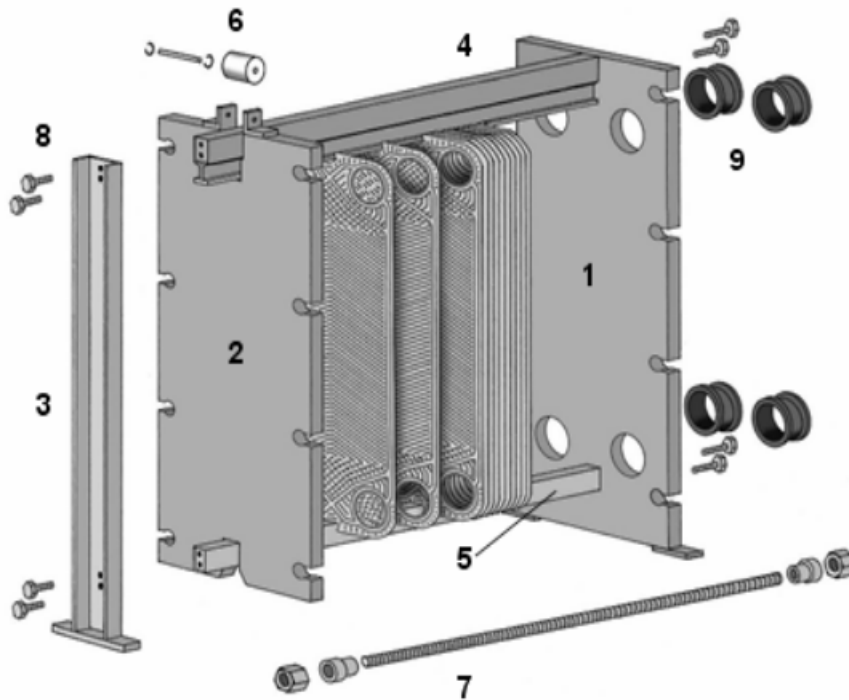


Figure 2. The device of a collapsible plate heat exchanger: 1 – fixed plate, 2 – movable plate, 3 – vertical column, 4 – upper horizontal rod, 5 – lower horizontal rod, 6 – fixing screw, 7 – coupling screw, 8 – bolt, 9 – fitting

Now in many residential buildings there are heat exchangers. Let's look at which of these types of heat exchangers has more advantages and is most efficient.

One of the advantages of a shell-and-tube heat exchanger is its high resistance to pressure surges in a liquid-filled system, i. e. to water hammer. In addition, they are less demanding on water quality, which cannot be said about a plate heat exchanger. But also, these heat exchangers have their drawbacks, among which are a low heat transfer coefficient, the need for thermal insulation of the structure, and high metal consumption. In addition, large dimensions do not allow this design to fit into a small space.

The advantages of a plate heat exchanger are as follows: the efficiency of such devices varies from 80 to 85%, these installations occupy a small space, high resistance to pollution. Unlike shell and tube heat exchangers, plate heat exchangers have a higher heating efficiency. Despite the large number of advantages, the device in question also has disadvantages: small energy losses and strictness to water quality.

When choosing a heat exchanger, price plays an important role. Comparing the wholesale prices of these equipments would be wrong. In addition to the purchase price, you need to compare the cost of service. This is where plate heat exchangers come into their own.

Thus, based on all the studies done, it can be seen that the obvious advantage is on the side of the plate heat exchanger. The use of this type has increased significantly due to the modification of the heat supply of housing and communal services.

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ANALYSIS OF FIREFIGHTER EQUIPMENT AND MEANS OF AUTOMATING THE FIREFIGHTING PROCESS

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Abstract. This article describes the history of the emergence of the profession of a firefighter, analyzes the equipment of a firefighter from Russian and foreign manufacturers. Examples of automated fire extinguishing equipment are given, as well as measures for their maintenance.

Keywords: firefighter, fire, firefighter clothing, combat clothing of a firefighter (CCF), firefighter gloves, firefighter boots, firefighter helmet, robotic complexes, automation.

АНАЛИЗ СНАРЯЖЕНИЯ БОЙЦА ПОЖАРНОЙ ОХРАНЫ И СРЕДСТВА АВТОМАТИЗАЦИИ ПРОЦЕССА ТУШЕНИЯ ПОЖАРОВ

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Аннотация. В данной статье описывается история возникновения профессии пожарного, анализируется снаряжение бойца пожарной охраны российских и зарубежных производителей. Приводятся примеры автоматизированных средств пожаротушения, а также мероприятия по их техническому обслуживанию.

Ключевые слова: пожарный, огонь, одежда пожарного, боевая одежда пожарного (БОП), рукавицы пожарного, сапоги пожарного, шлем пожарного, робототехнические комплексы, автоматизация.

Fire is one of the most destructive elements, each year it kills tens of thousands of people, causes billions of rubles worth of damage, destroys residential buildings, forests, and causes environmental disasters. For the period from January till June 2022 there were over 197 thousand fires which took lives more than 4 thousand people including 153 minors, the sum of material damage has exceeded 7 billion roubles. Fire can arise for various reasons, 77 thousand fires during the same period were caused by

careless handling of fire, 16 thousand by faulty electrical equipment, 3 thousand by arson [1].

However, this is only a small part of what could have been if there were not firefighters in the service of fire protection. A firefighter is a member of a professional firefighting unit responsible for fire suppression and emergency rescue work. This profession is very difficult and directly related to the lives of other people and their own. Firefighter can become a person who can mentally and physically cope with the task. In addition, it is necessary after service in the army to graduate from courses at the fire department, it is necessary to undergo testing for psychological qualities, a medical commission, to pass an interview and after a successful pass a candidate is sent to a training center for a trial period of up to 3 months.

Profession firefighter in Russia appeared in the 17th century, but there was no special protective clothing for people fighting with fire for the next two centuries, fires were extinguished in ordinary jackets and pants made of slightly denser fabric. Special uniforms were not adopted until the 19th century and did not have a common, uniform look. Bandmasters, the leadership of the fire brigade, wore a dark green caftan, trousers, chrome boots, a bronze gilt helmet with a coat of arms and a sword, ordinary firemen wore a gray half caftan, ordinary boots, a bronze helmet and a harness on the belt for an axe. The appearance of firefighter clothing in Russia 19th century is shown in figure 1 (a).



Figure 1. Appearance of fireman's clothes in Russia in the 19th century:
a) The appearance of firefighter clothing in Russia 19th century
b) the appearance of fireman's helmet in Russia of 19th century

Fireman's helmet of that time had a specific appearance, its design had a long back piece to prevent water from getting behind the collar, and on the top, there was a high comb for shock absorption, such helmets were widespread, but in some countries, such as Japan and Sweden the comb on the helmet was not used, the appearance of fireman's helmet in Russia of 19th century is shown in figure 1 (b).

To date, Presidential Decree No. 728 of December 19, 2018, increased the number of personnel of the federal firefighting service to 251,339. Every day they stand to protect people from emergencies. During the extinguishing of firefighters must not only extinguish the hearth, because the fire is not so much an open fire, uncontrolled

coverage of the territory, but a number of related factors, which, in turn, become the cause of death. Fire hazards affecting people and property include:

1. Uncontrolled flames and sparks;
2. Heat flow;
3. Elevated ambient temperature;
4. Increased concentration of toxic products of combustion;
5. Reduced oxygen levels;
6. Reduced visibility.

In addition, fire is often accompanied by the destruction of buildings, the spread of radioactive substances in the environment, explosions, and the effects of extinguishing agents.

In order for firefighters to perform their work efficiently they use modern personal protective equipment, special technical means. Firefighter's clothing in Russia has changed a lot compared to the century before last, nowadays it is a set of equipment, which includes:

1. Combat clothing of a firefighter (CCF)
2. Firefighter's boots;
3. Firefighter's gloves;
4. A firefighter's helmet;

This kit allows firefighters to do their job and confront the destructive elements with the minimum possible risk to life. Each piece of equipment is mandatory, reasonably necessary, and must be quality constructed for future use. At the same time, it should be convenient, because in cases of emergencies the count goes to minutes, and the loss of precious time can cost the lives of many people, including the firefighter.

Each of these tools should be subject to appropriate GOST certification and passport. Let us analyze the equipment of fire fighters in Russia with foreign analogues. In Russia CCF consists of a heat-reflective coverall and a jacket. Such kits are made of modern flame- and heat-resistant materials with a waterproof layer, such as polyesters, metalparamides, polyacrylonitriles, they are able to keep their integrity at high temperatures and do not let substances used for firefighting through [2]. The appearance of the Russian CCF is shown in Figure 2 (a).

Foreign analogue of CCF – fire suit Fire Flex made of modern heat-resistant materials, providing waterproofing and allow to protect from the excess heat transfer and penetration of water vapor, the appearance of the suit Fire Flex is presented in figure 2 (b). Compared to the Russian CCF this suit has no distinctive technical features, but has an attractive appearance [3].

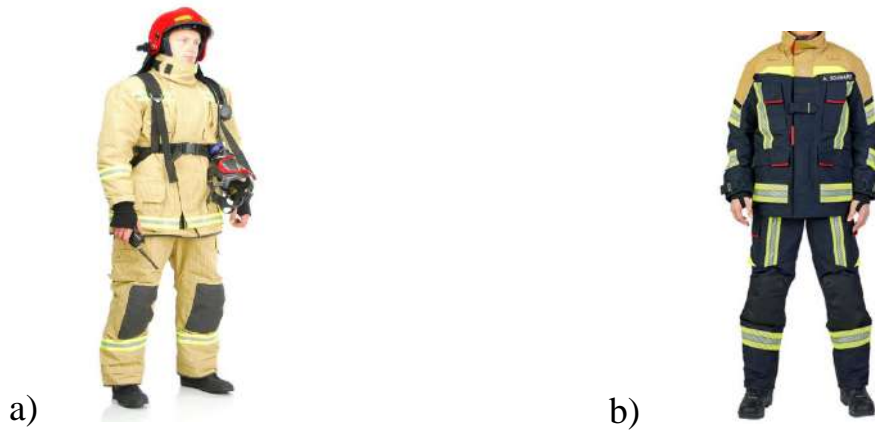


Figure 2. Exterior view of the CCF
 a) The appearance of the Russian CCF
 b) The appearance of the suit Fire Flex

The Russian firefighter's helmet is a cast metal construction that includes: helmet body, face shield, chin strap, inner harness, and cape. The design of the helmet does not impair hearing perception.

To increase the safety of the helmet in low visibility conditions and in the hours of darkness the helmet can be fitted with warning elements made of fluorescent or reflective material.

The design of the helmet makes it possible to use it with the means of individual protection of the respiratory organs, eyesight and all kinds of special protective clothing for firemen as well as wearing a fireman's helmet. The external view of the modern Russian firefighter helmet is shown in figure 3 (a). Of the modern foreign helmets, the PAB Fire 05 helmet stands out, awarded for its modern design and excellent protective properties, the appearance of the PAB Fire 05 helmet is shown in figure 3 (b). This helmet is made of thermoplastic and reinforced with fiberglass, which allows the helmet to withstand temperatures up to 500 degrees Celsius, as opposed to 160 degrees from the Russian manufacturer [4].



Figure 3. Appearance of a fireman's helmet
 a) The external view of the modern Russian firefighter helmet
 b) The appearance of the PAB Fire 05 helmet

To protect the hands and arms of firefighter's gloves are used. They provide protection from heat flow of 5 kW/m^2 for 30 minutes, in contact with an open flame – for 10 seconds. Inside the gloves there is a thermal insulating insert, for the convenience of wearing a loop is sewn into the bottom cut, for the convenience of fixing an elastic band is inserted, the appearance of fireman's gloves is presented in figure 4. In comparison with Russian gloves, we can bring the gloves of an Austrian manufacturer ESKA, which are made of fabric GORE-TEX Jupiter 5F, with kevlarlar elements on the outer side of the gloves. These gloves have an advantage over Russian gloves because of their materials and flame retardant properties, and the 100 years' experience of the foreign company in glove production gives an advantage in manufacturing techniques. The appearance of ESKA fireman's gloves is presented in figure 4 (b) [5].

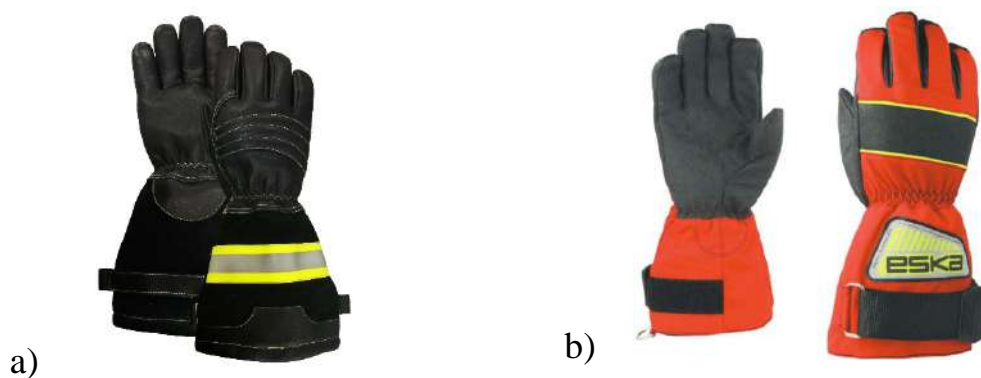


Figure 4. Appearance of firefighter's gloves
a) The appearance of firefighter boots in Russia
b) The appearance of ESKA fireman's gloves

Special boots made of heat-resistant nitrile rubber with protective elements to neutralize impact are provided to protect the feet of the firefighter in Russia. The appearance of firefighter boots in Russia is shown in figure 5 (a). At the same time, the German company Haix, which is the world's leading manufacturer of professional footwear, has developed a new type of mprotective boots for firefighter Fire Eagle, made of waterproof and breathable leather, the inner equipment consists of a moisture-wicking insole with a system of air channels. The appearance of the Fire Eagle firefighter boots is shown in figure 5 (b) [6]. This model does not surprise with its technical properties, but the design allows the boots to be put on in just over 5 seconds, which gives a significant advantage over their Russian counterparts.

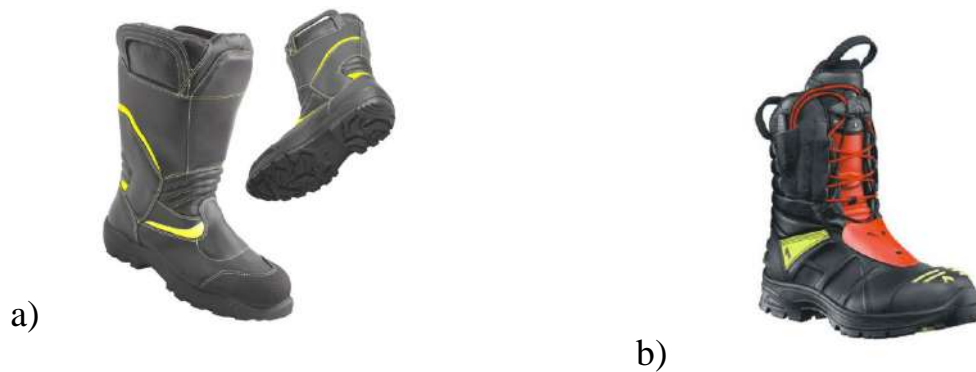


Figure 5. Appearance of the fireman's boots
 a) The appearance of firefighter boots in Russia
 b) The appearance of the Fire Eagle firefighter boots

Fire is unpredictable and fighting it is a very complex and dangerous process. It is important that every firefighter is equipped with all the necessary tools to do his job. In the future the firefighting profession has to become safer because of developments in firefighting to achieve automation of this process. Robot-technical complexes (RTC), allowing to automate the process of fire-extinguishing, are already applied in Russia multifunctional complexes of fire-extinguishing EL-4 (Figure 6 (a)), tracked unmanned firefighting robots LUF-60 (Figure 6 (b)), light multifunctional robots MRK-RP (Figure 6 (c)), RTK TROPA-3ROP (Figure 6 (d)), and many others [7].

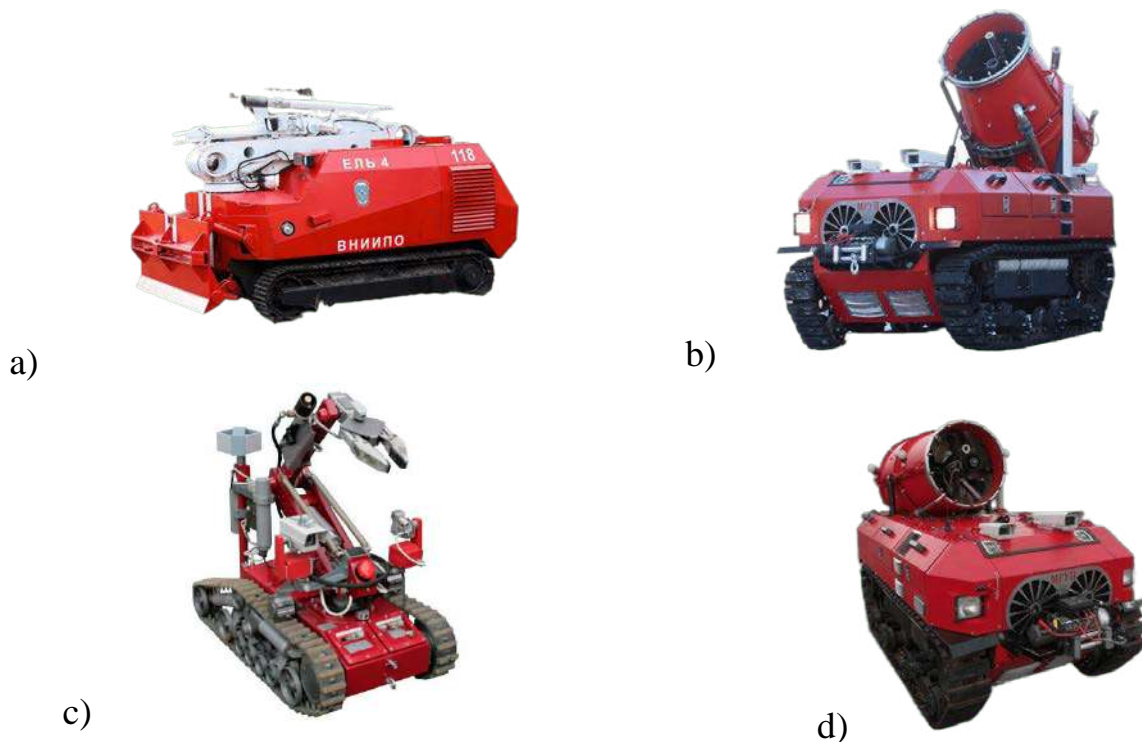


Figure 6. Robotics complexes
 a) Multifunctional complexes of fire-extinguishing EL-4
 b) Tracked unmanned firefighting robots LUF-60
 c) Light multifunctional robots MRK-RP
 d) Robot-technical complexes TROPA-3ROP

All these robotic complexes make it possible to extinguish fires without direct human presence at the seat of fire, which in the near future will almost completely automate firefighting and minimize the danger to which firefighters are exposed during the performance of their work. Time does not stand still and modern means of fighting fire are very different from what they were a few centuries ago, one day there will come a period in which robots will be able to save lives without human presence or operator control and stand guard against fires instead of people who risk it every day.

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GAME TECHNIQUES IN THE DEVELOPMENT OF MOTIVATION FOR TEACHING YOUNGER SCHOOLCHILDREN

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Abstract. The article deals with the development of motivation in schoolchildren, considers examples of the use of game technologies for the development of motivation, and also identifies the problems faced by practicing teachers in the implementation of technologies that contribute to increasing motivation in schoolchildren.

Keywords: FGOS NOO, motivation, FGOS OOO, game techniques, game.

ИГРОВЫЕ ПРИЕМЫ В РАЗВИТИИ МОТИВАЦИИ ОБУЧЕНИЯ МЛАДШИХ ШКОЛЬНИКОВ

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Аннотация. В статье рассмотрены вопросы развития мотивации у обучающихся в школе, рассмотрены примеры использования игровых технологий для развития мотивации, а также выявлены проблемы, с которыми сталкиваются практикующие учителя при реализации технологий, способствующих повышению мотивации у обучающихся в школе.

Ключевые слова: ФГОС НОО, мотивация, ФГОС ООО, игровые приемы, игра.

The problem of motivating schoolchildren is one of the main ones in pedagogical activity. Without the desire to learn, the child will not receive enough knowledge. At the same time, motivation should be considered both as an impulse to action and as a psychophysiological process that controls human behavior, setting its direction, organization, activity and stability [1].

One of the most effective methods of influencing the child is play activities. Play is a type of meaningful unproductive activity where the motive lies not in its result, but in the process itself [1]. It is often much easier for a schoolchild to receive material in a more intimate and understandable activity for him – a game. The modern education

system requires teachers to use all the opportunities and resources available today to improve the effectiveness of the educational process. In the Federal State Educational Standard for Primary General Education (hereinafter referred to as the Federal State Educational Standard of the NOO), there is a section with the planned results that the teacher must implement. In the category of “personal results” it is said that by the end of the 4th grade, children should have “the formation of motivation to learn and learn ...”. The FGOS OOO also notes the important role of motivation, which underlies ... formation of a responsible attitude to learning, readiness and ability of schoolchildren to self-development ...” [2].

A. S. Makarenko (1888-1939), one of the most famous teachers of the USSR, noted: “The game is of great importance in the life of a child, it also matters what kind of activity an adult has work, service. What a child is like in the game, so in many ways he will be in the work. Therefore, the education of the future figure takes place, first of all, in the game...” [3].

Due to the fact that the learning process is being modernized, teachers are forced to look for such pedagogical technologies that would be able to interest schoolchildren and motivate them to study the subject. The formation of educational motivation is the key to success in learning. Learning motivation is the process that triggers, guides and supports efforts aimed at performing learning activities [4]. Often in schoolchildren, the educational motivation to study the subject is insufficient, and sometimes absent, since when studying the subject, they experience significant difficulties and are not always ready to overcome them. Therefore, the relevance of the consideration of this issue is beyond doubt.

In the context of the implementation of the requirements of the FGOS NOO and OOO, the most relevant in this matter are project technologies; information and communication technologies (ICT); group technologies; critical thinking and gaming technologies.

Game technologies are associated with the game form of interaction between the teacher and schoolchildren through the implementation of a certain plot (games, fairy tales, performances, business communication), and, the latter, is objectively determined by the age characteristics of the child. At the same time, educational tasks are included in the content of the game, during the game and are solved.

During the analysis of the materials, we came to the conclusion that the use of gaming technologies will be especially useful for use in the younger grades, because with their help it is much easier to overcome difficulties, obstacles, psychological barriers. The schoolchild is interested in the activity, the process is important to him, active participation in it. During the game, the schoolchild is focused on active and cognitive activity; he does not want to stop it, because it is close to him. He develops leadership qualities, communicative abilities.

The variety of types of game techniques will help the teacher to choose the necessary type of game for the tasks and goals set by him. Each type of play helps in the development of the child as a healthy and independent personality. With the correct selection of games, you can plan and create conditions for the normal development and socialization of the child in society.

Game techniques are ways of joint (teacher and children) development of the plot-game idea by setting game tasks and performing appropriate game actions aimed at teaching and developing children [5].

The implementation of game techniques and situations in the classroom form of classes occurs in several main directions: first, the setting of a didactic goal, which is set for schoolchildren in the form of a game task; secondly, the subordination of educational activities to the rules of the game; the use of educational material as a means of implementing the game; thirdly, the introduction into educational activity of the element of competition, which translates the didactic task into a game one; and finally, the successful completion of the didactic task is associated with the game result [6].

With the use of gaming technologies, you can conduct a variety of types of lessons: role-playing games in the classroom; game organization of the educational process using game tasks (lesson – competition, lesson – competition, lesson – journey, lesson – KVN); game organization of the educational process using the tasks that are usually offered in a traditional lesson; the use of the game at a certain stage of the lesson (beginning, middle, end; acquaintance with new material, consolidation of knowledge, skills, abilities, repetition and systematization of what has been learned); various types of extracurricular activities (KVN, excursions, evenings, Olympiads, etc.), which can be held between schoolchildren of different classes of the same parallel [6].

For the successful inclusion of gaming technologies in the educational process, a number of conditions must be met. Thus, games are designed and selected in accordance with the content of the topic being studied, with the tasks and goals of the lessons; are used with other forms in combination, with effective techniques and methods in the study of new material; goals and objectives are clearly selected and formulated; are selected in accordance with the cognitive capabilities of schoolchildren and their interests [6].

For schoolchildren, the game is an exciting activity. These game techniques captivate teachers. In the game, everyone is equal. It is feasible even for schoolchildren who are lagging behind in their studies. Such a schoolchild can even be the first in the game: resourcefulness and ingenuity can be an important factor than knowledge of the subject. A sense of equality, an atmosphere of enthusiasm and joy, a sense of feasibility of tasks - all this allows schoolchildren to overcome shyness, which affects the positive learning outcomes.

In order to find out how to use game techniques among primary school teachers, we conducted testing on the basis of a number of schools in Yaroslavl and the Yaroslavl region: MOU secondary school No. 40, MOU secondary school No. 99, MOU secondary Ivnyakov school, MOU secondary Karachikha school. Testing of primary school teachers was carried out in order to clarify pedagogical technologies in the educational process. A total of 50 primary school teachers were interviewed.

Based on the analysis of testing, we can say that teachers consider it necessary to use game techniques in lessons in primary school, but they do not do it very often. Mostly 2-3 times a week. At the same time, it turned out that one of the reasons that limit the use of gaming technologies is the insufficient number of high-quality

methodological developments and manuals. A properly selected, skillfully and appropriately conducted game should be considered as important and necessary an element of educational work as a lesson.

Among all the variety of game techniques, we have chosen for testing several of the most interesting (in our opinion), which can be attributed to different types: playing (an object / character), the element of “travel” and the distribution of roles. The overall goal of all game techniques is to draw attention to learning activities.

Playing around on an item. The teacher brings the object to the classroom and gives it certain properties. For example: a teacher asks children to find out what is in the “black box”, which can serve as a painted box or box. This technique helps to draw schoolchildren' attention to details, teach them to study the subject from different angles. Observation, attention and imagination develop.

Playing the character. This type is similar to playing with a subject, only here the teacher “invites” a character from a cartoon, film or fictional, from the animal world, etc. For example: the teacher offers children to help Vanya explore outer space, during the lesson the children learn something new and for each task put on it a part of the spacesuit. At the end of the lesson, Vanya has already learned a lot and will be able to go into space. Or the keeper of the forest can “come” to the lesson to the children and tell them that it is necessary to protect nature. With the help of this technique, schoolchildren learn to help others, to respect another people's work. Also, this technique will be able to teach children to share their knowledge and do it in a correct and understandable form.

The “travel” element. An element of “travel” is introduced into the lesson. For example: the teacher for each completed task gives the children a part of the map, at the end the schoolchildren have a map with a certain algorithm (how to solve problems, how to parse a sentence, etc.).

Distribution of roles. The teacher invites the whole class to feel in the role of: designers (in a lesson of fine arts); Travelers; reporters (learn to do interviews); detectives and so on. Schoolchildren can learn more about a certain profession learn about the features and learn to respect another people's work. The technique helps children to understand the essence of certain professions, will teach them to appreciate another people's work.

Of course, only one or a few games, even the best ones, cannot ensure success in solving all the tasks at hand. At the same time, the constant use of game techniques in the classroom will help to draw more attention to the extraction of knowledge, to learn all the subtleties of the subject being studied.

To find out how effective the selected game techniques are, we conducted a study on the basis of the secondary Karachi school. The study class is 1. We conducted a primary diagnosis on the level of motivation to study in schoolchildren; four lessons of a teacher who does not use game techniques (Figure 1; Figure 2) were analyzed; 4 lessons were conducted using the game techniques described above. To get feedback, “Mood Maps” were created. Schoolchildren noted their mood before and after the lesson.

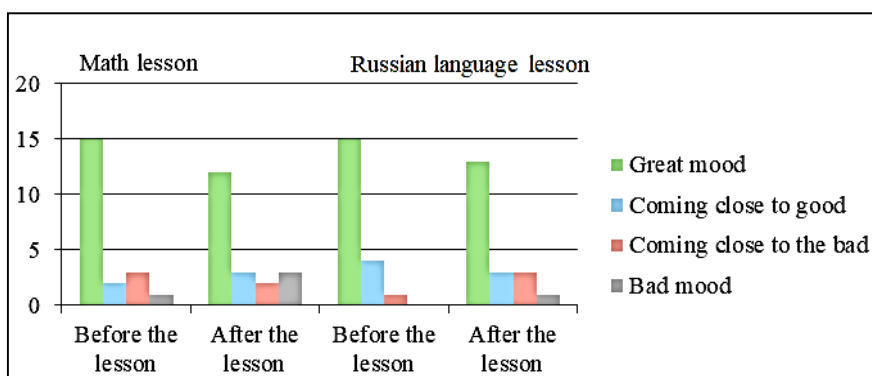


Figure 1. Mood of schoolchildren

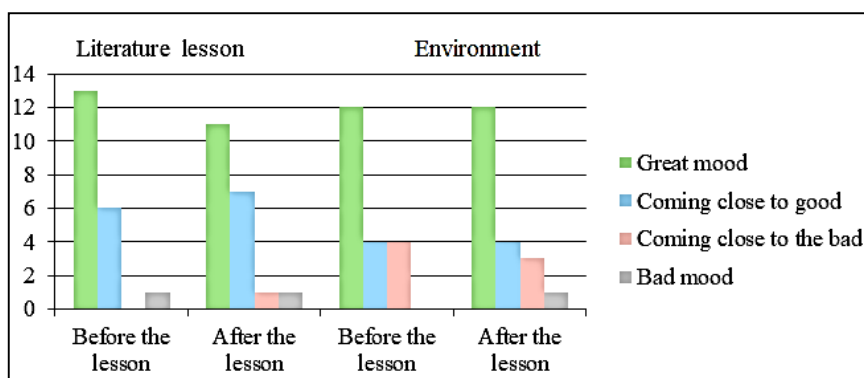


Figure 2. Mood of schoolchildren

At the beginning of the work, diagnostics was carried out to assess the level of educational motivation of N. G. Luskanova. Schoolchildren were given a questionnaire of 5 questions, according to the results of the questionnaire, a high level of motivation is observed in 6 schoolchildren (40 %). The percentage of children with a good level of motivation is 13.3 % (2 schoolchildren). 1 schoolchild of this class, which is 6.6 %, has a positive external motivation. Schoolchildren with a negative attitude towards school were identified 1 (6.6 %). 5 people from the class have low motivation, which is 33.3 % of schoolchildren, which means that they are in a state of unstable adaptation to school. So, in the classroom there is a problem with the motivation of schoolchildren. 39.9 % of schoolchildren are not interested in receiving educational material.

Own observations and special studies in this regard have shown that schoolchildren, during the school day, mainly reduce the emotional background. The percentage of schoolchildren with a great mood at the beginning of the math lesson was 75 %, with a bad mood was 5 %. After the lesson, the percentage of schoolchildren with a great mood decreased by 15 %. The number of children with a bad mood increased by 10 %. On average, for four lessons, the mood decreased in 15% of schoolchildren, which is not considered a good result. The results of the diagnosis can be closely related to the lack of materials for the teacher to attract schoolchildren to educational activities. Lessons go on as usual: we solve the problem, open the textbook and work on the tasks, at the end of the lesson we write down the homework and evaluate our activities in the lesson.

To solve the problem in the studied class, 4 lessons of “discovery” of new knowledge were held using game techniques. According to the results of the “Mood

Maps”, you can see that schoolchildren have a higher mood after the lesson. (Figure 3; Figure 4).

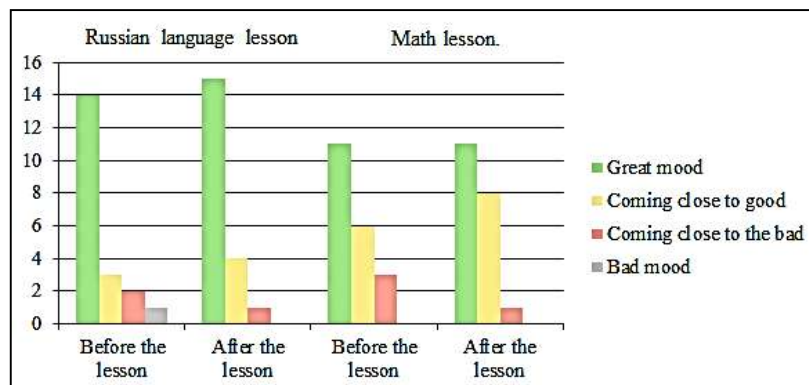


Figure 3. Mood of schoolchildren

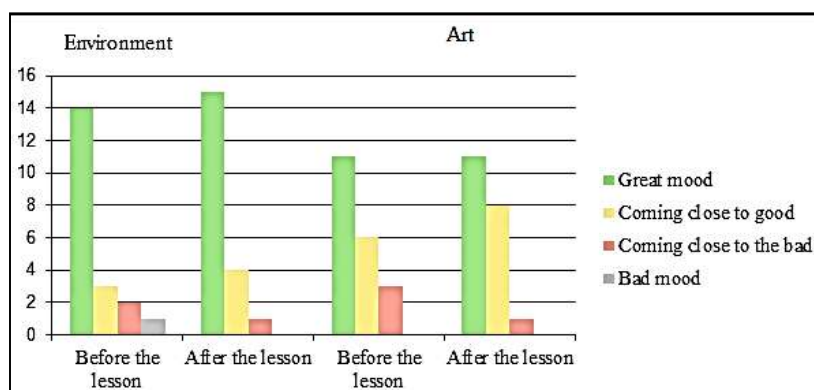


Figure 4. Mood of schoolchildren

On average, children's mood increased by 10-15 % and the percentage of children with a bad mood decreased, on average by 5-10 %. Using the method of observation, it was possible to notice the interest of schoolchildren in the educational process. At the Lesson of the Russian language, the technique “Playing with the object” was used, the subject was writing. The purpose of the lesson was as follows: to create conditions for acquaintance with the structural components of the letter, the concept of “address” and the way it is designed in writing. Schoolchildren actively discussed who the letter could be from; as a result, they tuned in to respond to a stranger, studied the structure of letters and were able to write a response under dictation. After mutually checking the letters, most schoolchildren were able to write a reply letter correctly. In connection with the processed results, we formulated a conclusion: the game techniques selected by us are effective and they can be used in their activities to preserve and increase educational motivation in younger schoolchildren.

Thus, we were convinced that the selected game techniques are effective and can be used in primary school. As a consequence of the described conclusions, using a set of game techniques in primary school to maintain and increase motivation in the younger grades should be recommended.

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RESEARCH OF THE PAPER WEB QUALITY MANAGEMENT SYSTEM

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Abstract. The pulp and paper industry is one of the most steadily growing industries. The quality of paper web is determined by various properties. Significant influences on paper production are profile roughness, weight of 1 m², moisture, and thickness. In order to keep all the necessary paper quality parameters within the specified limits, a sophisticated CD-control system exists. This system was investigated on various paper machines of Kondopoga Pulp and Paper Mill JSC. The results of the study are presented in this paper.

Keywords: paper production, paper quality, automation, newsprint, paper properties, canvas parameters, sensors.

ИССЛЕДОВАНИЕ СИСТЕМЫ УПРАВЛЕНИЯ КАЧЕСТВОМ БУМАЖНОГО ПОЛОТНА

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Аннотация. Целлюлозно-бумажная промышленность – одна из самых стабильно развивающихся отраслей. Качество бумажного полотна определяется с помощью различных свойств. Значительное влияние на производство бумаги оказывает неровность профиля, вес 1 м², влажность и толщина. Для того чтобы поддерживать все необходимые параметры качества бумаги в установленных пределах, существует сложная система CD-control (управление по ширине полотна). Исследование данной системы проводилось на различных БДМ АО «Кондопожский ЦБК». Результаты исследования представлены в данной работе.

Ключевые слова: производство бумаги, качество бумаги, автоматизация, газетная бумага, свойства бумаги, параметры полотна, датчики.

The technological process of paper production is a complex multi-stage process carried out with the help of devices of continuous operation that are different in design, principles of operation and processes occurring in them. This determines the complexity and variety of tasks of automating the paper production process. The composition and configuration of automation systems primarily depend on the features of the paper production technology that should be considered.

Kondopoga Pulp and Paper Mill JSC is a leading producer of newsprint in Russia and in Europe. The plant was founded in 1929. The industrial site of the enterprise is located in the city of Kondopoga of the Republic of Karelia. The newsprint of Kondopoga Pulp and Paper Mill JSC was awarded the “Quality Mark of the XXI century” of platinum dignity [1].

Today Kondopoga Pulp and Paper Mill JSC is a modern production complex with a high level of automation and mechanization of technological processes, equipped with equipment from leading European manufacturers.

The main activity of Kondopoga Pulp and Paper Mill JSC is the production of newsprint, however, in addition, the following products are produced at the Pulp and paper Mill: paper for the inner layers of corrugated cardboard, consumer paper, wrapping paper, feed yeast, technical lignosulfonates.

During the research work, the production of newsprint was considered.

For the production of high-quality paper, it is necessary that its properties meet the standards, depending on the grade and purpose. The greatest influence on the finished product is exerted by such parameters as the unevenness of the profile, the weight of 1 m², humidity and the thickness of the paper web. The main problem in maintaining the values is the fact that all stages of production have an impact on the final product, that is, the quality management system must be integrated into each department of Pulp and Paper Mill (PPM) [2].

One of the most important tasks of automating the paper production process is the regulation of the main parameters along the width of the web of paper-making machines. During the research work, the process of operation of the CD-control system (control over the width of the canvas) was studied.

The study took place in several stages: a survey of the personnel of the PPM controlling the operation of the system, monitoring the production process, studying the data of the automation systems of the technological process.

Based on the results of a survey of the personnel of the PPM that monitors the operation of the CD-control system, it can be concluded that the system is integrated into all stages of newsprint production.

The integration of the system can be divided into three levels, similar to the levels of automation of the technological process: the lower one is a scanning device equipped with sensors, the middle one is controllers and actuators that correct the main parameters of the paper web, the upper one is the operator's workplace, which allows monitoring the operation of the system.

As a result of observing the production process during the research work, it was concluded that the main part of the CD-control system is a scanning device moving across the paper web, the general view of the scanner is shown in figure.

This conclusion is based on the fact that the scanner monitors the main parameters of the paper web, the following is a description of its operation.



Figure. Scanning device

The intelligent measuring platform has its own controller that processes the information coming from the sensors. The scanner consists of:

- sensors of weight, humidity, thickness and optical properties of the paper web located on the movable heads of the scanner;
- weight, humidity and thickness sensor controller boards that measure the corresponding parameters;
- AC70 scanner drive controller;
- a network card that transmits data via fiber to the central controller.

The heads, with sensors located on them, move along the paper web. The control of their exact location relative to each other is carried out by the web edge sensors connected to the ECF board of the MPRC microcontroller.

Measuring devices calculate the value of a parameter over the entire width of the paper. The controller boards process it and, through the network module, transmit it to the main controller.

Since the sensors of weight, humidity and thickness are the main elements of the measuring platform, we will consider them in more detail.

To measure the weight of paper, a radioisotope sensor is used.

The weight sensor determines the degree of absorption of electrons emitted by a radioactive source by a paper sheet placed between the radiation source and the detector.

The measurement is performed by comparing the measuring and reference signals of the detector.

A high voltage (about 800 volts) is applied to the outer wall of the ionization chamber (detector) filled with an inert argon gas. The flow of beta radiation electrons passing through the chamber ionizes the gas and causes a weak electric current between the grounded central electrode and the chamber wall.

The current is amplified by an electrometric amplifier having a high input resistance and, accordingly, a high measurement sensitivity.

The amplified voltage is applied to the input of a frequency converter that processes a series of rectangular pulses with a frequency proportional to the input voltage [3].

Next, the signal is sent to a computing device (sensor controller), which calculates the amount of paper weight per unit of its area.

At Kondopoga Pulp and Paper Mill JSC, an infrared sensor from ABB is used to measure the moisture content of paper.

The sensor operation is based on the phenomenon of high absorption by water, at a wavelength of $\lambda = 1.9$ microns, of infrared radiation.

The paper fibers absorb these waves in about the same way. Therefore, the amount of available water can be determined by comparing the relative absorption at the specified wavelengths.

The sensor consists of a radiation source (projection lamp), a receiver and a special filter. The light from the source is filtered to remove most of the visible radiation and modulated in amplitude by means of a rotating metal disc (interrupter).

Passing through the paper, light is not only absorbed by paper and water, but also scattered, deviating from the direct path. The amount of scattering increases rapidly with increasing paper weight up to 200 g/m^2 . Increased paper moisture can reduce scattering.

After passing through the paper cloth, the light stream enters a dichroic splitter, which transmits light at a wavelength of about $\lambda = 1.8$ microns and reflects it (at an angle of 90°) at lower wavelengths. Then the transmitted light signal passes through a filter with a narrow bandwidth $\lambda = 1.9$ microns. The reflected light is passed through a bandpass filter tuned to a wavelength of $\lambda = 1.7$ microns.

Both signals come to the sulfur-lead photoresistors sensitive to infrared radiation, which are voltage dividers. A change in the level of light energy incident on photoresistors causes a change in voltage [4].

The signal is amplified by a multiplex amplifier, demodulated and converted into a DC voltage, which is supplied to a frequency converter that generates rectangular pulses.

Next, the signal is sent to the serial input board, for subsequent transmission to the main controller.

The sensitive elements of the sensor are special plates located between the paper web. The upper plate is made of ferromagnetic material, and the lower one contains an inductor.

The plates are pressed against the paper by air currents. The air is controlled by solenoid valves.

A change in the thickness of a sheet of paper causes an increase in the distance between the upper and lower plate. Thereby, the magnitude of the magnetic flux passing through the coil L and, as a consequence, the inductance of the coil changes.

When scanning the properties of a paper web, some additive mixture of measurement results in the longitudinal and transverse directions is formed [5].

Since the control of technical indicators in the longitudinal and transverse directions is carried out using various technical means, the measurement results obtained during the scanning process are divided in the scanner controller into components corresponding to these directions.

Measuring devices calculate the value of a parameter over the entire width of the paper. The controller boards process it and, through the network module, transmit it to the main controller [6].

The main controller, based on the data received from the scanner, generates a control signal to the actuators. In this way, the basic parameters of the paper web are adjusted.

The data from the scanner, the position of the actuators and other parameters are displayed at the operator's workplace, in addition, it is possible to change the limits of the monitored parameters.

During the research work, the main parameters of the paper along the width of the canvas and their impact on the quality of finished products, as well as the operation of the CD-control automatic control system, were studied. The paper quality management system used at Kondopoga Pulp and Paper Mill JSC has a complex structure that allows maintaining the necessary parameters within the specified limits at all stages of production.

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IMPLEMENTATION OF CIRCUIT BREAKERS AS PROTECTIVE DEVICES IN THE POWER SYSTEM

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Abstract. This article examines the comparative characteristics of a circuit breaker and a fuse in an electrical circuit. Circuit breakers are widely used in power systems and have a high level of development. As part of the work, the basic principles of the functioning of these protective devices are considered and the process of their impact in the power supply system, on electrical loads is described.

Keywords: circuit breaker, electromagnetic release, electrical circuit, short circuit, fuse.

ВНЕДРЕНИЕ АВТОМАТИЧЕСКИХ ВЫКЛЮЧАТЕЛЕЙ В КАЧЕСТВЕ ЗАЩИТНЫХ УСТРОЙСТВ В ЭНЕРГОСИСТЕМЕ

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Аннотация. В данной статье исследуется сравнительная характеристика автоматического выключателя и предохранителя в электрической цепи. Автоматические выключатели в основном применяются в энергосистемах и имеют высокий уровень развития. В рамках работы рассмотрены основные принципы функционирования этих защитных устройств и описан процесс воздействия их в системе электроснабжения на электрические нагрузки.

Ключевые слова: автоматический выключатель, расцепитель, электрическая цепь, короткое замыкание, предохранитель.

In the modern world, almost no day can be imagined without electricity. It has quickly penetrated into our everyday life, that almost no sphere of human activity can do without its use. The use of electricity made it possible to automate various systems, increase human efficiency and create new technologies that speed up the production process of products, and also contributed to providing a convenient and high-quality environment for further life.

In accordance with the tasks of improving the technical level, it is necessary to ensure the reliability and uninterrupted operation of the power supply system of

industrial enterprises. This, in the main, is complicated at the first stage of implementation – during its design, as technical requirements are constantly increasing, and the specifics of its implementation are expanding. At the same time, they try to draw up a power supply scheme with such a forecast that it can carry out its functioning for a long time, taking into account the upcoming capital costs, operating costs and stability to emergency modes.

In this regard, there is a need for optimal construction of the power supply system. The calculation of electrical loads, determining the number and power of transformers, the location of the transformer substation, accounting for reactive power compensation devices, the transmission of electricity to power consumers and their direct protection form the basis for the correct and high-quality energy supply of the enterprise. At the same time, do not forget that the power supply system must be resistant to a possible increase in the capacity of the enterprise, the introduction of modern production technologies and changes in technical processes. It is also necessary to take into account that the electrical network should not contain underloaded installations, and during an emergency, the elements remaining in operation were able to take on the entire allowable load and ensure uninterrupted power supply to electrical equipment [1].

In the energy system, circuit breakers are used to a greater extent as protective switching device. They are electrical devices whose role is to preserve the functionality of the network and equipment from damage caused by short circuit currents and overload.

Unlike fuses, which are considered disposable, circuit breakers are reusable devices. That is, when an overcurrent passes, the fusible link burns out and it needs to be replaced in the future, the electrical circuit opens and the faulty section is separated from the current source. The second one can be used again after the cause of the damage has been eliminated and ensures the stability of the specified limit value of operation [2]. One of the main components of circuit breakers is the release. It supervises the given circuit and activates the release device, as a result of which the switching device is switched off (Figure):

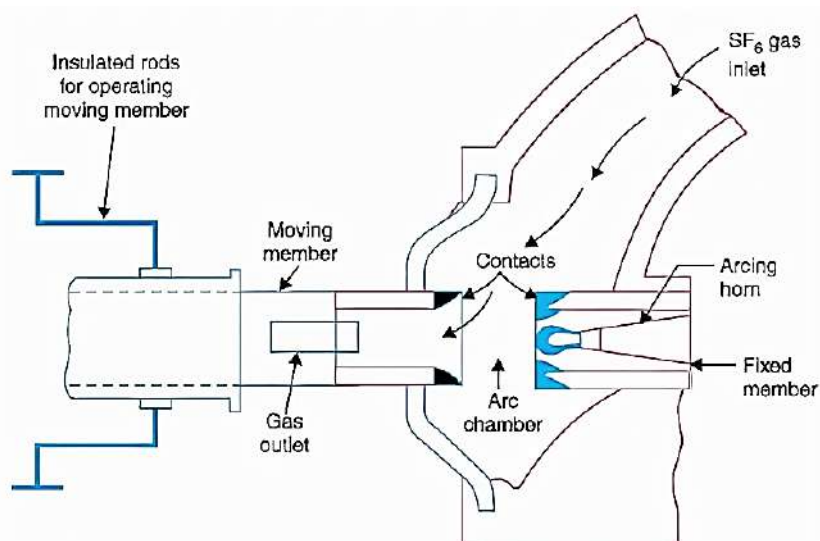


Figure. The structure of the circuit breaker device

In most cases, circuit breakers are used, equipped with electromagnetic, thermal and combined releases.

The main purpose of the electromagnetic release is to cut off short-circuit currents that are several times higher than the nominal value in the electrical circuit. The design consists of a solenoid and a core inside it, held by a special spring. When overcurrent flows through the coil, in accordance with the law of electromagnetic induction, a high-power magnetic field is created, as a result of which the core, overcoming the influence of the spring, moves inside the solenoid. This generates a disconnection of the power contacts of the switching device and the electrical circuit is turned off. If the current is within acceptable limits, then the value of the magnetic flux is not enough to attract the core with a moving contact.

The functional task of the thermal release is to ensure the safety of the electrical circuit when a current pass through it with a value slightly exceeding the allowable one, in particular, during a relatively long overload [3].

The device is a bimetallic plate, which includes two alloys with different thermal expansion. The principle of operation of a thermal release is based on the fact that when a current greater than the nominal value flows through it, the plate is subjected to a load. As a result, having reached a certain temperature, it deforms and bends in the direction of the alloy with a minimum expansion rate when heated, on the basis of which it acts on the lever of the release mechanism. The contact switching device is switched off and the electrical circuit is opened.

When choosing circuit breakers, the following requirements must be met for the main indicators:

1. The rated current of the electrical circuit must not exceed the rated current of the release of the switching device [4].

2. During overloads and in the event of a short circuit, the closing current of the circuit breaker is assumed to be such that the line does not de-energize in normal mode and when exposed to short-term overloads.

3. To prevent spontaneous activation of the release in normal mode, the operating current is used in accordance with 100% to 130% of the rated current [5].

In addition, it is necessary to take into account the rated operational breaking capacity of the circuit breaker, which must exceed the three-phase short-circuit current.

Making rational decisions is impossible without studying the features and fundamental principles of building a power supply system that will ensure its high-quality performance, meet the requirements of its reliability, recommended voltage losses and the general task of optimizing the enterprise. Therefore, with the complication of electrical processes, circuit breakers appear and improve, which provide maximum safety.

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RISKS AND THREATS OF SELF-INVESTMENT FOR STUDENTS

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Abstract. Every student is looking for additional earning opportunities. One option is investing. The article presents the risks and threats faced by students when investing independently. All the risks that are considered in the article are classified by the factor of their occurrence. The factors that can prevent students from investing effectively are also indicated.

Keywords: investments, risks, threats, finance, self-investment, losses, capital, assets.

РИСКИ И УГРОЗЫ САМОСТОЯТЕЛЬНОГО ИНВЕСТИРОВАНИЯ ОБУЧАЮЩИМИСЯ

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Аннотация. Каждый студент ищет возможности для дополнительного заработка. Одним из таких вариантов является инвестирование. В статье приведены риски и угрозы, с которыми сталкиваются обучающиеся при самостоятельном инвестировании. Все риски, которые рассмотрены в работе, классифицированы по фактору их возникновения. Также указаны факторы, которые могут помешать эффективно инвестировать обучающимся.

Ключевые слова: инвестиции, риски, угрозы, финансы, самостоятельное инвестирование, убытки, капитал, активы.

INTRODUCTION

One of the most important human needs in the modern world is money, if you have no money many aspects of life cannot be realized: food, clothing, health, apartment rent, etc. People need to realize their wishes, which require funds, but there is not always an opportunity to earn them, so they have to look for additional ways to

earn money. To better understand the essence of the problem, you should consider it narrower.

Let's look at it from our side – the side of an ordinary student. In addition to the above components of life, students have to give part of their financial resources to study. Therefore, they are forced to look for various ways to earn money. But do not forget that the main priority is studying, for which most of the student's time is allocated. Thus, in order to earn money, you need to find solutions that will not occupy too much time.

What are these solutions? Let's look at this issue in more detail.

One of the possible examples may be working as a waiter, courier, loader, cleaner. Anyway, these ways of earning still have their disadvantages: physical fatigue, attachment to a specific place of work, a set schedule. Because of these conditions, some students are not satisfied with these types of activities. So, they resort to simpler ways to make a profit in their opinion. For example, it may be investments.

Everyone has heard about this kind of activity and it seems to everyone who is not enlightened in this topic that in this way you can earn a lot of money without any knowledge and effort. However, such conclusions are based only on false judgments. In fact, everything is much more complicated than it seems. So, we will look at this topic in more detail.

Let's look what investment is. This term has several interpretations.

WHAT IS INVESTMENT IN ECONOMY

In the economy investment is a set of costs in industry, agriculture, transport and other production and non-production areas for a long time [1].

The investment is the most important tool in the economy. At the macro level investments are the basis for improving the competitiveness of domestic production, developing education, medicine and solving problems with unemployment [2]. At the micro level the increased volume of capital investment makes it possible to increase the level of technical equipment of enterprises, expand and develop production, improve quality and ensure the competitiveness of a particular enterprise [2].

Thus, investments are an important part of a single mechanism aimed at stabilizing and the economy growth. Without the help of investments none of the sectors of the economy is able to exist freely because nothing can be created without financial investments [3]. In our article we will not touch on investments in the industrial complex, since this area requires a large amount of capital investment, which students do not have. Therefore, we will consider financial investments.

WHAT IS INVESTMENT IN FINANCIAL SECTOR

Investment is any deposits in the objects of entrepreneurial activity in order to generate income in the future [3]. This interpretation corresponds to the main goal of any business – making a profit. It is worth saying that the quickness of profit earning is not important to the investor. The profitability that he will receive from the invested funds and the reliability of the financial instrument in which he invested are more significant to him [4, p. 85]. It is also essential to note that the investor pursues purely personal goals that are not aimed at ensuring the growth and development of the economy as a whole.

The peculiarity of financial investments is the independence of the investor in relation to the main type of activity. It is enough for him to have access to a stock or currency exchange, free finances and an agreement with an organization that will allow operations on a special trading platform [5, p. 391]. But it is necessary to have some experience and knowledge, which a novice investor and a student do not have enough. Therefore, he should make a choice in favor of those financial instruments that will provide him with high reliability in order to avoid an outcome in which he will the assets invested by him [4, p. 85]. Given this we have to look for various options that will provide a greater guarantee that the investor will not lose money. Investments can be divided into several groups according to the following criteria: by investment objects, by the purpose and period of investment, by the method of obtaining funds, etc [6]. We will distinguish two groups in which students are most involved – these are investments by investment objects and by investment period.

Investments by investment objects are of three types [6]:

- Real investments are investments in the real sector of the economy. They are investments in the overall development of the material well-being of society. For example, it may be the construction of new facilities, the purchase of new equipment;
- Financial (portfolio) is an investment of capital in company shares, bonds and other securities, as well as bank deposits;
- Intellectual is an investment in intellectual activity (trademarks, new developments, technologies).

According to the investment period, they are divided into [6]:

- Short-term is an investment for a period of up to 1 year;
- Medium-term investments are investments for a period of 1 to 3 years;
- Long-term investments are investments for a period of more than 3 years.

INVESTMENT RISKS

Investments have two key qualities that have a direct relationship – profitability and risk. The greater the potential yield, the higher the risk of losing all your capital [4, p. 86]. Reliable investments never allow you to expect on high earnings.

Investment risk is the probability of receiving less income than expected, as well as the loss of part or all of the invested capital [5, p. 392]. There are many types of possible risks when investing but let's consider only those that students face when they invest independently.

Globally, all investment risks can be divided into 2 groups:

- external (systemic) risks are risks that are associated with external factors such as the economic, political, social situation in the country or the world; the investor cannot influence them [5, p. 396];
- internal risks are risks that are directly related to the object of investment, starting from the competence of the management staff and ending with competition in this market segment [5, p. 396].

RISKS FOR STUDENTS

- Liquidity risk – purchase of unclaimed assets that will be difficult to sell in the future. Students, especially at the initial stages, can invest in those assets that will stop "working" and it will be difficult to sell them. The reason for this is the lack of

experience in this field. Because of this, there is a possibility of losing the invested money;

- Unification of the investment portfolio – often newcomers invest all their capital in the same financial instrument, which increases the risk of loss or decrease in the value of the invested funds [4, p. 92].

For instance, the Forex financial market, in which a student, for example, can invest in only one specific currency, which can dramatically lose in price, thereby leading to a loss of funds. This can happen if a student climbs into this niche without any information.

- The threat of declining academic performance – if a student starts investing, he will devote more time to this, which will greatly affect his academic performance. Thus, he will move away from his main goal – getting an education.

- The threat of burnout – if a student loses at least a small part of his capital when investing, it can hit him hard mentally because any failures and losses are associated with nerves. This affects the student more strongly, since most young people are not psychologically ready.

- The need to attract funds from life – many students do not have the initial capital that is required in order to start investing. Because of this, they have to allocate money for this from their current life. But students are usually people who always have a need for funds, so doing less from "small" is not the best way out.

- Financial “pit” – if the student still lost his funds, he will decide to return the lost money, so he will make the following investments. In this case, the loss of capital may be even greater, which is extremely risky.

- In order to invest, you need to make a plan: goal, deadline, amount of investments, financial instruments, solutions in case of losses [4, p.89]. In order for this plan to work, the student will have to take into account these and many other factors that he cannot foresee.

CONCLUSION

After analyzing the topic of investments and the risks that students may face when investing independently, we can conclude that investing is not the most reliable way to earn money for students. There are many factors that students may not be ready for, or that cannot be influenced.

Firstly, the unavailability is due to the fact that students do not have enough information in this area. You can't earn money if you only have a desire. There must be some kind of knowledge base that will allow you to invest wisely.

Secondly, initial capital is needed for investment, which also needs to be formed. It is necessary to allocate funds for this from the current life but, as we know, students are people who do not have extra funds. In addition, if a person decides to invest, he must have a financial reserve that will need to be used in case of unforeseen expenses.

The next aspect is emotional unavailability. You need to approach with a cool head, you should not play with emotions. Do not forget that bad investing may lead financial losses, so you need to approach this issue with maximum seriousness.

It should also be noted once again that investing requires a huge amount of time, which is still better to direct to study because getting an education is the primary goal of the student.

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THE PECULIARITIES OF INTERPERSONAL RELATIONS AT THE STAGE OF MATRIMONIAL INTENTIONS

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Abstract. The role and importance of the process of communication, acting as the main means in establishing interpersonal relationships and providing a joint vital activity of family members as a cumulative subject, is important. A special role this factor plays at the stage of formation of premarital to enter into marriage. All this led to the relevance of the theme of the work and interest in its study.

Keywords: interpersonal communication, marriage relationships, interpersonal relationships, family.

ОСОБЕННОСТИ МЕЖЛИЧНОСТНЫХ ОТНОШЕНИЙ НА СТАДИИ МАТРИМОНИАЛЬНЫХ НАМЕРЕНИЙ

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Аннотация. Роль и значение процесса общения, выступающего в качестве основного средства в установлении межличностных отношений и обеспечивающего совместную жизнедеятельность членов семьи как совокупного субъекта, очень важны. Особую роль этот фактор играет на этапе становления добрачных отношений к вступлению в брак. Все это обусловило актуальность темы работы и интерес к ее изучению.

Ключевые слова: межличностное общение, брачные отношения, межличностные отношения, семья.

Talking about the marriage period as a preparatory stage for subsequent family relationships, in our opinion, is not quite fair due to the blurred boundaries between formal marriage and informal quasi-marital ties (civil marriage and the like, as well as premarital couples, essentially implementing certain family functions), as well as the

presence of many transitional forms between them, all caused by the collapse of the patriarchal family as historically established earlier form of marriage relations, as the latter has exhausted itself virtually across the spectrum

Of particular importance in the formation of relationships between partners at the stage of premarital relations plays the phenomenon of empathy. Let's define this term and consider it in more detail.

The problem of empathy takes one of the central places among the problems of interpersonal cognition. It focuses on issues of people's understanding of each other, issues of their communication and their relationships. In psychology, empathy refers to a number of mental phenomena, such as sympathy, empathy, "feeling" in the state of the other, "penetrating" into the world of experiences of people, understanding of emotions and feelings of other people, the ability to imagine oneself in the place of the other and even reflection of understanding the emotional states and experiences of the other. Less often this term is used for the ability to identify and decentration [1, p. 2].

All of these phenomena, processes and abilities have in common that they concern understanding people's experiences and reciprocal emotional responsiveness to these experiences. Many scientists talk about predicting another person's feelings, moods and reactions.

P. Massen and J. Conger believe that the mechanism of empathy is the mechanism of imitation, because imitation is the following of certain observable actions. They understand identification as a "more subtle" process of perceiving common patterns of thinking and behavior, which is characterized by a strong emotional connection with another [2, p. 1].

Similar views are held by N. Newcomb. He also interprets imitation as an elementary copying of some behavior, and by identification he understands a mechanism by which a person adopts individual features and whole patterns of behavior of another person [3, p. 3].

The role of imagination in the empathy process was pointed out by A. A. Bodalev. For example, he described predictive empathy as a person's ability to penetrate into the state of another individual through imagination and intuition. Describing the ability to "penetrate" into the sensual world, into the state of the other individual, A. A. Bodalev notes the presence of three levels in it. At the lowest level, which is characterized by passive imagination, simple perception acts and interpersonal cognition as such does not occur. At the second level, there is also action in terms of perceptions. This level is characterized by disordered imagination and fragmentary perceptions of other's experiences. And only at the third, highest level does one reach full-fledged affective-cognitive empathy with participation of perceptual, emotional, and mnemonic processes, which allows a person to imagine himself/herself in the other's place, imagine his/her feelings and state and thereby understand them [4, p. 5].

Empathy is not simply the result of the cognitive and emotional processes described above – it can act as a motivating force when it comes to helping behavior. This kind of empathy, characterized by active assistance, helping other people, is called in social psychology effective empathy or effective emotional identification and is considered to be the highest socially significant form of empathy, which is expressed

in the manifestation of altruistic behavior. Thus, in addition to the emotional and cognitive, the structure of empathy may include a behavioral component.

The family is one of the main institutions of society, which plays a leading role in the life of the individual. It is in the family that the initial formation of the personality, its character and worldview takes place. Throughout the development of mankind, the family has been the basic and basic form of unification of people, and along with the historical development it has managed to retain its status as the main and leading sphere of socialization of the individual. The current status of the family in society is characterized by considerable instability, as divorce and family breakups are frequent. Young families with no more than 3 years of cohabitation are most often affected by this trend.

The family, as a special psychological system, acting as a subsystem of the system "society", has been and remains the main source of social and economic development of society. It produces and reproduces the main social wealth – a human. At the same time, the family also acts as a tool for satisfying a person's diverse individual needs – spiritual, material, physiological, psychological. Thus, in the unified psychological system "society-family-personality" the family appears as a kind of mediator between society as a whole and the individual, performing the most important functions of forming and maintaining socially significant values, legal and moral standards of behavior. Consideration of the family from the point of view of a systemic approach makes it possible to analyze the processes taking place in it and with it, taking into account simultaneously its features as a small group and as a social institution. This is the advantage of system analysis in relation to such a phenomenon as the "family" [5, p. 1].

The structure of interaction in marriage can be considered in terms of a four-component structure of interaction. It includes affective, cognitive, conative (behavioral) and physiological components. In various kinds of joint activity in marriage different components are included, or one of the components becomes the leading one. For compatibility and congruence each component has a different specific weight (objective, independent of the desire of partners and subjective, significant for them and regulated or not regulated by them). The behavioral component is the leading one in the matched relationship. The components overlap with each other. For example, the overlap, or, to be more precise, the interrelation of the cognitive and emotional components is evident in evaluations and self-evaluations. Moreover, the ratio of evaluations and self-evaluations will be different depending on the quality of the marriage. The quality of marriage is also influenced by the congruence of the partners. Well-working is the coordination in joint activity between its participants. Two features are essential in this definition: congruence and activity. Family harmony is defined as unanimity, commonality of points of view, unanimity and friendly relations. In conditions of solution of joint tasks, the consent reflected in psychomotor skills, characterizes congruence. The second attribute of jointness – efficiency of activity. It points to the fact that congruence in this case is connected not with any type of interaction of people, but with concrete activity. Work, activity always assumes as a consequence productivity, success, efficiency. Work is connected with the production of material and spiritual products. It is evaluated by time, quality, and efficiency in

general, including the coefficient of efficiency. The result of workability is the effectiveness of the spouses' joint activity. The process of co-operativity between spouses in marriage is the coordination of the tempo-rhythmic organization of partners, individual style of activity, their skills, abilities in carrying out these or those operations, knowledge of their duties to the family [5].

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MODERN MARKETING STRATEGIES IMPLEMENTED THROUGH PRODUCT PACKAGING DESIGN

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Abstract. The article considers packaging design as one of the key tools used by marketers. The major aspects of successful packaging design are discussed; various strategies of using packaging design with respect to target consumers are exemplified.

Keywords: design, packaging, marketing strategies, environmental friendliness, recycling, functionality, reuse.

СТРАТЕГИИ СОВРЕМЕННОГО МАРКЕТИНГА ЗА СЧЕТ ДИЗАЙНА УПАКОВКИ ПРОДУКЦИИ

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Аннотация. В статье рассматривается дизайн упаковки в качестве одного из ключевых инструментов современного маркетинга. Обсуждаются основные аспекты успешного дизайна упаковки, а также приводятся примеры стратегий, используемых при дизайне упаковки продуктов с учетом особенностей целевого потребителя.

Ключевые слова: дизайн, упаковка, стратегии маркетинга, экологичность, переработка, функциональность, вторичное использование.

Packaging appeared in ancient times. Primitive people used animal skins or grass baskets to carry wild berries and fruits from the forest to their caves. Later on, the Chinese invented a variety of clay containers for storing solid objects and liquids and the ancient Egyptians created glass vessels for storing liquids. In the Middle Ages, leather, fabric, wood, stone, ceramics and glass were used as packaging materials. For

a long-time ensuring safety and facilitating transportation have been considered the major functions of packaging, but at present packaging is becoming one of the most effective marketing tools. A well-designed wrapper can become an additional convenience for consumers, and a means of stimulating the sale of goods for manufacturers. A variety of factors contribute to the growing use of packaging as a marketing tool.

Competition is everywhere and always, and the marketing sphere is no exception. The design should always remain innovative, attractive and at the same time in-demand; it should show that the product has value for the buyer.

Currently, it is not enough for the product to look good to make consumers buy it over and over again, therefore manufacturers have to look for new marketing strategies every day.

To create a good packaging, manufacturers should consider the following points:

- current topics discussed in the society;
- features of using the product being sold;
- lifestyle of a potential buyer;
- psychological peculiarities of the age group for which the product is made.

Environmental protection has been at the forefront of public debate for quite a long time. Nature conservationists are concerned about the problems of the depletion of resources, harmful emissions, waste generated by manufacturers and health problems, which are aggravated due to the air and water pollution, the consumption of food processed with chemicals, etc. They believe that the goal of the marketing system lies not in maximizing the consumption, expanding the consumer choice and ensuring consumer satisfaction, but in maximizing the quality of life, because this notion implies not only the abundance of first-class goods and services, but also the preservation of a high-quality environment [1].

Therefore, environmental friendliness of packaging is one of the basic strategies: the packaging can be recyclable or made from recycled materials. Eco-friendly packaging will not only attract environmentally aware customers and create positive publicity, recycling itself is profitable, because the use of recycled materials makes it possible to reduce the cost of creating new products.

Let us consider the concept presented by Sony. In accordance with its global environmental protection plan The Road to Zero, Sony continues to reduce the consumption of resources and increasingly uses secondary raw materials in its products and production processes, cutting down the use of plastic in the packaging by 95%.

For instance, cute “aibo” robot dogs arrive to the buyer in dense felt packages made from recycled plastic bottles (Figure 1). This packaging is not only esthetically pleasing, but also practical, as it prevents scratching of the robot.

Petroleum products, chemicals and other potentially harmful compounds of printing ink are not used in the production either. Headphones and other devices are now stored in paper packaging that is 100 % recyclable [2].



Figure 1. Eco-friendly packaging by Sony

Food companies use the concept of the environmental friendliness no less efficiently. Increasingly, natural materials such as grape pomace, cork tree residues and compressed grass are used for the production of food packaging. This type of packaging is biodegradable, can withstand large temperature changes, has no sharp edges and is cheaper than similar products made of expanded polystyrene.

One of the companies focusing on the naturalness of its packaging is “Happy Hens”, which uses straw – an inexpensive renewable resource – as a packaging material for eggs (Figure 2). The egg box is given a shape resembling a nest, which draws an analogy with the natural environment. Straw has a pleasant smell and makes the packaging pleasant to the touch, therefore, it gives the feeling that the whole product is completely natural. In addition, such packaging can make customers feel nostalgic [3].



Figure 2. Straw egg boxes by Happy Hens

As mentioned earlier, taking into account the characteristics of a particular product is another marketing strategy. A perfect example is the packaging of honey produced by PURE QUEBEC HONEY (Figure 3). The box is made of 100 % wax, and

when it is emptied, it can be used as a candle [4]. Thus, this packaging has a double advantage of being made from an unusual natural material and being reusable, which means attracting both environmentally aware customers and the lovers of something out of the ordinary.



Figure 3. Wax honey boxes by PURE QUEBEC HONEY

Knowledge of the psychology and lifestyle of the products consumers is the key to high quality packaging and another marketing move. For example, in case with the young people it is reasonable to stake on leisure activities and ways of spending free time. The sport brand Saucony, whose main audience is young people, suggested using the box as a blank canvas. Buyers were asked to create their own version of the box design (Figure 4). The best designs were officially used. This heightened the interest in the brand and led to the creation of innovative styles [5].



Figure 4. Shoe-boxes by Saucony

Pizza Hut chain has also focused on the peculiarities of its customers' lifestyle and their hobbies. Nowadays food delivery is gaining popularity, pizza being one of the best-sellers. Since pizza is most often ordered by young people for friendly gatherings, manufacturers have added a magnifying lens to their boxes, thanks to which the box can be used as a projector. If a smartphone is put in the box, the lens will project an image (Figure 5). This design solution makes it possible to give the packaging a new life without recycling [6].



Figure 5. Pizza boxes by Pizza Hut

Packaging should attract the attention of consumers and encourage them to buy the product. Some packaging can also be used as an element of interior decor due to its unique shape. A vivid example is a milk package concept MOLOCOW, which is a bottle shaped like a ray from UFO stealing a cow (Figure 6). These bottles will undoubtedly be popular among children and Internet memes lovers, and the product name “Molocow” itself pays homage to Stanley Kubrick and his “Clockwork Orange”. The buyers will also be able to use the container for their own purposes, for example, to make a night light or lava lamp [7].



Figure 6. Milk bottles by “MOLOCOW”

It is hard to surprise anyone with a birdhouse made from a juice box or a plastic bottle. In case with “Tyto Alba” wine, the wine box turns into a birdhouse. The wine itself is inspired by barn owls that have become the main characters of this brand (Figure 7) [8]. This way nature can benefit from human love for wine!



Figure 7. Wine boxes by “Tyto Alba”

As we can see from the previous examples, packaging of bottled products is often used not only for storing liquids. A Chinese designer Jin Le came up with a way to extend the life of a plastic bottle. She named her plastic bottle Dumbbell Sports Drink. Thus, the packaging is used as a sports equipment that will be in demand among beginners in the field of sports (the bottle weight is 0.5 kg). Subsequently, the bottle can be filled with sand or stones (Figure 8) [9].



Figure 8. Dumbbell Sports Drink

A variety of factors contribute to the expansion of the use of packaging as a marketing tool:

- packaging should attract attention to the product, describe its properties, inspire the consumer with confidence in this product and make a favorable impression as a whole;
- well-designed packaging provides for the instant recognition of the company or brand;
- innovation in packaging can bring great benefits to the manufacturer.

The development of effective packaging for a new product requires a large number of decisions, and the examples analyzed above show, that modern packaging design should satisfy the buyer not only aesthetically, but also be useful, convenient, innovative and safe.

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GENERAL REQUIREMENTS FOR CONSTRUCTION MACHINES FOR MECHANIZATION OF DISMANTLING WORKS

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Abstract. The article presents materials for studying the experience of eliminating the consequences of natural disasters, namely, the experience of operating construction machines when performing dismantling works. The factors determining the operability of construction machines are considered. A comparative analysis of the main types of load characteristics of machines is carried out. The reasons leading to overloads and frequent engine stops have been identified.

Keywords: complex mechanization, dismantling works, load characteristics, engine overload.

ОБЩИЕ ТРЕБОВАНИЯ, ПРЕДЪЯВЛЯЕМЫЕ К СТРОИТЕЛЬНЫМ МАШИНАМ ДЛЯ МЕХАНИЗАЦИИ ДЕМОНТАЖНЫХ РАБОТ

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Аннотация. В статье приведены материалы по изучению опыта ликвидации последствий стихийных бедствий, а именно опыта эксплуатации строительных машин при выполнении монтажных работ. Рассмотрены факторы, определяющие работоспособность строительных машин. Проведен сравнительный анализ основных видов нагрузочных характеристик машин. Выявлены причины, приводящие к перегрузкам и частым остановкам двигателя.

Ключевые слова: комплексная механизация, монтажные работы, нагрузочная характеристика, перегрузка двигателя.

The successful execution of dismantling works depends a lot on the degree of their mechanization. The experience of eliminating the consequences of natural disasters shows that various engineering machines can be used to perform dismantling works – bulldozers, excavators, cranes and other mechanisms available in construction organizations and enterprises.

The operability of construction machines during dismantling works will largely be determined by the degree of adaptability of the engine, transmission and chassis of these machines to the specific conditions of work.

The machines used for mechanization of dismantling work work in difficult conditions. Thus, the process of dismantling buildings by engineering machines will be characterized by periodic changes in the external load on the working bodies and other basic elements of machines and cases of locking of working bodies when encountering obstacles in the form of large structures, fittings and other inclusions [1].

A sharp deceleration of the working body when it meets an obstacle will lead to a change in the load on the car, an increase in the torque in the transmission, which will cause engine overload. These loads can cause the destruction of the working equipment and other basic elements of the machine.

Load conditions in machines for various purposes can be expressed using so-called load characteristics. They are understood as special characteristics of working processes that reflect the change in rated power or torque transmitted from the power plant of the machine to the actuators, as a function of time $M(t)$ or $N(t)$.

The load characteristics depend on the operating conditions of the machines. Due to the wide variety of types of machines used for mechanization of dismantling works and operating conditions, the load characteristics may be different. Four main types of load characteristics can be noted: constant, shown in figure 1, which some lifting machines, compressors, fans, etc. have [2; 3; 4].

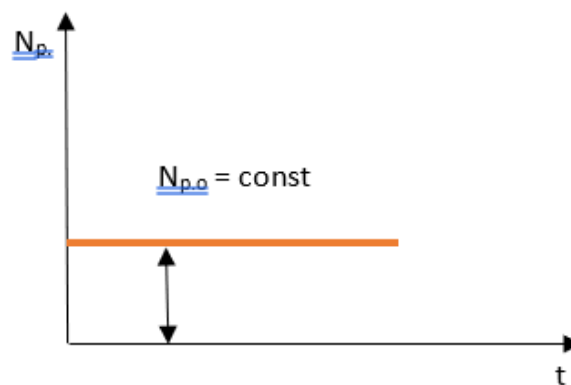


Figure 1. Constant load characteristics of machines

Excavator – sharply changing, but repeating during one cycle, is shown in Figure 2, characteristic of single-bucket excavators and other machines of periodic action. The load characteristics of the first type are not associated with the appearance of dynamic loads in the elements of machines, which cannot be said about the last three types of characteristics. The greater the amplitude of load changes and the shorter the time during which these changes occur, the more intense the unsteady processes in the machine will be.

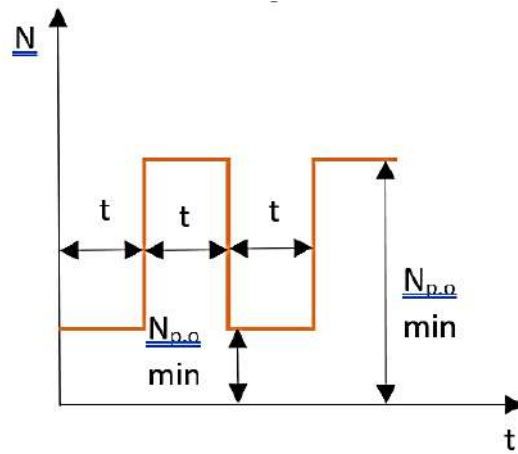


Figure 2. Excavator – sharply changing load

Pulsating and variable, shown in figure 3 and figure 4, changing arbitrarily, are most often found in the operation of continuous machines.

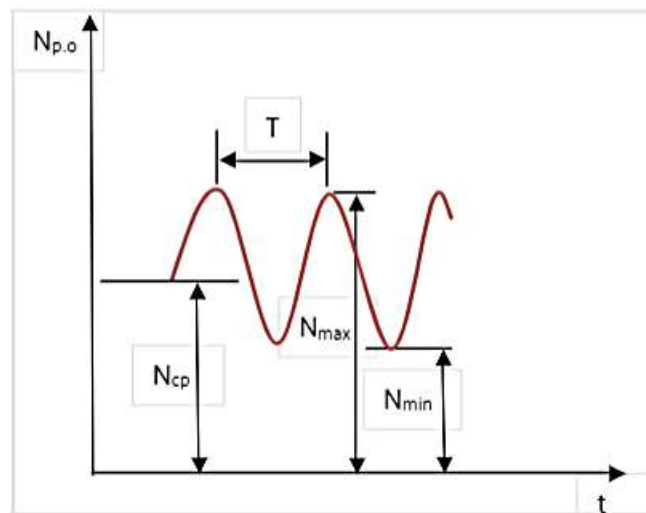


Figure 3. Pulsating load characteristics of machines

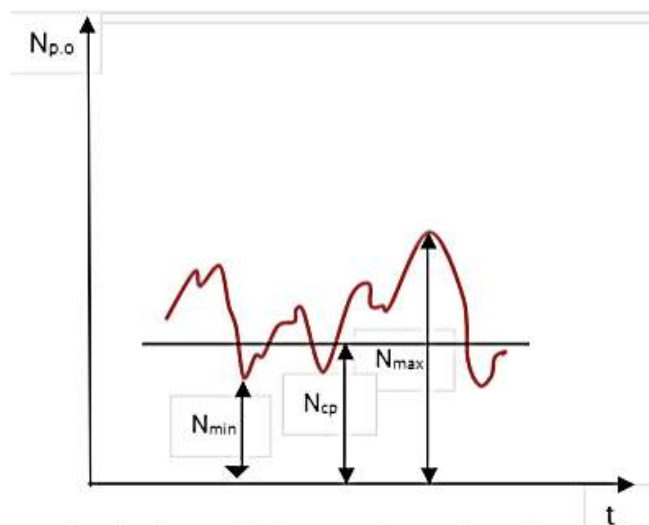


Figure 4. Variable load characteristics of machines

The reason for the deviation of the real modes from the calculated ones is primarily the manifestation of operating resistances unusual for machines in strength and nature of action. The change in the latter is often random: sudden and abrupt overloads are possible.

Overloads lead to frequent engine stops, which is associated with the subsequent starting and starting of machines with loaded working equipment. Overloads also occur with frequent reversal of movement, the need for which is determined by the technology of dismantling work. At the same time, experience shows that frequent peak overloads, not to mention overloads that cause immediate destruction of machine elements, significantly reduce the service life, worsen reliability indicators. All this makes dynamic loads a dynamic factor affecting the efficiency of the machine [5; 6].

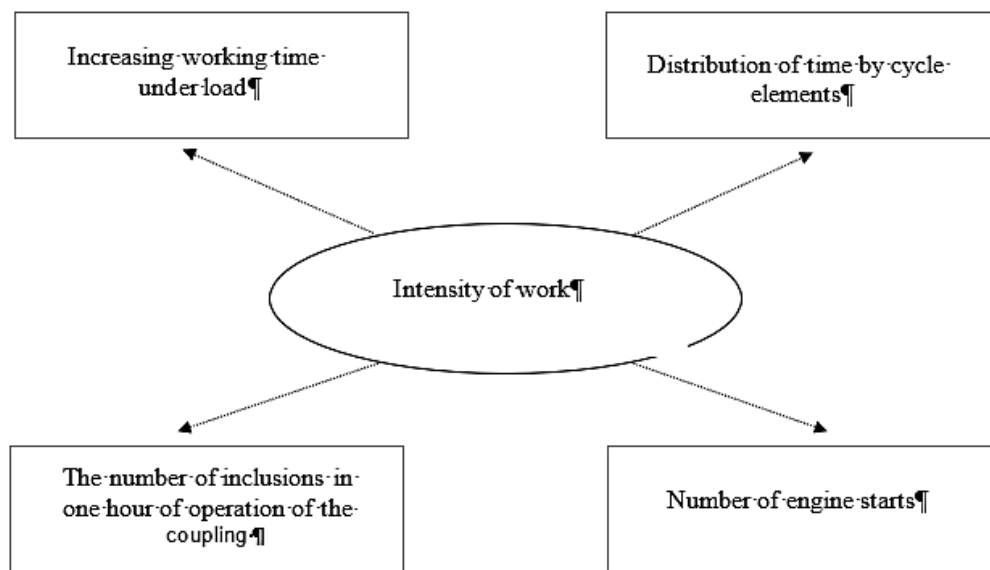


Figure 5. Indicators of work intensity

So, the peculiarity of the work of construction machines during dismantling works is the high intensity of work.

The intensity of the work is characterized, shown in the figure 5 [7]:

by increasing the operating time under load as a percentage of the total working time of the engine;

distribution of time by cycle elements when performing typical technological operations;

the number of inclusions in one hour of operation of the clutch, gearbox, clutches, hydraulic systems that affect the loading of the engine and its nature;

the number of engine starts per 100 hours of operation.

For engines used on construction machines, their adaptability to overcoming sudden overloads is more important. If the driver of a transport vehicle, for example, a dump truck has time to prepare the transmission and engine for movement on a bad section of road or on the rise (switch to the desired gear), then the driver of an engineering vehicle, for example, an excavator, will not have time to do this when the working body meets the disassembled structure, and with low engine overload capabilities, the latter will stall [1; 6; 8; 9].

The ability of the engine and transmission to automatically overcome temporary overloads depends on the coefficient of adaptability of the kpr power plant and the kinetic energy that is accumulated by the moving parts of the engine and transmission. The coefficient of adaptability of the power plant can be determined from the ratio:

$$k_{pr} = M_{d \max} / M_{d.nom} , \quad (1)$$

Where $M_{d \max}$, $M_{d.nom}$ – the value of the motor torque when operating in the mode of maximum torque and rated power [9; 10].

The value of modern engines is within 1,05 – 1,2.

Special tests carried out at various facilities made it possible to obtain averaged data on the operating time under load of engines of various construction machines, given in table.

Table – averaged data on operating time under load

Machines	Engine operating time under load, %	Execution time of the most difficult operations, %
Truck Cranes	65	-
Bulldozers	63-75	58-69
Loaders	70-75	46-50
Excavators	75-78	65-60

As can be seen from the table, the intensity of work is high enough for all types of machines under consideration.

A comparative analysis of existing and prospective types of engines shows that diesel engines are most suitable for use on construction machines, as the most durable, economical, meeting the conditions of use on construction machines necessary for mechanization of dismantling works.

Among the important features of the working conditions of construction machines and mechanical drivers when performing dismantling work should include high dustiness of the air, a wide range of changes in air temperature and humidity, smoke and high intensity of work. During the operation of construction machines during the dismantling of structures, a high concentration of dust in the air is created. Increased dustiness of the air leads to an increase in dust ingress into the cylinders, oil and fuel contamination, which causes intense abrasive wear of the engine. At the same time, engine compression worsens, power and fuel efficiency decrease, and oil consumption increases. Increased dustiness of the air causes the need for more frequent oil changes in the engine, requires maintenance of filters and air purifiers, which leads to a complication and increase in the complexity of maintenance of the entire power plant [2; 5; 11].

An important feature of the working conditions of construction machines is the transmission. As is known, the transmission provides transmission, conversion and distribution of the energy flow going from the engine of the machine to its actuators. The transmission of a car of any complexity, as a rule, includes elements that, according to the functions performed, can be divided into two main groups.

The first group of elements transmits power without changing kinematic and dynamic parameters. Such elements include shafts in mechanical transmissions, pipelines in hydraulic systems, wires in power transmission.

The second group of transmission elements is used to convert the parameters of the energy flow. These include various gears (gear, worm, chain, etc.), braking devices, torque converters, etc.

In construction machines, mechanical transmissions are most common, characterized by high reliability of operation, simplicity of the device and high efficiency [6].

Significant disadvantages of mechanical transmissions of common designs are the abrupt change in gear ratios, the difficulty of automating the transition from one gear to another and the rapid wear of the engine and transmission components in the case when the workloads are shock. Changing the gear ratio by a jump leads to the fact that the engine does not always work in optimal mode, and this is due to a decrease in its efficiency. The lack of automaticity in the transition from one gear to another makes it necessary to manipulate the controls of the machine, which, with frequent changes in the load on the working body, quickly tires the driver.

Thus, the experience of eliminating the consequences of natural disasters shows that in order to successfully complete the tasks of dismantling work, it is necessary to select construction machines taking into account their operating conditions. The efficiency of the equipment is largely determined by the degree of adaptability of the engine, transmission and chassis of this equipment to the specific conditions of work. Promising types of engines for use on construction machines are diesel engines, as the most durable, economical, meeting the conditions of use on construction machines necessary for the mechanization of dismantling works.

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APPLICATION OF ENZYMES OF THE HYDROLASE CLASS OF THE PROTEASE SUBCLASS IN INDUSTRY

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Abstract. This article discusses the classes and properties of enzymes. The classification of enzymes of the hydrolase class is considered separately. The application of the protease subclass, of various origins: plant, animal and microbial, is presented in detail. Enzymes such as papain, chymopapain, ficin, bromelain, trypsin, chymotrypsin, pepsin, rennin have been allocated.

Keywords: enzymes, hydrolases, proteases, hydrolysis, papain, chymopapain, ficin, bromelain, trypsin, chymotrypsin, pepsin, rennin.

ПРИМЕНЕНИЕ ФЕРМЕНТОВ КЛАССА ГИДРОЛАЗ ПОДКЛАССА ПРОТЕАЗЫ В ПРОМЫШЛЕННОСТИ

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Аннотация. В данной статье рассматриваются классы и свойства ферментов. Отдельно рассматривается классификация ферментов класса гидролазы. Подробно представлено применение подкласса протеазы различного происхождения: растительного, животного и микробного. Выделены такие ферменты, как папаин, химопапаин, фицин, бромелаин, трипсин, химотрипсин, пепсин, реннин.

Ключевые слова: ферменты, гидролазы, протеазы, гидролиз, папаин, химопапаин, фицин, бромелаин, трипсин, химотрипсин, пепсин, реннин.

Enzymes are protein-based molecules that interact with various substances, accelerating their chemical transformation along a specific pathway. However, they are not spent. Each enzyme has an active site that attaches to the substrate, and a catalytic site that triggers a particular chemical reaction. These substances accelerate the biochemical reactions taking place in the body without increasing the temperature.

Basic properties of enzymes:

- specificity: the ability of the enzyme to act only on a specific substrate, for example, lipases-on fats;
- catalytic efficiency: the ability of enzymatic proteins to accelerate biological reactions hundreds or thousands of times;
- ability to regulate: in each cell, the production and activity of enzymes is determined by a peculiar chain of transformations that affects the ability of proteins to be synthesized again [1].

Classes of enzymes:

Class 1 – oxidoreductases-enzymes that catalyze redox reactions (addition of O₂, removal and transfer of H₂, transfer of electrolytes);

Class 2 – transferases-transfer enzymes. Catalyze the transfer of entire atomic groups from one compound to another (for example, monosaccharide residues, amino acids, phosphoric acid residues, methyl and amine groups, etc.);

Class 3 – hydrolases-enzymes that catalyze hydrolysis reactions, that is, the splitting of complex organic compounds into simpler ones with the participation of water.

Class 4 – lyases-enzymes that catalyze the reactions of non-hydrolytic cleavage of any groups from the substrate with the formation of a double bond or the addition of groups at the site of the double bond break (for example, H₂O, CO₂, NH₃, etc.);

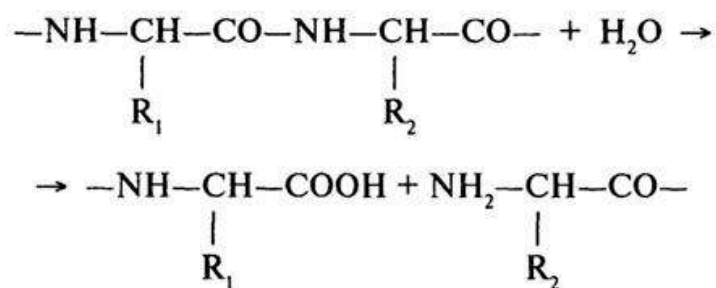
Class 5 – isomerases-enzymes that catalyze isomerization reactions, i.e. intramolecular transfer of chemical groups and formation of isomeric forms of various organic compounds;

Class 6 – ligases (synetases) – enzymes that catalyze synthesis reactions associated with breaking the high-energy bond of ATP and other nucleoside triphosphates (with the formation of C–C-; C–S-; C–O-; and C–N- bonds) [2, p 17-18].

The leaders of the global enzyme market are proteases and amylases, which account for 25 % and 15 %, respectively. Over the past five years, the global carbohydrase market, which mainly includes amylases, cellulases and xylanases, has been the fastest growing segment of the enzyme market with a cumulative average annual growth rate of more than 7.0 % [3].

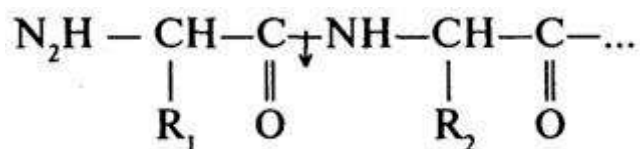
The role of hydrolase enzymes in food technologies is very important. This is reflected in specialized literature, monographs, technical instructions, and standards. Therefore, in this section we will focus on a brief description of the most important representatives of hydrolytic enzymes. For technologists, three subclasses of hydrolase enzymes are of the greatest interest. These are enzymes that act on ester bonds-esterases; those that act on glycosidic compounds – glycosidases; and those that act on peptide bonds-proteases.

Let's consider proteolytic enzymes. The main reaction catalyzed by proteolytic enzymes is the hydrolysis of the peptide bond in protein and peptide molecules:

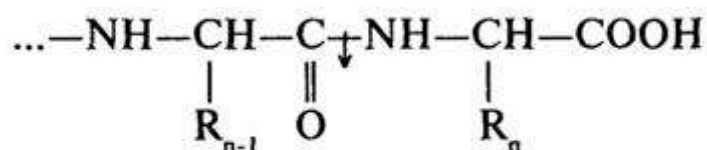


According to the initial classification of proteolytic enzymes, they were divided into two groups: proteinases and peptidases. At the same time, it was believed that proteinases act on proteins, splitting them into polypeptides; polypeptides are hydrolyzed by peptidases to amino acids. Many proteases can intensively catalyze the hydrolysis of a number of proteins (including muscle tissue proteins) – have a general proteolytic effect, but at the same time have a weak effect on connective tissue proteins [4]. The later classification, which retains its significance, is based on the scheme proposed by M. Bergman and D. Fruton (1937). According to this scheme, proteases are divided into endo- and exopeptidases. Enzymes of the first group (endopeptidases) can hydrolyze deep peptide bonds and split the protein molecule into smaller fragments; enzymes of the second group (exopeptidases) cannot hydrolyze peptide bonds located in the middle of the chain, and act either from the carboxyl or amine end of the chain, sequentially cleaving off one or the other terminal amino acids. In this regard, exopeptidases are divided into aminopeptidases, carboxypeptidases and dipeptidases.

1. Aminopeptidases catalyze the cleavage of N-terminal amino acids.



2. Carboxypeptidases catalyze the cleavage of C-terminal amino acids.



3. Dipeptidases are specific to dipeptide substrates.

At the same time, endopeptidases (proteinases) are divided into subgroups, starting with the serine proteinases subclass, primarily based on the catalytic mechanism (structure of the active site); specificity features are used only to identify individual enzymes within the subclass:

- serine proteinases, in the active center of which the rest of serine and histidine functions;
- thiol (cysteine) proteases containing the SH group of the cysteine residue in the active center;

- acidic (carboxylic) proteases, in the active center they contain COOH-a group of the aspartic acid residue;
- metalloproteinases that contain in the active center the metal necessary for the manifestation of their catalytic activity.

The substrate specificity of proteinases will be determined by the following factors: the nature of the amino acid forming the hydrolyzable peptide bond; the amino acid radicals removed from the hydrolyzable peptide bond; and the overall spatial conformation of the protein molecule that makes certain peptide bonds available for enzyme action.

The study of proteolytic enzymes is very intensive. This is because they are an extremely convenient object for studying the structure of proteins, active centers of enzymes, mechanisms of regulation of enzymatic activity, and other important issues of enzymology; in addition, proteases are widely used in various industries: food, agriculture, and medicine.

Enzymes can be obtained in three ways: plant, animal, and microbial. Disputes about the priority of certain enzyme preparations obtained from these sources have been going on for quite a long time. However, due to the limited availability of animal raw materials (internal organs of cattle and pigs), as well as the possible toxicity of microbial preparations (all of them require a high degree of purification, although this cannot serve as an absolute guarantee of their safety), plant proteases without these disadvantages are of great interest. Consider *plant proteases*:

- Papain and himopapain. Papain is the most commonly used proteolytic enzyme in human production. The enzymes papain and chymopapain are the true latex enzymes of the melon tree fruit (*Carica papaya*). These enzymes belong to the group of thiol proteases, a characteristic feature of which is that they are activated by sulfhydryl compounds-reduced glutathione, cysteine. Papain and chymopapain are obtained in the crystalline state; their molecular weights are 20,700 and 36,000 Daltons, respectively, and their isoelectric points are 8.75 for papain and 10.1 for chymopapain. The optimal pH range for papain action depends on the nature of the hydrolyzed protein and can be slightly acidic, neutral, or slightly alkaline. Chymopapain is very similar to papain, but there are some interesting differences. For example, the activity of chymopapain in the hydrolysis of hemoglobin and casein is two times lower than that of papain; it is more heat-resistant than papain, and shows good stability in an acidic environment (pH 2.0). Papain has a fairly broad specificity. It preferentially hydrolyzes the second peptide bond behind the carboxyl group of phenylalanine [5].

Various companies, both foreign and domestic, produce enzyme preparations based on papain with various degrees of purification. The possibilities of their use are extensive: the leather industry (for dewatering and softening hides); film production (for dissolving the gelatin layer on films during their regeneration); perfumery (for creating additives in creams, lotions, toothpastes); production of synthetic detergents (for removing protein-based contaminants); medicine (for treating inflammatory processes burns, thrombosis, etc.); food industry (wine-making, brewing, alcohol production, bread-making, cheese-making, etc.).

- Ficin and bromelain. Ficin is isolated from the milky juice of ficus plants, such as figs (*Ficus carica*). Just like papain, it belongs to thiol proteases. Another thiol

enzyme, bromelain, is obtained from fresh pineapple juice (Bromeliaceae). Both of these enzymes are similar to papain, show the greatest activity in the neutral pH zone, have a wide specificity, and preferably cleave peptide bonds formed by positively charged amino acids. The use of bromelain and ficin is similar to that of papain; their production has increased in recent years, and these enzymes are now used to remove protein sludge in beer and soften meat.

Proteolytic enzymes of plant seeds. The seeds of cereals and legumes contain a whole complex of proteolytic enzymes involved in the breakdown of spare proteins to amino acids during seed germination. In dormant seeds, the state of the protein complex is characterized by high stability and autolysis in aqueous suspensions is weakly expressed. Therefore, the complex of proteolytic enzymes of seeds remained poorly studied for a long time. This was due to the methodological difficulties of their isolation and purification. Currently, it is known that proteolysis of proteins in plant seeds is carried out by a complex of enzymes that differ in their functions, mechanism of action, and other indicators. Some of these enzymes have been isolated as highly purified preparations and characterized in detail. For example, several types of proteolytic enzymes have been isolated from wheat seeds that differ in optimal pH: acidic proteinases with an optimum pH of 3.7-4.0; neutral proteinases with an optimum pH of 6.5-7.0; and alkaline proteinases with an optimum pH of > 8.0 .

Of the three groups of proteinases, neutral proteinases deserve the most attention of technologist's proteinases. They are several times more active than acidic ones and can effectively break down gluten proteins under test conditions. One of the features of neutral proteases is that they do not dissolve in water, salt, or buffer solutions. They are strongly bound to the gluten complex proteins and are extracted by partially dissolving the gluten in an alkaline solution. The maximum recovery of neutral proteases occurs when ground grain, flour, or freeze-dried gluten is treated with a 0.35% sodium carbonate solution. When an alkaline solution is acidified, neutral proteinases precipitate, and their protein inhibitors remain in the supernatant. Thus, in mature wheat seeds, neutral proteinases and their protein inhibitors form a single inactive complex associated with gluten. The ratio of the activity of proteinases and their inhibitors in the ripened grain determines the stability of the protein complex, its stability in the process of doughscience.

Neutral proteases are not activated by reduced glutathione or cysteine and therefore cannot be attributed to thiol enzymes, unlike acidic proteases. Neutral proteinases are inhibited by sodium chloride, phenolic compounds, aromatic amino acids, and products of the sugar-amine reaction (melanoidins). Sodium chloride is a mandatory component of the formulation and, added in this amount, reduces the activity of neutral proteases and, accordingly, the intensity of autolysis by 60-70%. Depending on the quality of flour and the state of its gluten complex, the technologist can vary the time of salt application and thereby adjust the intensity of proteolysis. When processing weak flour, it is necessary to introduce salt as early as possible, whereas for flour with excessively strong gluten, it is desirable to activate proteolysis, and salt should be added at a later stage.

In this regard, it is necessary to emphasize once again the importance of studying the own endogenous enzyme systems of biological raw materials, the factors affecting

their activity in terms of their huge role in the processes occurring during the maturation, storage and processing of food raw materials.

Proteases of animal origin. Animal-derived proteases play a huge role in the digestive process. They were among the first enzymes to be obtained in a highly refined crystalline state and studied in detail. They became the objects for deciphering the structure of the active center and the mechanism of catalytic activity. In addition, these enzymes, due to their high specificity, have themselves become tools for deciphering the primary structure of proteins, studying the regulatory functions of proteases in cell metabolism.

– Trypsin. Trypsin is a serine protease obtained in crystal form. The molecular weight of about 23,800 Daltons is an isoelectric point of 10.6; the optimum pH of action is between 7.0-9.0 for proteins and synthetic substrates.

Trypsin exhibits high specificity for certain peptide bonds. It performs hydrolysis of peptide bonds formed by the carboxyl groups of arginine and lysine. Trypsin is secreted by the pancreas as a zymogen-trypsinogen, an inactive precursor, and is activated either by enterokinase or by autocatalytically active trypsin by the mechanism of limited proteolysis. Highly purified trypsin is used for medical purposes. This is one of the main pancreatic proteases, which in the form of crude pancreatin finds some use in the food industry for the production of hydrolysates.

– Chymotrypsin. Chymotrypsin is a proteolytic enzyme secreted by the pancreas into the small intestine as an inactive precursor called chymotrypsinogen. Chymotrypsinogen is a polypeptide chain consisting of 245 amino acid residues and containing five disulfide bonds. It is activated in the small intestine by the action of trypsin. In this case, four peptide bonds are hydrolyzed and two dipeptides (14-15 and 147-148) are cleaved off. This results in the formation of an active chymotrypsin consisting of three polypeptide chains covalently linked by two disulfide bridges. The active site of chymotrypsin contains a histidine residue (57), an aspartic acid residue (102), and a serine residue (195). The molecular weight is about 22,500 Daltons. The isoelectric point is 8.3; the optimum pH is in the range of 7.0-9.0, which is consistent with the natural conditions of its action.

The specificity of chymotrypsin lies in the fact that it preferentially hydrolyzes peptide bonds formed by aromatic amino acids: tyrosine, tryptophan, phenylalanine. This enzyme is not used in the food industry as such, but is an integral part of complex pancreatin preparations.

– Pepsin. Pepsin is produced by the gastric mucosa in the form of pepsinogen (molecular weight about 42,000 Daltons). Pepsinogen is converted to active pepsin by HCl or autocatalytically by cleavage of a single peptide bond. The enzyme is obtained in crystalline form, its molecular weight is 35,000 Daltons, and the optimum pH is 1.8.

Pepsin is an acidic (carboxylic) protease. Its specificity is expressed in the predominant hydrolysis of peptide bonds formed by the amine groups of phenylalanine and tyrosine. Pepsin is of great importance as a digestive enzyme, it is a part of medicinal enzyme preparations, tonics, chewing gum. In the food industry, pepsin is used to curdle milk casein and to dissolve protein sludge in beer.

– Rennin. This enzyme, which has many similarities with pepsin, is found in the juice of the fourth part of the stomach of calves. Rennin is formed from its precursor,

prorennin. Its molecular weight is about 40,000 Daltons, and its isoelectric point is about 4.5. Optimum pH of the enzyme action is 3.7.

Rennin is a potent milk clotting protease; it is the main component of crude extracts and complex industrial preparations used for this purpose.

Microbial proteases. The number of microorganisms that produce proteases is extremely high. The specificity of these enzymes is in many cases broader than that of well-studied animal-derived enzymes, which makes their classification more difficult.

Microbial proteases (fungal and bacterial) are widely used in various industries. Among them, there are enzymes that have optima in the neutral, acidic, and alkaline pH zones; some of them exhibit trypsin-like action, others are pepsin – like enzymes, others are thiol-based, others have peptidase activity, and so on. Many of them were isolated in the form of highly purified preparations and described in detail.

The most widely used products are alkaline serine protease from *Bacillus licheniformis*, which is used in detergents; Musog protease Mycor, which has replaced veal rennet in cheese production; and fungal protease from *A. oryzae* (in combination with amylase), which is used in bread-making.

Proteases are the most important industrial enzymes. The level of consumption of microbial protease preparations is about 40 % of all used enzymes (Table).

Table – Consumption of industrial protease preparations

Enzyme	Market share of microbial proteases, %	
	Microbial enzymes	Total enzymes
Bacterial alkaline protease	37	30
Microbial rennin	7	6
Other microbial proteases	4	3.5
Animal rennin	-	11
Other animal proteases	-	2.5
Plant proteases	-	11
Other (non-proteolytic) microbial enzymes	52	36
Total	100	100

– Subtilisin Karlsberg Subtilisin. The crystal form of this enzyme was first obtained in 1952, and since then subtilisin has been the most important commercially used microbial protease. It is produced by *B. subtilis* and *B. licheniformis*. This enzyme consists of a single polypeptide chain (214 amino acid residues), among the amino acids there is no cysteine. The molecular weight of the enzyme is 27,277 Daltons, the isoelectric point is 9.4; the optimum pH is 8.0-9.0. The enzyme has a high pH stability in the range from 5.0 to 11.0.

– Subtilisin Carlsberg subtilisin is a serine protease, has broad specificity, and preferably hydrolyzes peptide bonds formed by aromatic amino acids.

Rennin-like acid proteases. The most important acidic proteases used in cheese production from a practical point of view are the *Mucor pusillus* and *Mucor miehei* cultures.

– Proteases from *Mucor pusillus* have a molecular weight of 30,000 Daltons, consist of a single polypeptide chain, the optimum pH of action for casein is 4.5, for hemoglobin 4.0.

– Proteases from *Mucor miehei* have a large molecular weight of 38,000 Daltons contain about 6 % carbohydrates and exhibit maximum hemoglobin activity at pH 4.5 [5]. Thus, enzymes of the hydrolase protease class are common and used in industry because of their availability.

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ASSESSMENT OF THE IMPACT OF DISTRIBUTED GENERATION ON THE WORLD ENERGY SYSTEM

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Abstract. This paper studies the dynamics of the development of distributed generation in two countries of the world, such as Russia, the USA, and assesses the impact of distributed generation on the development of the global electric power industry. Distributed generation is being actively introduced into power systems and has a high level of development in the countries under consideration. This development of distributed generation is facilitated by the widespread use of renewable energy sources, as well as distributed cogeneration technologies. As a result of this study, the main trends in the development of distributed generation were identified, and it was also revealed that it accounts for a significant share in the global energy sector.

Keywords: electric energy, distributed generation, decentralization, renewable energy sources, electric networks.

ОЦЕНКА ВЛИЯНИЯ РАСПРЕДЕЛЕННОЙ ГЕНЕРАЦИИ НА МИРОВУЮ ЭНЕРГОСИСТЕМУ

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Аннотация. В данной работе исследуется динамика развития распределенной генерации в двух странах мира, таких как Россия, США, и оценивается влияние распределенной генерации на развитие мировой электроэнергетики. Распределенная генерация активно внедряется в энергосистемы и имеет высокий уровень развития в рассматриваемых странах. Такому развитию распределенной генерации способствует широкое использование возобновляемых источников энергии, а также технологий распределенной когенерации. В результате данного исследования были выявлены основные тенденции развития распределенной генерации, а также установлено, что на нее приходится значительная доля в мировой энергетике.

Ключевые слова: электрическая энергия, распределенная генерация, децентрализация, возобновляемые источники энергии, электрические сети.

Most often, distributed generation is determined by sources of electric (thermal) energy and, if necessary, distribution networks created by economic entities for their own needs, as well as for sending surpluses to a common network (electric or thermal). The type of primary energy source used by the station (for example, organic fuel or renewable energy), as well as the station's affiliation to the consumer, generating or grid company, or a third party do not matter.

This study will examine the development of distributed generation on the example of individual countries in America and Europe, as well as highlight the main trends in its development and impact on electric power systems.

In the Russian energy sector, it is almost impossible to single out the exact share of distributed generation, as well as the dynamics of its change, since the main industry regulators do not single out distributed generation in their public reports.

According to Rosstat, in Russia in 2016 there were 36,000 power plants with a capacity of no more than 25 MW, and their total capacity was 13.0 GW (Figure 1). Approximately 8.5 GW (about 2/3 of the total DG capacity) is used in the decentralized energy supply zone. Compared to 2006, the distributed generation capacity increased by 3 GW. The main part of DG facilities is thermal power plants, which account for 92 % of the total capacity (the remaining 8 % are solar, hydraulic, and other stations) [1, p. 87].

Given the fact that the total installed capacity of all power plants in Russia in 2016 was about 255 GW, then the share of distributed generation capacity in the country is estimated at 5 %.

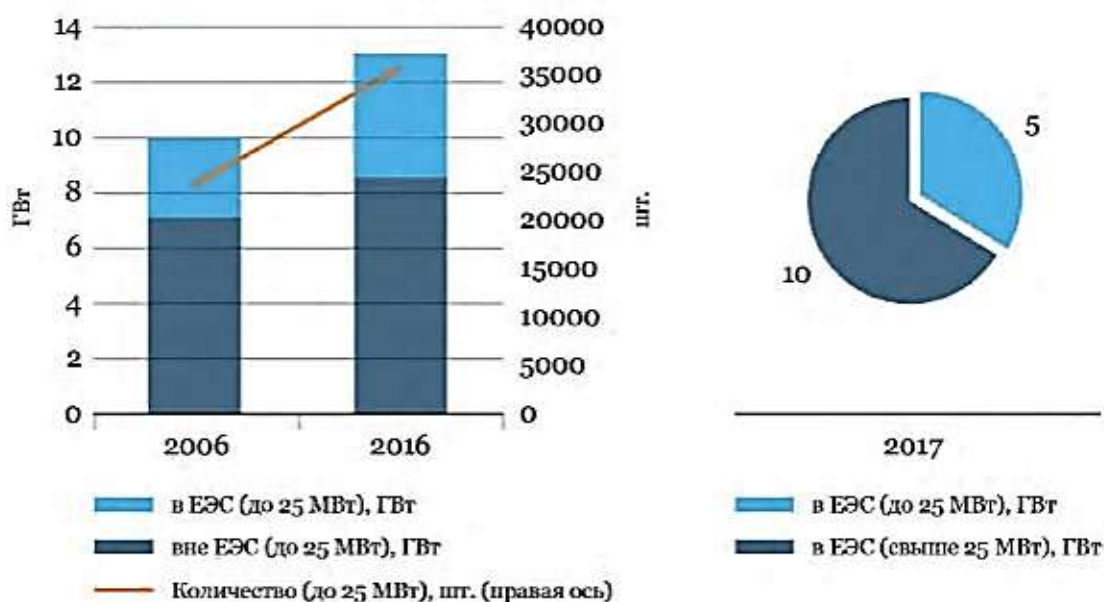


Figure 1. Capacity and number of power plants of distributed generation in Russia

The United States of America is one of the first countries where the development of distributed generation began. The US Distributed Energy Coalition predicts that in the next two decades, 20 % of new generating capacity will be distributed generation facilities [2, p. 38].

According to the US Department of Energy, published in 2007, about 12 million units were already installed in this country, which can be classified as distributed

generation, owned by end consumers. Their total capacity is about 200 GW, or approximately 25 % of the total installed capacity of 811 GW. About 84 GW of these 200 GW are combined generation plants, i.e. provide electrical and thermal energy to industrial enterprises, university campuses and residential areas. In 2010, cogeneration plants with a total capacity of 92 MW were put into operation in the United States, and in 2020 an increase of 95 GW of new installed capacities is expected, which will amount to 29 % of the total installed capacity [3]. Figure 2 shows how distributed generation has evolved in the US for over 40 years.

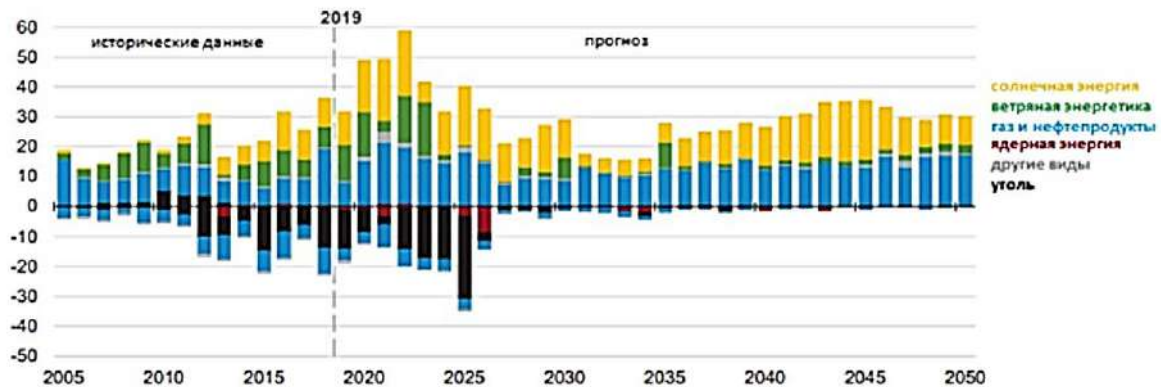


Figure 2. Forecast of changes in energy generation in the United States from 2005 to 2050

The primary energy sources used here are: natural gas, hydropower, wind energy, biomass, solar energy and others. Figure 2 shows that starting from about 2010, the increase in new DG capacities is provided mainly by renewable energy sources (RES) [1, p. 87].

Over the past 20 years, distributed generation has become widespread throughout the world and is strengthening its position. In 2000, a total of \$30 billion was invested worldwide in the development of distributed generation, and the commissioning of new capacities in this energy sector was 47 GW per year. Despite the fact that the capacity of large centralized power plants increased by 180 GW per year. Thus, the share of distributed generation in the commissioning of new capacities amounted to 21 %.

By 2012, the share of distributed generation in the commissioning of new capacities almost doubled, i. e. increased from 21 to 39 %. Investment in distributed energy has increased five-fold, from \$30 billion to \$150 billion, and annual growth in new capacity has increased by 300 %, from 47 to 142 GW per year. This growth trend of distributed generation is expected to continue, and it will play an even greater role in the global power industry. According to General Electric, by 2020, the annual increase in new distributed generation capacity will reach 58 GW per year. Investments in distributed energy will increase from \$150 billion to \$205 billion [3]. DG's installed capacity will account for 42 % of all global installed capacity.

The global market for distributed energy technologies (small distributed generation, demand management, storage, energy efficiency, etc.) is growing at a rate of about 6-9 % per year.

The spread of small and medium generation in the world has been very active recently. Distributed generation in close proximity to the load center creates the possibility of delaying or eliminating the need for the construction of large power plants and additional network infrastructure by reducing peak demand and offloading existing networks. The presence of voltage sources in the immediate vicinity of the load increases the reliability of the power supply, helps maintain proper voltage levels in the network and reduces the risk of instability. Due to distributed generation, network losses and reactive power flows are reduced. As a result, the tariff burden on consumers served by the energy system is reduced, as investment costs are contained. It is obvious that the capital costs for the construction of a distributed generation facility are borne by its owner and they do not need to be divided among other consumers. In addition, the financial risks associated with small and medium generation facilities are much lower than for facilities with large installed capacity. Own source of electricity for its owner allows you to increase the reliability of power supply.

In the United States, the construction and operation of electrical networks is one of the most capital-intensive areas of financing in the country. According to the Edison Electric Institute (EEI), in 2012, electric utilities invested \$90.5 billion in generation, transmission and distribution networks and about \$20 billion of that in transmission networks alone. Compared to others, investments in such networks carry more risks and take longer to develop and build. With the large-scale implementation of distributed generation, there is no need to build backbone networks, thus reducing the huge range of costs for the construction and operation of high-voltage power lines [4].

Network problems exist not only in the USA. For example, the European electricity grid system also faces limitations and difficulties. In many regions of Europe there is a need to increase capacity, but investment is difficult and subject to complex regulation. Many power supply projects are delayed or cancelled. In 2006, the Association of European System Operators noted that in some European countries, not a single overhead transmission line longer than five kilometers had been built in the last 10 years. While the volume of investments in the construction of electrical networks is growing very slowly, the demand for electricity transmission is growing at an ever-faster pace. According to the International Energy Agency (IEA), by 2030, Europe will need \$187 billion to build network infrastructure. In this case, despite the advantages of large centralized power plants in terms of capital costs, distributed generation becomes an increasingly competitive option compared to the further development of long-distance electric network [5].

The trend of reducing investment in the construction and operation of high-voltage transmission lines due to the development of DGs is already clearly expressed in Europe and the USA. Distributed generation contributes to the rapid expansion of electricity generation without the need for additional development of the power grid infrastructure.

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HIGHLY TOXIC SUBSTANCES IN INDUSTRY: CLASSIFICATION AND PRECAUTIONS

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Abstract. This article discusses the highly toxic substances, their classification and features. It describes what precautions should be taken and how to provide first aid in case of poisoning. It is also presented how penetration into the human body is possible. Such highly toxic substances as chlorine, ammonia, mercury, prussic acid, hydrogen sulfide, phosgene, benzene, toluene, xylene, tetrodotoxin have been allocated.

Keywords: highly toxic substances, poisons, chemical accident, emergency chemically dangerous substance, toxicological effects, toxicological substances, chemical poisoning.

СИЛЬНОДЕЙСТВУЮЩИЕ ЯДОВИТЫЕ ВЕЩЕСТВА В ПРОМЫШЛЕННОСТИ: КЛАССИФИКАЦИЯ И МЕРЫ ПРЕДОСТОРОЖНОСТИ

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Аннотация. В данной статье рассматриваются сильнодействующие ядовитые вещества, их классификация и особенности. Описано, какие необходимо применять меры предосторожности и как оказывать первую медицинскую помощь при отравлении. Также представлено, каким образом возможно проникновение ядовитых веществ в организм человека. Выделены такие сильнодействующие ядовитые вещества, как хлор, аммиак, ртуть, синильная кислота, сероводород, фосген, бензол, толуол, ксилол, тетродотоксин.

Ключевые слова: сильнодействующие ядовитые вещества, яды, химическая авария, аварийно химически опасное вещество, токсикологическое воздействие, токсикологические вещества, химическое отравление.

In the modern world, where industry is developing every year, it is becoming more and more difficult to monitor the ecology of the environment. Toxicological substances used in production and agriculture are increasingly entering the atmosphere, hydrosphere, lithosphere. Toxic compounds in emergency conditions, harmful conditions at chemical enterprises can cause poisoning of living beings. Substances containing toxins often pollute vegetables and fruits. With the consumption of food, they penetrate into the human body through the liquid [1].

Chemicals by the nature of exposure are divided into:

- general toxic,
- irritating,
- sensitizing – causing hypersensitivity;
- mutagenic – affecting the genetic apparatus;
- carcinogenic or blastogenic – causing the formation of tumors;
- affecting reproductive function (including gonadotropic – acting on the sex glands; embiotropic – acting on the embryo and fetus);
- teratogenic – causing deformities.

After the chlorine leak at Gorky station in 1960, a list of chemicals dangerous to humans was developed – HTS – highly toxic substances.

Later, there was a need for a new concept of hazardous chemicals, accidents in the production and storage of which can lead to emergencies.

In accordance with Russian National Standard HTS renamed ECHS (emergency chemically hazardous substance).

ECHS is a dangerous chemical used in industry or agriculture, with an emergency release (spill) of which environmental contamination may occur in concentrations affecting a living organism (toxodoses).

According to the degree of impact on the human body, the AAHS are divided into four classes in accordance with Russian National Standard 12.1.007-76 "The system of occupational safety standards. Harmful substances. Classification and general safety requirements":

Class I – extremely dangerous: (mercury, lead, cadmium, zinc; hydrogen cyanide, prussic acid, nitrites; phosphorus compounds; phosgene, etc.)

Class II – highly dangerous: (sulfuric, nitric, hydrochloric acids; ammonia; formaldehyde, methyl alcohol; aniline, nitrobenzene; phenols).

All other chemical compounds belong to Class III (moderately hazardous) and Class IV (low-hazard).

Taking into account the ingress of the substance into the organism, the following AHS are released:

- substances of inhalation action (ECHS IA) – when received through the respiratory system;
- substances of oral action (ECHS OA) – when administered by mouth;
- substances of skin-resorptive action (ECHS SRA) – when exposed through the skin.

In addition, poisons have selective toxicity. According to this feature, they are divided into cardiac, nervous, hepatic, renal, blood, and pulmonary.

In accordance with the general toxicological classification according to the methods of exposure to living organisms, the following types of chemicals are distinguished:

- nerve-paralytic (seizures, paralysis);
- skin-resorptive (local inflammation in combination with general toxic phenomena);
- general toxic (coma, brain edema, seizures);
- tear and irritating (irritation of the mucous membranes of the eyes, nose, throat);
- psychotropic (violation of mental activity, consciousness).

All dangerous chemicals are divided into fast-acting, persistent and unstable. When affected by fast-acting, the picture of poisoning develops almost immediately, and with slow-acting, a latent period of several hours. Unstable high-speed substances include, for example, ammonia, carbon monoxide. Among the persistent slow-acting ones is dioxin.

The maximum permissible concentrations of harmful substances in the air of the working area are regulated by Russian national standard 12.1.005-88 and GN 2.2.5.686-98.

A chemical accident is a violation of technological processes in production, damage to pipelines, tanks, storage facilities, vehicles, leading to the release of gases into the atmosphere in quantities that pose a danger to human life and health, as well as the functioning of the biosphere.

Chemical accidents can be accompanied by explosions and fires.

Chemical, pulp and paper and processing plants, mineral fertilizer plants, ferrous and non-ferrous metallurgy, as well as refrigeration plants, breweries, confectionery factories, vegetable depots and water supply stations have large reserves of hydrocarbons, mainly chlorine, ammonia, phosgene, prussic acid, sulfurous anhydride.

Among the numerous toxic substances used in industrial production and the economy, chlorine and ammonia have become the most widespread [2].

Classification of chemical compounds by their effects on the body:

- Carcinogenic compounds cause the appearance of malignant tumors, stimulate the spread of metastases.
- Mutagenic have a negative impact on the genetic level, accumulate in the body and lead to the development of genetic mutations.
- Sensitizing compounds negatively affect the immune system, increase the sensitivity of the body to allergens.
- Chemicals provoke various disorders in the work of all body systems, adversely affect the reproductive system [3].

Chlorine is a yellow-green gas with a pungent odor, heavier than air (therefore it accumulates in low-lying areas of the terrain, penetrates into the lower floors and

basements of buildings). Strongly irritates the skin, mucous membranes of the respiratory tract and eyes. When spilling from faulty containers, it "smokes".

Chlorine is used in cotton mills for bleaching fabrics, in the production of paper, the manufacture of rubber, at water disinfection stations.

Precautions:

- do not approach the danger zone closer than 200 m;
- stay to windward;
- avoid low surface areas, basements;
- do not touch the spilled substance;
- in case of fire, do not touch the container;
- after leaving the hearth, undergo a medical examination.

Signs of poisoning: sharp chest pain, dry cough, vomiting, sore eyes, watery eyes.

First aid for chlorine poisoning:

- put a gas mask or a cotton gauze bandage (or a folded handkerchief, scarf, towel, etc.) on the victim, having previously moistened it with water or a 2 % solution of baking soda;
- remove it from the infection zone;
- rinse the exposed areas of the body with running water for 15 minutes, and the eyes with 1 % boric acid solution;
- give a warm, plentiful drink (tea, milk, etc.);
- deliver the victim to a medical facility.

Ammonia is a colorless gas with a pungent odor, lighter than air. Acute ammonia poisoning leads to damage to the respiratory tract and eyes. Ammonia is used at facilities where refrigeration units operate (meat processing plants, vegetable stores, fish canneries), in the production of fertilizers and other chemical products.

An aqueous solution of ammonia is called ammonia.

Precautions:

- do not approach the accident site closer than 200 m;
- stay to windward;
- observe fire safety measures;
- do not smoke;
- eliminate sources of fire and sparks;
- do not touch the spilled substance;
- in case of fire, do not approach the containers;
- after leaving the hearth, undergo a medical examination.

Signs of poisoning: runny nose, cough, suffocation, lacrimation, rapid heartbeat.

First aid for ammonia poisoning:

- put a gas mask or cotton gauze bandage on the victim, having previously moistened it with water or a 5 % solution of citric acid;
- remove it from the infection zone;
- rinse the exposed areas of the body with running water for 15 minutes, and the eyes with 1 % boric acid solution;

- give a warm, plentiful drink (tea, milk, etc.);
- deliver the victim to a medical facility.

Mercury is a heavy mobile liquid of silver color – a liquid metal. It is not soluble in water. Heavier than water. Easily volatile, well absorbed by any surface. Mercury vapor is heavier than air, accumulates in low areas of the surface, basements, tunnels.

Mercury is used in the production of mercury lamps, instrumentation, thermometers, pressure gauges, barometers.

Precautions:

- do not enter the danger zone (the radius of the danger zone is 50 m);
- stay to windward;
- avoid low surface areas, basements;
- do not touch the spilled substance;
- after leaving the hearth, undergo a medical examination.

Signs of poisoning: cough, tickling and sore throat, metallic taste in the mouth, salivation, nausea, vomiting, dizziness, weakness, fainting, trembling limbs, shaky gait, confusion, speech disorders.

Mercury is dangerous if inhaled, in contact with the skin (acts through intact skin).

First aid for mercury poisoning:

- call an ambulance;
- rinse eyes with plenty of water, skin with soap and water;
- rinse the stomach (for 1 cup of water – 20-30 g of activated charcoal);
- after gastric lavage, give an enveloping drink (jelly, etc.), expectorants, laxatives to drink;
- provide fresh air, peace, warmth, clean clothes.

In addition to chlorine, ammonia and mercury, such highly toxic substances as prussic acid are widely used in industrial production. hydrogen sulfide, phosgene, etc.

Prussic acid (hydrogen cyanide) is a colorless liquid with the smell of bitter almonds. Prussic acid is widely used in chemical enterprises and factories for the production of plastics, plexiglass, artificial fiber. It is also used as a means of controlling agricultural pests.

Hydrogen sulfide is a colorless gas with a sharp unpleasant odor. It, like chlorine, is heavier than air, therefore, in case of an accident, it creeps along the ground, filling low-lying places, ravines, flowing into basements, cellars, the first floors of buildings. Hydrogen sulfide is formed during the production of sulfuric acid at petrochemical and gas processing plants.

Phosgene is a very poisonous colorless gas. It is distinguished by the sweet smell of rotten fruit, rotten foliage or wet hay. Heavier than air. It is used in the manufacture of various solvents, dyes, medicines and other substances.

Aromatic hydrocarbons. The most common representatives are benzene, toluene, xylene (three isomers – ortho, meta, para). Aromatic hydrocarbons are obtained during the distillation of coal at coke plants and during oil refining. Benzene is considered to be the most dangerous toxic substance. Chronic poisoning by all three

representatives of aromatic hydrocarbons occurs approximately of the same type, most pronounced – when poisoning with benzene vapors. Mild forms of chronic poisoning are characterized primarily by disorders of the central nervous system: headaches, dizziness, increased weakness, drowsiness, loss of appetite. On the part of other organs, there are pains in the heart area, a slowing of the pulse, a decrease in blood pressure. In the future, due to a violation of vascular permeability, bleeding from the nose, gums, subcutaneous spot hemorrhages are observed; during this period, vascular fragility is noted [4, p 37-38].

Tetrodotoxin, is a potent neurotoxin, which is mainly found in carp and porcupine fish. Blowfish is the largest source of tetrodotoxin consumption in the human body, as the Tokyo Bureau of Social Welfare and Health stated that it had about 7% mortality among those who consumed it. There are currently no known antidotes for this toxin, some preliminary studies have shown that the antibody developed by USAMRIID could potentially be used in the future [5].

How do toxic substances get into the body?

They can get inside in different ways, which depend on the aggregate state of the substance. Pathways and impacts:

– Most often, admission occurs through the respiratory tract. In such situations, the poison quickly penetrates the circulatory system and spreads throughout the body. First of all, the nervous system suffers. Toxic fumes and gases act on all organs much faster than substances in another state.

– In second place are poisoning as a result of ingestion of the toxin, getting it into the stomach. Harmful compounds can be liquid or solid. Such intoxication is less dangerous, because there is time to provide first aid to a person. Toxins are absorbed slowly; symptoms develop after a while.

– Penetration through the skin occurs only if the toxin has a destructive effect on the epidermis. The poison is absorbed inside and spreads throughout the body.

– Mucous membranes cannot detain harmful compounds, so penetration occurs rapidly, poisoning occurs.

– Open wounds pass toxins easily, there is a rapid absorption of harmful products into the blood. Burns and frostbite slow down this process.

If it is impossible to eliminate industrial hazards or significantly weaken their effect, in addition to general preventive measures, personal protective equipment is used. Medical and preventive measures include medical examinations and preventive medical examinations (preliminary and periodic), the referral of workers to sanatoriums-dispensaries for a course of preventive treatment. The correct choice of a complex of technical, sanitary, sanitary-hygienic and therapeutic-preventive measures when working with harmful chemicals largely guarantees favorable working conditions and contributes to the prevention of occupational diseases.

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**SOFTWARE IMPLEMENTATION OF THE ALGORITHM
FOR THE FORMATION OF A MULTIDIMENSIONAL MATRIX
BY RANDOM NON-REPEATING NUMBERS**

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Abstract. The article presents a method for forming ten pairs of tables consisting of ten columns and fifty rows with random non-repeating numbers in the range from 000 to 999. Fragments of the software implementation of this method in the Pascal programming language are presented.

Keywords: non-repeating sequence, matrix, random number.

**ПРОГРАММНАЯ РЕАЛИЗАЦИЯ АЛГОРИТМА ФОРМИРОВАНИЯ
МНОГОМЕРНОЙ МАТРИЦЫ СЛУЧАЙНЫМИ
НЕПОВТОРЯЮЩИМИСЯ ЧИСЛАМИ**

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Аннотация. В статье приведен способ формирования десяти пар таблиц, состоящих из десяти столбцов и пятидесяти строк, случайными неповторяющимися числами в диапазоне от 000 до 999. Представлены фрагменты программной реализации данного способа на языке программирования Pascal.

Ключевые слова: неповторяющаяся последовательность, матрица, случайное число.

Problem statement

Generate separate text files of ten pairs of tables consisting of ten columns and fifty rows (set by the user: the minimum number of rows is 1, the maximum is 50). The numbers in the columns of a random, non-repeating sequence should be distributed by bit: 0 hundred, 1 hundred, 2 hundred, 3 hundred, 4 hundreds, 5 hundreds, 6 hundreds, 7 hundreds, 8 hundreds, 9 hundreds. The rows, in accordance with the bit depth of the columns, should be filled with numbers: from 000 to 099 – for bit depth 0, from 100 to 199 – for bit depth 1, from 200 to 299 – for bit depth 2, from 300 to 399 – for bit depth 3, from 400 to 499 – for bit depth 4, from 500 to 599 – for a bit depth of 5, from 600 to 699 – for a bit depth of 6, from 700 to 799 – for a bit depth of 7, from 800 to 899 – for a bit depth of 8, from 900 to 999 – for a bit depth of 9. Thus, in one pair of tables

with a dimension of 10x50, a thousand non-repeating numbers in the range from 000 to 999. This distribution of numbers in all generated tables should not be repeated for either one or each program run.

Software implementation

The solution of the task is implemented [1] in the Pascal programming language in the Delphi 6.0 object-oriented programming environment [2; 3].

After running the executable file "Generator.exe " the main window of the program appears on the screen of a personal computer (PC), shown in figure 1.

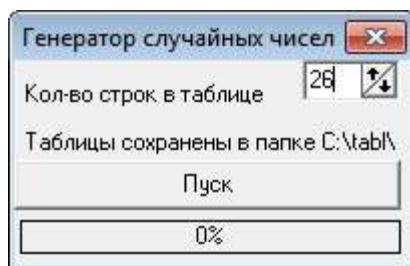


Figure 1. Appearance of the main program window

In this window it is possible to set the required (no more than 50) number of rows in the generated matrices. After pressing the "Start" button, they are automatically formed.

Visually, the formation of matrix tables is displayed on a scale in percentages, every 10% corresponds to the formed one matrix. For the convenience of using the program, each generated matrix is saved in a separate text file in an automatically created folder "C:\tabl" (Figure 2).

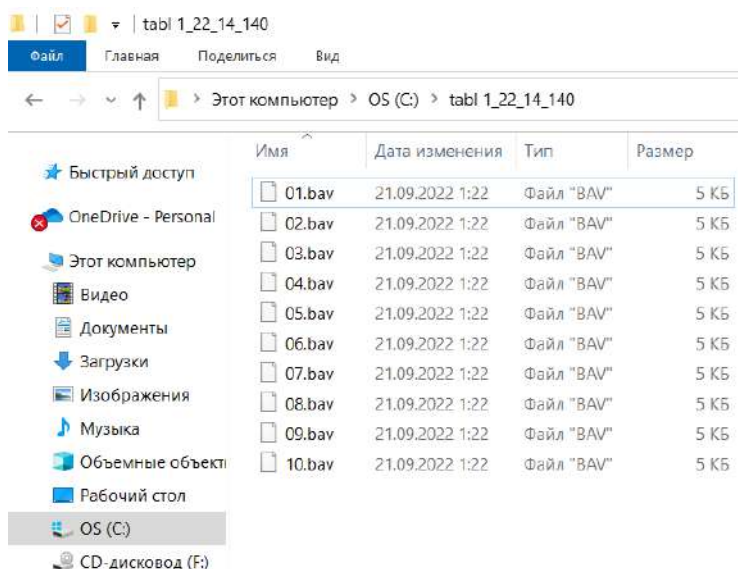


Figure 2. The location of the generated 10 pairs of tables on the computer

The algorithm of the program is based on generating random numbers (the "MassRand" procedure) in the above ranges and checking their repetition in each sequence (the "Unic" function). Figure 3 shows a fragment of the program code for

generating arrays of random numbers in specified ranges by the "MassRand" procedure.

```
Randomize;
//100-диапазон случайных величин (от 0 до 99),
//0-для последовательности от 0 до N+0, mas...-массив выходной
MassRand(99, 0,mas0); //от 0 до 99
MassRand(100,100,mas1); //от 100 до 199
MassRand(100,200,mas2); //от 200 до 299
MassRand(100,300,mas3); //от 300 до 399
MassRand(100,400,mas4); //от 400 до 499
MassRand(100,500,mas5); //от 500 до 599
MassRand(100,600,mas6); //от 600 до 699
MassRand(100,700,mas7); //от 700 до 799
MassRand(100,800,mas8); //от 800 до 899
MassRand(99,900,mas9); //от 900 до 999
```

Figure 3. Code fragment of the program for generating arrays of random numbers in specified ranges

The "Randomize" procedure provides a non-repeating sequence of random numbers each time the program is run.

The combination of the "MassRand" procedure and the "Unic" function ensures the formation of a sequence of non-repeating random numbers in specified ranges. The program code is shown in figure 4 and figure 5.

```
procedure MassRand(range,m: integer; var inputMass: array of integer);
var
  i: integer;
  bm: array of boolean; //массив флагов для отслеживания было уже число или нет
begin
  SetLength(bm, length(inputMass));
  for i := 0 to length(inputMass) - 1 do
  begin
    inputMass[i]:=Unic(bm,range)+m; //для последовательности 0,1, ... , N +m
  end;
end;
```

Figure 4. Code fragment of the "MassRand" procedure

```
function Unic(var flag: array of boolean; range: integer): integer;
begin
  {данная функция возвращает одно случайное число}
  result := random(range);
  while flag[result] do
    result := random(range); //ищем какого числа еще нет
  flag[result] := true; //чтобы не было повторений
end;
```

Figure 5. Code fragment of the "Unic" function

A fragment of the implementation of a non-repeating sequence of ranges in the columns of two tables of the same matrix is shown in figure 6.

```

schet:=schet+1;//считаем сформированные файлы (таблицы)
//если сформированно 10 файлов, то останавливаем и закрываем программу
if schet=11 then begin Timer1.Enabled:=false; Beep; Form1.Close; end;
  case schet of
1:begin//для формирования первого файла
1:MassRand(10,1, mass);MassRand(10,1, mass1);//для адресов столбов в файлах
for u:=1 to 10 do begin
//проверяем совпадение в первой таблице адресов столбцов в 2х вкладьшах
if mass[u]=mass1[u] then goto 1;
end;//for u:=1 to 10 do
for h:=1 to 10 do
begin
mass_Kontr[h]:=mass[h];
mass_Kontr1[h]:=mass1[h];
end;//for h:=1 to 10 do
end;//schet=1

```

Figure 6. A fragment of the program code that implements a non-repeating sequence of ranges in the columns of two tables of the same matrix

Similarly, a sequence is formed for the tables of all ten matrices, with each pair of tables having its own non-repeating sequence.

Hardware requirements

The program works in any version of the operating system "Windows". Since the formation of random sequences occurs in the range of numbers from 0 to 999 tenfold, and text files are formed in real time, it is recommended that the amount of RAM is not less than 8 GB, the processor frequency is not lower than 3.6 GHz. On less powerful PCs, the program's running time will increase significantly.

Testing was carried out on three PCs (the results are shown in table):

No. 1 – based on Intel(R) Core (TM) i7-10870H CPU @ 2.20 GHz, RAM 16.0 GB, 64-bit Windows 10 operating system;

No. 2 – AMD A4-7210 APU with AMD Radeon R3 Graphics 1.80 GHz, 8.0 GB RAM, 64-bit Windows 10 operating system;

No. 3 – based on Intel(R) Pentium(R) CPU G4600 @ 3.60 GHz, 8.0 GB RAM, 64-bit Windows 7 operating system.

Table – Fixed time of formation of 10 matrices

	1	2	3	4	5	6	7	8	9	10	aver.
No.№1	11,05	11,12	11,11	11,13	12,14	11,05	13,13	11,10	11,09	11,08	11,4
No.№2	16,06	18,10	11,03	22,07	26,14	24,18	19,13	17,09	12,03	16,13	18,2
No.№3	12,17	11,15	11,15	11,15	11,15	13,18	11,15	11,15	13,18	11,15	11,7

Thus, the application of this approach provides a tenfold formation of unique matrices consisting of tables No. 1 and No. 2, with a dimension of 10x50, since the number of possible combinations of the necessary sequences is more than 10^{10} . A fragment of the text file of the generated pair of tables is shown in figure 7.

Файл	Правка	Опции	Помогите																
778	240	501	971	192	887	331	053	499	632	670	122	266	479	766	060	587	933	883	380
786	203	592	987	114	868	364	038	471	605	613	160	268	439	770	063	536	999	872	309
772	235	551	985	155	810	370	002	458	678	658	194	285	472	726	087	502	975	877	368
720	231	520	961	154	898	396	024	463	624	646	130	282	456	781	076	508	963	809	358
788	281	573	970	150	848	302	056	492	673	625	168	238	430	798	026	540	930	845	399
792	211	541	915	138	818	342	047	484	691	629	141	213	467	777	004	503	983	800	344
774	226	564	911	120	854	332	085	461	679	612	163	257	480	791	022	545	990	876	379
783	294	590	942	189	826	306	062	495	620	661	111	229	460	771	042	598	903	830	317
701	243	566	940	116	863	310	012	403	671	660	172	279	445	715	074	532	932	884	394
743	260	514	988	183	899	327	064	421	698	686	104	227	497	796	054	574	900	835	354
747	275	510	958	123	867	369	025	418	615	685	185	210	428	749	097	543	919	878	398
702	254	582	974	140	888	371	050	457	630	600	100	225	488	744	027	589	929	829	380
717	204	537	976	112	890	322	057	493	694	653	135	217	431	713	013	562	904	841	349
782	241	529	935	126	861	339	032	437	641	688	177	236	427	754	001	547	926	859	320
707	272	593	916	169	801	313	092	433	662	627	186	293	404	769	043	523	949	819	389
797	259	549	968	147	897	341	082	496	643	631	143	242	490	729	061	588	937	807	305
758	252	535	954	146	885	397	046	429	621	635	125	208	415	794	008	579	969	864	343
725	234	538	945	144	856	355	084	476	618	695	176	265	425	763	073	521	925	873	361
732	218	524	943	131	843	357	021	494	659	674	188	297	465	724	045	577	927	816	352
753	222	554	998	182	874	345	009	498	606	628	165	230	449	765	007	519	953	813	367
734	220	522	972	162	814	374	018	477	669	687	166	292	447	712	029	586	978	858	308
706	298	580	913	127	849	315	036	452	645	684	142	228	451	759	059	553	982	828	323
764	256	548	910	145	882	395	078	475	619	696	149	288	440	721	003	567	928	806	386
735	201	556	965	191	802	328	055	406	607	675	137	270	411	799	052	507	952	834	382
714	264	581	917	196	894	393	011	478	677	642	153	253	413	776	094	591	922	865	347
718	296	509	905	190	836	350	072	417	617	644	161	287	485	746	051	559	938	866	333
751	205	505	957	134	880	375	093	432	602	651	103	286	482	767	088	583	909	871	326
704	214	528	948	121	860	321	077	409	664	680	105	245	410	742	048	572	907	820	334
762	280	557	924	184	823	378	019	468	639	601	128	299	450	789	091	516	944	847	337
757	212	575	931	136	846	385	096	400	648	616	101	221	489	738	068	515	946	853	311
787	261	555	991	113	842	329	080	423	637	634	109	244	470	741	058	511	921	839	362
710	200	585	964	199	838	376	041	443	656	682	118	258	435	731	079	513	993	844	363
795	273	550	989	139	822	301	039	408	650	649	102	271	491	779	023	526	981	840	366
755	248	533	984	173	879	391	030	474	697	633	178	219	438	775	083	560	986	804	387
750	249	569	996	107	896	383	040	434	666	655	129	276	424	756	071	525	947	850	319
709	206	597	920	180	869	304	065	405	610	693	167	255	481	708	098	576	966	805	384
745	250	596	960	132	817	316	016	416	657	672	179	239	446	773	020	512	955	827	360
728	291	531	934	197	837	373	066	486	668	676	152	216	462	761	044	506	941	821	381
733	223	530	959	119	811	359	089	466	611	626	117	284	401	793	033	561	908	851	324
700	215	568	967	170	886	314	017	412	638	654	159	224	442	730	067	594	936	833	325
727	247	500	962	198	824	335	035	453	609	603	148	274	426	705	015	558	992	803	346
736	263	518	951	106	889	372	010	469	604	622	110	209	441	723	034	542	912	893	351
737	278	571	977	181	875	338	070	422	665	636	124	277	487	752	005	517	979	852	348
739	283	570	997	171	862	356	031	483	690	608	193	246	473	716	049	539	906	831	353

Figure 7. Fragment of one pair of tables of the formed matrix

The copyrights of the program implementing this algorithm [1] are recommended to be protected from unauthorized copying by the method presented in [4], and the PC designed to work with this program by the method described in [5].

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ANALYSIS OF AUTOMATED ENVIRONMENTAL CONTROL SYSTEMS IN RUSSIA

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Abstract. This article analyzes modern technical means, allowing to automate the process of monitoring the ecological condition of the environment, describes the principle of their work, tells the possibilities and features of their application, gives examples of their successful operation on the territory of different Russian cities.

Keywords: automation, automated systems, mobile laboratories, fixed stations of environmental monitoring, geoinformation analytical systems, remote probes, monitoring, harmful substances, atmosphere.

АНАЛИЗ АВТОМАТИЗИРОВАННЫХ СИСТЕМ КОНТРОЛЯ ЗА СОСТОЯНИЕМ ОКРУЖАЮЩЕЙ СРЕДЫ В РОССИИ

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Аннотация. В данной статье проводится анализ современных технических средств, позволяющих автоматизировать процесс наблюдения за экологическим состоянием окружающей среды, описывается принцип их работы, рассказываются возможности и особенности их применения, приводятся примеры их успешной эксплуатации на территории различных городов России.

Ключевые слова: автоматизация, автоматизированные системы, мобильные лаборатории, стационарные посты экологического мониторинга, геоинформационные аналитические системы, дистанционные зонды, мониторинг, вредные вещества, атмосфера.

The policy of the modern approach to production now consists in regulating and observing a set of measures to ensure safety both for the employees of the enterprise and for the environment, but often the human impact on the environment is disproportionate to the efforts aimed at leveling it out. In the 21st century, the public is seriously concerned about the future of the planet and its condition, and this leitmotif is closely linked to new technologies. More and more emphasis is being placed on the environmental friendliness of the production process, and more and more sanctions are being imposed on companies that do not comply with certain standards of environmental impact.

So, Apple in 2020 completely excluded the presence of power adapters and external peripherals in the entire line of its products, due to the impact of their production on the natural complex, this impact is due to the fact that people, upon appearance of a new adapter or new peripherals, throw away the old set for uselessness, thereby causing great harm to the environment. Science does not stand still, there is new software and automated systems for environmental protection, allowing more thorough monitoring of the state of the natural complex. Environmental monitoring is understood as a set of measures to monitor the degree of ecological balance around the production enterprise and to determine the level of environmental pollution in case of various violations. Enterprises that fall into the zone of environmental risk primarily include enterprises of power engineering, chemical industry, and oil and gas companies. At such enterprises monitoring of the environmental situation should be put at a high level [1, p. 30-33]. Automated environmental protection systems can include the following means:

1. Mobile laboratories;
2. Stationary posts of ecological monitoring;
3. Geoinformation analytical systems;
4. Remote probes.

Mobile laboratory is a vehicle equipped with a special set of technical means for measuring and analyzing various factors, it is designed to measure the level of pollution of air, soil and water, determine the parameters of radioactive measurements, control of meteorological parameters at a distance from stationary laboratories. It is often used by state ecological services, as well as ecological laboratories of individual companies - for industrial and sanitary control at enterprises or control of emission sources and industrial waste. As for ecomonitoring, there are also mobile laboratories in certain areas: for example, a mobile laboratory for atmospheric air monitoring, a separate mobile laboratory for water analysis, a mobile laboratory for radiation control, mobile hydrological laboratories [2]. The exterior view of the mobile laboratory is shown in figure 1.



Figure 1. Exterior view of the mobile laboratory

The laboratory is equipped with universal software on the EMC Lab Assistant platform developed by the IMC of the Vega Concern and designed to automate measurements of EMC parameters [3].

An example of such a laboratory is Stavropol, which, according to Rosstat and Roshydromet, is one of the Russian Federation subjects with the most favorable environmental situation. This city was one of the first to have these environmental monitoring tools. The use of this technical means allows not only to track the state of the atmosphere of the city in time, but also opens up the possibility to monitor groundwater, determining the level of their pollution [4].

Other means of the automated system of environmental protection are stationary posts of ecological monitoring. Most often the stationary system is designed to solve the problem of continuous monitoring of atmospheric air quality. The equipment of such posts is a complex of technical means and consists of:

1. Pavilion for placement of control and measuring equipment
2. Automated sampling system
3. Gas analysis system
4. Meteorological station
5. Data collection and transmission systems

Such stations allow to measure CO, NO-NO₂-NO_x, NH₃, SO₂, H₂S, CH₄ content in atmosphere as well as total content of hydrocarbons, content of organic compounds, dust content [5].

The posts have their own system of life support, fire and unauthorized access alarms, a computer system for primary data collection and processing and instrument

control, automatic self-start during external power interruptions. The system provides reliable detection of gas concentrations starting from tenths of ppb.

The control, data collection and transmission system contain hardware-software complexes, united in a local computer network. The hardware is based on IBM-PC compatible computers. Software products allow to control the work of the stationary post and analyzers, collect and process data, simulate and make predictions on the dynamics of pollution [6, p. 51-52]. The appearance of the stationary station of environmental monitoring is shown in figure 2.



Figure 2. Exterior view of the stationary environmental monitoring post

An example of the use of such equipment is the city of St. Petersburg. According to the North-West Hydrometeorology and Environmental Monitoring Department in August, September and October 2021, St. Petersburg recorded an increased level of air pollution. Such assessment of the agency is based on the analysis of air samples from stationary control posts, which monitor the content of harmful substances in the air. State stationary checkpoints are located in 12 districts of the city, where the concentration of 14 hazardous substances in the air is determined 3-4 times a day. To assess the results obtained concentrations of pollutants are compared with MPC – maximum permissible concentration of these chemical elements and their compounds in the air, established by Sanitary Regulations and Norms SanPiN 1.2.3685-21 [7].

Another tool is a Geographic Information System (GIS). GIS is a hardware and software human-machine complex that provides collection, processing, display and distribution of spatial and coordinate data, integration of information and knowledge

about the territory for their effective use in solving scientific and applied tasks related to the inventory, analysis, modeling, forecasting, environmental management and territorial organization of society. GIS is capable of modeling objects and processes occurring not only on land (territory), but also in water areas of seas, oceans and inland water bodies (water areas). For example, GIS of the Black Sea, GIS for monitoring of the deep-water gas pipeline "Blue Stream", marine navigation facilities. GIS with the use of GPS is actively used for control in the field of environmental protection. Environmental control is a system of measures aimed at prevention, detection and suppression of environmental legislation violations, ensuring the compliance of economic and other activities subjects with the requirements, including standards and regulatory documents in the field of environmental protection. The experience of using GIS-technologies in searching for and determining the areas of illegal logging proved to be the most effective. For environmental protection universal GIS-systems MapInfo, Arc-Gis, Geomedia are used or develop universal (GIS "State Environmental Control") [8, p. 8-10].

The most modern way to analyze the state of the environment is the use of remote sensing probes, which carry out remote sensing of the Earth (ERS). Remote sensing data is one of the main means of independent environmental monitoring. With the help of remote sensing, it is possible to solve a wide range of tasks in the field of the Ministry of Natural Resources of Russia, including for environmental purposes. According to the results of the research work on the topic "Development of scientific, methodological support of natural resources and environmental monitoring using remote sensing (RS)" a wide range of environmental monitoring tasks were identified and a number of methods for detecting various violations were proposed. In order to solve problems using remote sensing on the basis of the situational center of the Ministry of Natural Resources and Environment of Russia there was created a cluster of systems which allows solving the whole range of such problems. The cluster consists of two subsystems for operations with remote sensing data, one of which solves tasks of all-Russian monitoring using low-resolution data and automated algorithms for processing large amounts of information. The second subsystem solves problems using high and ultrahigh resolution space images, as well as the possibility of obtaining and different representation of the results of additional automated and manual interpretation and analysis of Earth observation data.

Also the data bank and the components of the spatial data infrastructure of the Russian Information Fund of the Ministry of Natural Resources of Russia are integrated into the cluster, allowing to connect to the systems the necessary resources for analysis, as well as for storing the archive of the obtained results [9, p. 40-45].

The main task of such probes is fighting fires. Fire is the most dangerous element, the fight against which is a dangerous and time-consuming process. If a fire is detected in time, the flame can be suppressed, avoiding great damage, natural and financial losses.

These probes allow recognizing possible fire outbreaks, displaying detailed information about the outbreaks, notifying the subordinate structures, which allows the most rapid response when a fire occurs.

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ANALYSIS OF THE FINANCIAL SYSTEM OF THE RUSSIAN PENSION FUND

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Abstract. This article analyzes the features of the state pension fund of Russia and the state management company of the Pension Fund, clarifies their place in the system of financial regulation and reveals the composition of their investment portfolios.

Keywords: pension fund, pension provision, state management company, investment portfolio, pension insurance, investment of the pension means.

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Аннотация. В данной статье проводится анализ особенностей государственного Пенсионного фонда России и государственной управляющей компании Пенсионного фонда, уточняется место фондов в системе финансового регулирования и раскрывается состав их инвестиционных портфелей.

Ключевые слова: пенсионный фонд, пенсионное обеспечение, государственная управляющая компания, инвестиционный портфель, пенсионное страхование, инвестирование пенсионных средств.

In Russia, the old-age labor pension, assigned for payment to citizens entitled to it, consists of two parts – insurance, provided by the state, and funded, the funds, and a component of, which is managed by professional market participants.

First, it is necessary to tell about the regulation. The federal law No. 167-FZ "About compulsory pension insurance in the Russian Federation" is consisted a lot information about key issue in pension's sphere [1].

Our legislation obliges to every citizen in our country be insured in Russian Pension Fund's system. We mean SNILS, one of necessary citizens' documents.

Nevertheless, this law was accepted in 2001 and man could get it at the birth but we got this card only in school because we were born earlier hence, we could get this card only when we were 14. In this age people in our country get the passport instead of birth certificate, also get the SNILS and the last but not the least since 14 the citizen of our country subject to criminal liability.

So everyone must be issued in pension insurance. It means that citizens will accept pension from Russian Pension Fund. In addition, also the everyone citizen can to refuse to receive a funded pension from the Pension Fund of the Russian Federation and transfer his savings to a non-government pension funds, we need only to conclude a contract with one of them.

The Russian Pension Fund (RPF) is one of three state extra-budgetary funds that provide social services to the population. By the way, extra – budgetary means that Russian Pension Fund is the separate organization with its own budget, which is not included in federal, sub federal or municipal budget. No one can withdraw money from it.

There are branches of the pension fund in every subject of the Russian Federation, in every major city and district center. The headquarter is located in Moscow.

The main difference between the RPF and the Non-Government Pension Funds (NPF) is that the budget of the pension fund is part of the budget system of the Russian Federation and it is accountable to the state, while the NPF is not: this is a private company that operates under license.

There are some functions of the Pension Fund of the Russian Federation.

The main task of the RPF is money management, as well as the payment of pensions and social benefits to residents of the Russian Federation [2].

1. Russian Pension Fund puts citizens on pension accounting.
2. Pays insurance pensions for old age, disability and loss of breadwinner, for state pension provision, social pensions and pensions for civil servants.
3. Pays the difference between the social pension and the subsistence minimum.
4. Pays pension savings – the accumulative part of the pension.
5. Pays a number of child benefits, for example, a one-time allowance for the birth of a child, as well as monthly allowances for the care of a child up to one and a half years if the parents do not work.
6. Establishes and pays monthly cash payments to combat veterans and labor veterans.
7. Issues certificates for mother's capital.

The RPF has more functions that are global. For example, it invests the money of insured persons in securities, also cooperates with other countries on pension issues. The one of interesting moments that insurance premiums pay by our employees, but if you became entrepreneur than you must pay insurance premiums by yourself.

In table 1, we can see the key indicators of the pension and social security system of the Russian Federation.

Table 1 – Key indicators of Russian Pension Fund (Part 1) [3]

Indicators of the pension and social security system of the Russian Federation	2018	2019	2020	2021
Number of individual personal accounts in the compulsory pension insurance system (mln)	155,3	159,2	156,4	156,2
Pensioners:	43,9	43,6	43	42
Persons who are forming pension savings: (mln)	76,8	76,3	75,5	74,7
– in the state management company VEB	39,6	38,6	38,2	37,6
– in private management companies	0,3	0,3	0,2	0,2
– in non-state pension funds	36,9	37,3	37,1	36,9
The amount of maternal (family) capital (thnd)	453,0	453,0	466,6	483,8
Inflation in Russian Federation	4,27	3,05	4,91	8,39
Number of issued certificates for maternity capital	9,0	9,6	10,9	12,0
Families who have completely disposed of maternity capital	5,6	6,3	6,5	6,6

As we can see the number of individual personal accounts in compulsory pension, insurance system is more than actual population in Russian Federation. The reason of the people who do not live and work in Russia, but who were insured in Russian Pension Fund also are there. They are not deleted from system because they still apply on their accumulated pension insurance.

On the table you can see that approximate equal parts of pension's savings belongs Russian Pension Fund and Non-government Pension Fund. There numbers of pensioners are little less one third of population of Russian Federation. We guess it is one of the reasons why some years ago was accepted the reform increasing the age when people became a pensioner.

We added also a bit information about mother's capital on this because it is one the task of Russian Pension Fund. As you can see, the size of mother's capital increase in last two years by 3-4 %, it is less than inflation, however. Accordingly, not all families spent their mother's capital. Maybe they want to spend it on the improvement of their housing conditions or pay for children education.

Table 2 – Key indicators of Russian Pension Fund (Part 2) [3]

Indicators of the pension and social security system of the Russian Federation	2018	2019	2020	2021
Budget revenues (bln)	8 269,6	8 781,0	10 303	9 794
Budget expenditures (bln)	8 428,7	8 627,1	9 728	10 125
The average size of the insurance pension (rub)	13 729	14 608	15 456	16 330
The living wage of a pensioner in the Russian Federation (rub)	8 726	8 846	9 308	10 022
Indexation of the insurance pension (%)	3,7	7,05	6,6	6,3
Inflation in the Russian Federation	4,27	3,05	4,91	8,39
Investment profitability of pension savings in the expanded portfolio of VEB	6,1	8,6	6,8	4,5
Investment profitability of pension savings in the portfolio of government securities of VEB	8,7	12,1	7,8	4,8
Average investment return on pension savings PMC (private management companies)	5,0	13,9	8,1	3,7

Consequently, we can see the income and the expenses of the Russian Pension Fund in table 2.

Unfortunately, in 2018 and in 2021 expenses were higher than revenues. In addition, in these years inflation was higher than indexation of the insurance of pension.

The average size of pension is higher than the minimum living wage in Russian Federation. Meanwhile, we are talking about average. What will happen if in some region the size of pension is low than the minimum living wage? The Russian Pension Fund will compensate the difference between these two values. It is one his tasks.



Figure 1. Expanded portfolio of Pension Fund of the Russian Federation [4]

In figure 1, we can see the expanded portfolio of Russian Pension Fund. Thus, almost half of this portfolio consists of Russian corporate bonds. One quarter is government securities of the Russian Federation. In conclusion, the cash is equal to zero. It means that all money is invested.

There are two portfolios in VEB: expanded portfolio and portfolio of government securities.

Since 2003, VEB has been a state management company for the trust management of pension savings. The activity of VEB as a state management company is carried out in accordance with the legislation of the Russian Federation, regulatory legal acts of the President and Government of the Russian Federation, regulatory documents of the Central Bank of the Russian Federation, the Ministry of Finance of the Russian Federation, and other federal executive authorities.

In 2018, by Decree of the Government of the Russian Federation No. 814 dated July 12, 2018, the implementation of VEB, the functions of the state management company for the trust management of pension savings and the state management company for the funds of the payment reserve were extended for another five years – until January 1, 2024.

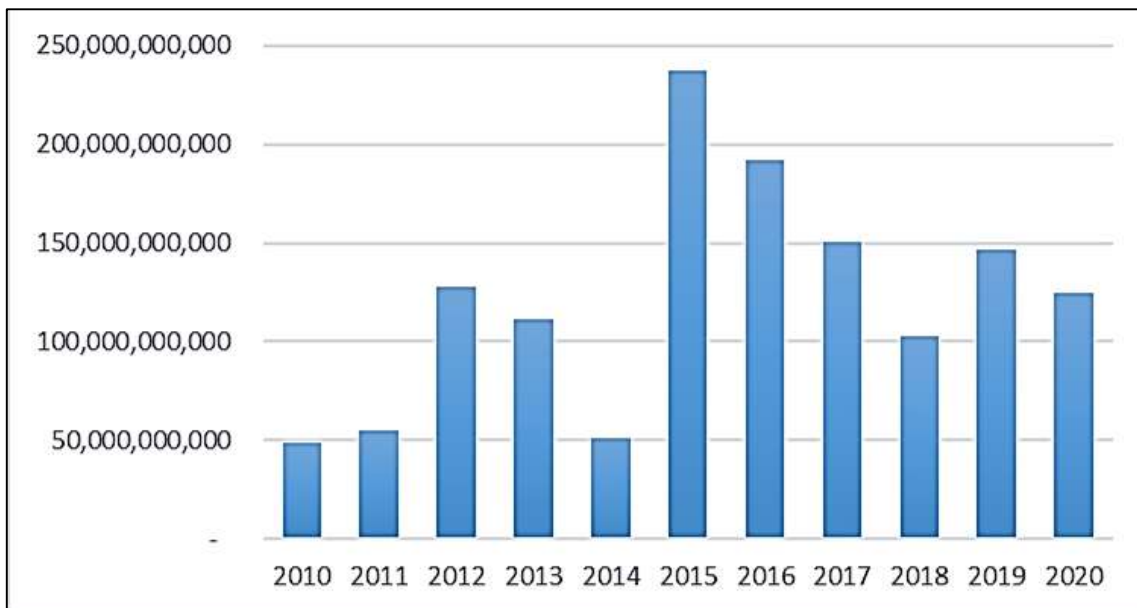


Figure 2. Invest income of Pension Fund of the Russian Federation in rubles [5]

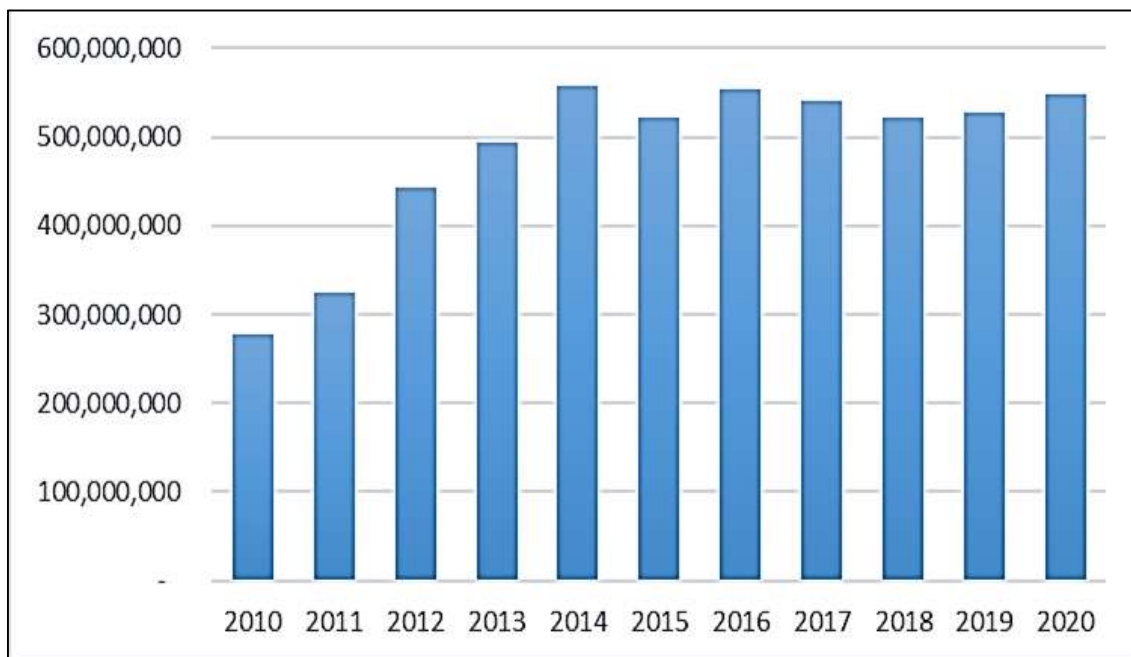


Figure 3. Remuneration of the VEB in rubles [5]

In figure 2 and figure 3, you can see the one of the revenues of Russian Pension Fund – we mean invest income. There is no data information on 2022 year and only three statements for 3 quarters in 2021. Hence, we consider last 10 years since 2010 to 2020. In addition, on this slide you can see the remuneration of the VEB Company in rubles. There is interesting moment that in 2014 the income was the smallest one but the remuneration was the highest.

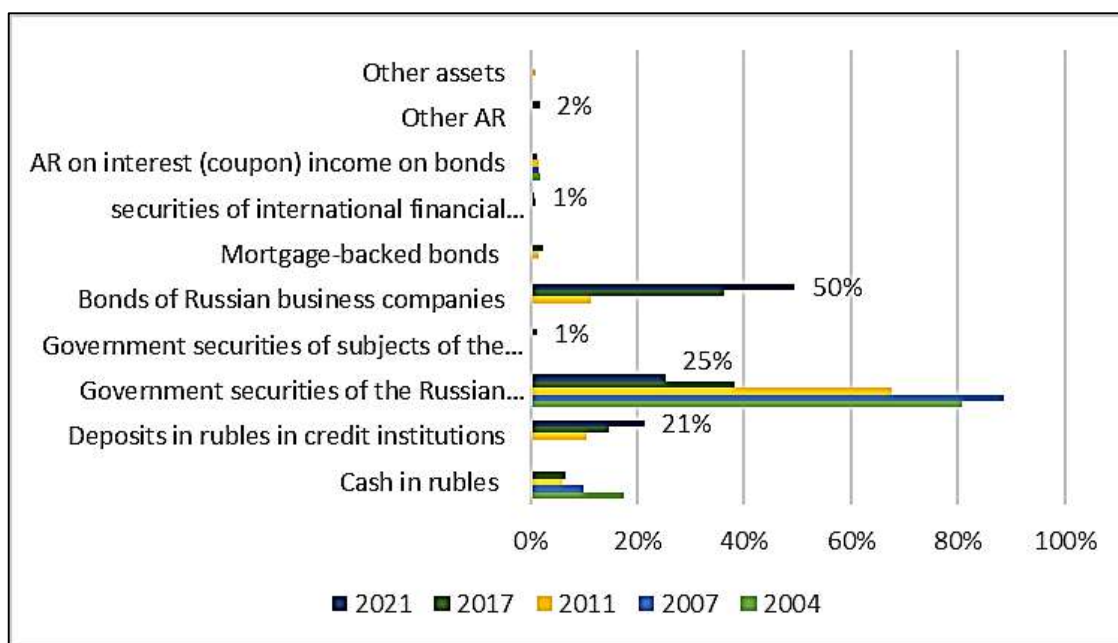


Figure 4. Change in the shares of VEB's expanded portfolio [5]

In figure 4, you can see the dynamic of changing portfolio structure of VEB. As we said earlier VEB is the management company of Russian Pension Fund since 2003, but actual data was only since 2004. Thus, we took data in first and last and some intermediate years.

Extended investment portfolio [6]:

- government securities of the Russian Federation and subjects of the Russian Federation;
- bonds of Russian issuers, including those secured by government guarantees of the Russian Federation;
- funds in rubles and foreign currency on trust management accounts with credit institutions.
- mortgage-backed securities;
- bonds of international financial organizations;
- deposits in rubles and foreign currency;

Investment portfolio of government securities:

- government securities of the Russian Federation;
- bonds of Russian issuers, backed by state guarantees of the Russian Federation;
- funds in rubles and foreign currency on trust management accounts with credit institutions.

Pension savings may be invested in shares of Russian open joint-stock companies, provided that these shares must be included in at least one top-level quotation list, that is, in a quotation list, for inclusion in which, in accordance with the legislation of the Russian Federation, maximum requirements are established. [7]

After analyzing the investment portfolios of the PRF and one of its largest management company VEB, we concluded that the return on the expanded portfolio is lower than on the regular one, despite the fact that the extended portfolio includes more instruments than the non-expanded one.

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ASSESSMENT OF WATER QUALITY IN THE DON RIVER BY ZOOBENTHOS ORGANISMS

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Abstract. The paper reflects the results of assessment of the quality of ecosystems of the Don River in the zone of influence of the city of Rostov-on-Don by the method of bioindication according to zoobenthos organisms. Soil samples were taken on the eighteenth of August at two o'clock in the afternoon at three different points. The results of qualitative and quantitative zoobenthos counts were used in determining water quality by such indices as the Goodnight-Watley, Woodiwiss, and Perele indices.

Keywords: bioindication, the Don River, zoobenthos organisms, hydrobiological indices; pollution level.

ОЦЕНКА КАЧЕСТВА ВОДЫ В РЕКЕ ДОН ПО ЗООБЕНТОСНЫМ ОРГАНИЗМАМ

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Аннотация. В работе отражены результаты оценки качеств экосистем реки Дон, в зоне влияния города Ростов-на-Дону, методом биоиндикации по зообентосным организмам. Пробы грунта отбирались восемнадцатого августа в два часа дня в трех разных точках. Результаты подсчета качественных и количественных характеристик зообентоса использовались при определении качества воды по таким индексам, как индекс Гуднайта-Уотлея, Вудивисса и Переле.

Ключевые слова: биоиндикация, река Дон, зообентосные организмы, гидробиологические индексы, уровень загрязнения.

The total length of the Don River is 1,870 kilometers. It is the fifth longest river in Europe. The area of the Don basin exceeds 440 thousand kilometers. The Don River

originates from a small brook Urvanka in the town of Novomoskovskoye in the Tula Region, flows through its territory as well as the territories of Lipetsk and Volgograd Regions, crosses Voronezh and Rostov Regions, flowing into the Sea of Azov.

There are several meanings of the Don River for a city of Rostov-on-Don: 1. a navigable waterway, weather conditions do not lead to freezing of the river, therefore ships depart all the year round; 2. water from the river is used in agriculture (irrigation and fish and waterfowl breeding); 3. use of water in industry (there are large industrial zones on a coast of the city); 4. a recreational zone (there are some large beaches and also rest zones in the city).

Particular attention should be paid to the fact that Rostov-on-Don is a major industrial port, through which more than 1,000 ships a year pass. Since this section of the river is very busy with river ship traffic. Pollution occurs as a result of discharges of bilge, fecal and ballast water, as well as during the processing of watercraft and machinery during construction and subsequent operation there is pollution of the water mass and bottom sediments with petroleum products [1]. Also, on the territory of the city there are several large industrial enterprises, which affect the ecosystems of the river. These objects are marked in figure 1.

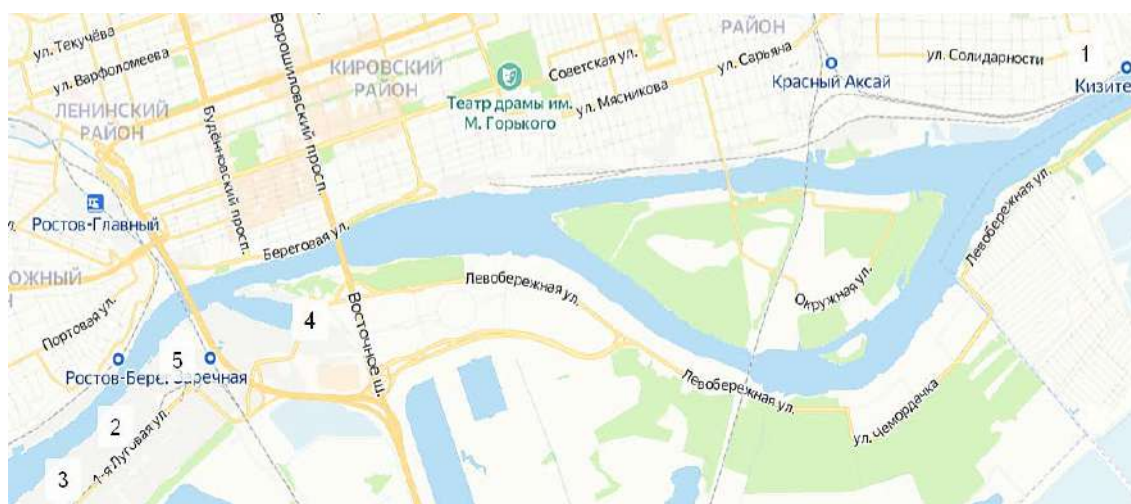


Figure 1. Map of the city with marked industrial facilities: 1 – LLC RZE (Rostov electronics plant); 2 – Tobacco factory "CJSC Donskoy tobacco"; 3 – LLC Ladashet (production of single and multi-layer plastics); 4 – Shipyard "Moryak"; 5 – Public Association Donskoy port

Anthropogenic pollution of water bodies changes the chemical composition of water and also affects the composition of aquatic biocenoses. This can be used to monitor water bodies. The application of hydrobiological indicators allows a comprehensive assessment of water quality by a set of effects of chemical, physical characteristics of water on living organisms.

Since there are a lot of industrial objects on the coast there were selected control points, where the research was conducted in the zone of influence of the city of Rostov-on-Don by bioindication method on zoobenthos organisms. Ground samples were taken in August, 2022 in three sections of the river: 1) at the central beach; 2) near Donskoy Port; 3) in the vicinity of Moryak Ship Repair Plant. Sampling locations are

shown in figure 2 below. The given points were chosen according to their importance for the city. Donskoy Port and "Moryak" shipyard are of strategic importance, since the city is a major port and connects ship traffic from the Caspian Lake to the Black Sea. And the central beach is one of the largest recreational areas of the city, where people come from the whole Rostov region. Detailed characteristics of each of the points are presented in table 1.

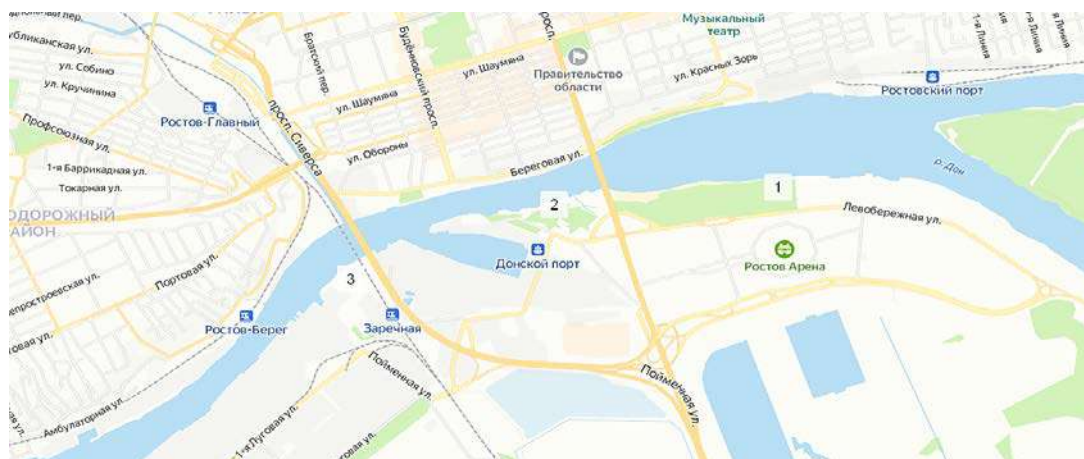


Figure 2. Map of the samples taken: 1 – central beach; 2 – near Donskoy Port; 3 – in the vicinity of Moryak shipyard

Table 1 – Characteristics of soil sampling points

Map number	Coordinates	Soil type	Water temperatures	Features
1	47.213854 39.737380	Sandy	24	Large number of clams in the ground
2	47.211994 39.717870	Chernozem	24,5	Oil stains on the water surface in places
3	47.207837 39.701026	Clay	25	Coastal overgrowth

The possibility of using bioindication as a way to determine the sanitary and hygienic state of watercourses involves a detailed study of communities of hydrobionts confined to specific water bodies and river basins [2]. Based on the need to apply qualitative and quantitative characteristics of water bodies experiencing anthropogenic pressure, various approaches are used, including analysis of fouling (periphyton).

The results of calculations of qualitative and quantitative characteristics of zoobenthos were used in determining water quality by such indices as the Goodnight-Wattleya, Woodiwiss, and Perele indices. Data on the number of organisms in all three sampling points are shown in table 2.

Table 2 – Found benthos by points

Organisms	Number of organisms		
	Point 1	Point 2	Point 3
Oligochaetes	20	5	8
Mosquito larvae	9	2	4
Leeches	1	-	-
Mayflies	1	-	-
Clams	17	-	1
Ringworms	-	1	-
Water mites	-	-	2

Figure 3 shows the results of the found benthos in the quantitative ratio.

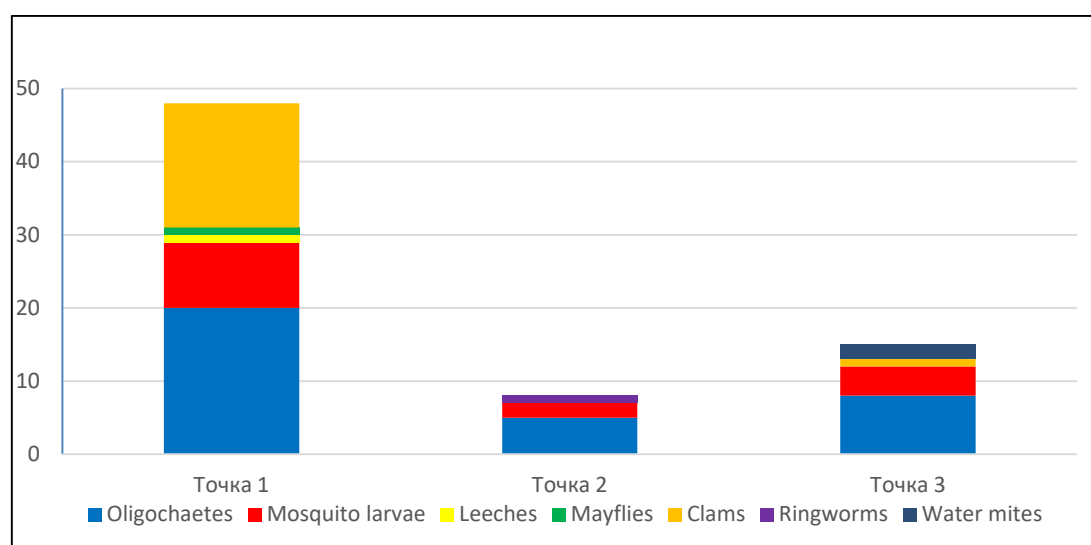


Figure 3. Quantitative ratio of benthos

It is believed that the proportion of oligochaetes is the greater the more polluted the water and the bottom with the organic matter they feed on. They live mainly in freshwater reservoirs and soils, and prefer shallow areas with sufficient water oxygenation, but there are also forms that can live in considerable depths, where anaerobic conditions prevail. Leeches are common in freshwater reservoirs such as rivers, lakes, streams and marshes. Leeches are free-living worms; they can both parasitize on mollusks, crustaceans, and fish and feed on worms, small mollusks, and aquatic insect larvae. Mayflies belong to the freshwater forms of insects. They play an important role as a food source for many fish species. They themselves feed on algae, plant detritus, small invertebrates and larvae of other aquatic insects. Mayfly larvae are less resistant to water body pollution, so they are considered indicators in the Woodiwiss index. Water mites are widespread, found in large bodies of water, in ponds densely overgrown with vegetation. Mollusks play an important role in shaping water quality and bioproductivity of aquatic ecosystems due to high biomass. They live in water bodies with a constant mesospore zone with a relatively stable water, chemical, and oxygen regime [3]. Mosquito larvae feed on unicellular algae and decomposing

plant organic matter. They are more resistant to pollution, but die when the water is heavily polluted with oil products because the film prevents them from breathing.

From table 2 we can see that the highest diversity of organisms is at point 1 (central beach). The Goodnight-Watley index was calculated according to the formula $D_1 = n_0/n_b$, where n_0 is the number of oligochaetes and n_b is the number of benthos [4]. Thus, the index is 41.6 %, which means that water quality class 3 (moderately dirty), and the self-purification zone is betamesosaprobic. For such a zone corresponds to low organic pollution, a large amount of oxygen and richness of species diversity. Woodiwiss index is 3, which corresponds to class 5 water quality and degree of pollution – dirty [5]. At this point, the water is moderately polluted, it is suitable for bathing, but for domestic use, without proper treatment, is not recommended.

At point 2 (Don port) Goodnight-Watley index is 62.5 %, which means that water quality class 4 (polluted) and the self-purification zone is alpha-mesosaprobic. This zone is characterized by significant organic pollution, lack of oxygen, oxidation-reduction processes in water and bottom sediments. Woodiwiss index is 2, which corresponds to the 6th class of water quality and degree of pollution – very dirty [5]. Thus, this point is characterized by severe water pollution, which affects the number and condition of microorganisms, mainly dominated by organisms resistant to pollution. Negative impact here is caused by the port, where many cargo ships come, and it is due to them that oil products spill, as well as ballast and other waters are discharged.

At point 3 (shipyard "Moryak" Goodnight-Watley index is 53,3 % – this means that water quality class 4 (polluted), and the self-purification zone is alpha-mesosaprobic. As well as in point 2, this zone is characterized by significant organic pollution, lack of oxygen, oxidation-reduction processes in water and bottom sediments. Woodiwiss index is 2, which corresponds to the 6th class of water quality and degree of pollution – very dirty [5]. The results of the calculations of the sample of this point is similar to the point 2, as the sample is taken from the shipyard. In addition, diesel oil spillage, rust and dirt from the ship are added here. All these factors have a negative impact on the ecosystems of the coastal area.

The study indicates that the periphyton of artificial substrates includes hydrobionts, which can be used to monitor water quality in surface watercourses. The index of saprobity is determined on the river section as alpha- and beta-mesosaprobic zones, which allows to speak about the absence of significant pollution of the Don River with toxic substances. Also, the received results testify to necessity of increase of frequency of water sampling in different months of year for more exact definition of a condition of ecosystems.

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CONSUMER EXPERIENCE MANAGEMENT BASED ON THE CONCEPT OF EMOTIONAL MARKETING AS THE BASIS OF SUCCESSFUL BRANDS

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Abstract. This article deals with the conception of emotional marketing as a new paradigm in the modern world. Increasing market competition, changing preferences of consumers, the necessity to increase brand loyalty leads to the necessity to change brand strategy for managing consumer experience. An integral part of the new strategy is an emotional approach, which is aimed to shape a clear brand positioning, set correct communications and convey the right message to the audience.

Keywords: consumer, emotional marketing, customer experience management, respondent, emotions.

УПРАВЛЕНИЕ ОПЫТОМ ПОТРЕБИТЕЛЕЙ НА БАЗЕ КОНЦЕПЦИИ ЭМОЦИОНАЛЬНОГО МАРКЕТИНГА КАК ОСНОВА УСПЕШНЫХ БРЕНДОВ

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Аннотация. В статье рассматривается концепция эмоционального маркетинга как новая парадигма в современном мире. Увеличение конкуренции на рынке, изменение предпочтений потребителей, необходимость повышения лояльности к бренду приводит к необходимости изменения в компании бренд-стратегии управления опытом потребителей. Неотъемлемой частью новой стратегии является эмоциональный подход, который призван сформировать четкое позиционирование бренда, настроить правильные коммуникации и донести верный посыл до аудитории.

Ключевые слова: потребитель, эмоциональный маркетинг, управление опытом потребителей, респондент, эмоции.

Emotional marketing is rather new concept in modern marketing and currently is at its development stage. Nowadays we can see an increased interest of specialists to the given concept, which indicates about the importance of shaping such close emotional connection between consumers and the brand and shift focus to emotions in communications. The research conducted by the authors shows that 74 % of respondents at the age of 27 to 38 want to receive the emotional component of interacting with brand, in addition to the rational benefits of using it.

The first mention of emotional marketing can be found in the book by M. Gobe, where the author emphasizes, that the existing model of brand recognition has lost its relevance and suggests taking a look at it from a new angle, through an emotional approach, which is based on the relationship between the brand and the consumer, imagination [1].

Based on the analysis of national and foreign literature, as well as depth interviews with consumers aged 25-38 years in different markets, the following conclusions were made, which formed the basis of the study of consumer experience management based on the concept of emotional marketing:

1. 76 % of the surveyed respondents give preference to those brands that give the consumer a sense of individuality, “to be different from everyone else”;

2. The emotional component is an important trigger in choosing a product, since consumers want not only to interact with the brand at the level of rational communications, but also to receive some positive experience and impressions;

3. Consumers of the considered age category appreciate the personalized approach in interaction with the brand;

4. 83 % of surveyed respondents mark the importance of interaction with a brand. Therefore, the brand must be presented wherever the potential target audience is located;

5. Consumers tend to share their experiences of interacting with a brand. At the same time, negative experiences are expressed more actively in reviews on large platforms.

Considering rapidly changing world, the appearance of new technologies, increasing competition in the market and more complex process of involving the consumer in interaction with the brand, the concept of emotional marketing is gaining more and more popularity.

Emotional marketing is a marketing concept based on emotions that influence the process of interaction between a brand and a consumer. In the evolutionary development process, many scientists began to distinguish two main purposes of emotions: physical and social adaptation [2].

Analyzing Russian and foreign literature, the authors of the article distinguish three types of emotions that affect consumer taking a decision [3; 4].

- Integral emotions are directly related to the consumer's final decision to interact with the brand.

– Incidental emotions, or the current mood of consumers. These emotions are typical to the consumer at the present time, which are taken as the basis for making judgments.

– Situational emotions - this type is characterized by the mood of the consumer now, which can be influenced by many factors, by the weather outside, for example.

All of the above-mentioned emotions have a direct impact on consumer behavior. The authors of the article give some of the most common changes in consumer behavior under the influence of emotions [4; 5]:

1. Area of attention. Negative emotions, such as fear, tends to reduce the focus of a person's attention, when on the contrary, positive emotions increase attention. Emotions also have an impact on the perception of information that the consumer relies on.

2. Social focus.

Human emotions can be directed both to oneself and to the environment. For instance, pride enhances the focus on the environment, as a person seeks attention in various ways in order to evoke a positive response from other people.

Satisfaction is aimed at weakening the focus on society. In this case, the person is oversaturated with emotions, and the main need is to satisfy the result received in a calm environment.

3. Regulatory focus. Emotions affect the consumer's tendency to acquire or reject. We will take two emotions as an example: sadness and disgust. It is worth noting that at first glance, these emotions are rather negative, but they are able to cause different effects. With disgust, consumers have a desire to reject a given brand, a product, which, in turn, reduces its cost, as consumers seek to get rid of the irritant quickly. With sadness, there is a need to change certain moments, circumstances in life. This emotion tends to increase the propensity of consumers to make a decision. The feeling of sadness can increase the price for the reason, that the consumer has a need to improve his position in society.

4. Depth of processing. Emotions directly affect the consumer's thought process and the level of information processing. The level of confidence is one of such factors. One such factor is the level of confidence.

– Emotions with a deep degree of confidence entail heuristic processing of information. In this case, the consumer feels confident in his emotions and transfers them to making a final decision about interacting with the brand, product.

– Emotions with a low degree of confidence (fear) entails systematic processing of information. The consumer feels insecure about his emotions and doubts the decision about the need to interact with the brand.

– Another factor affecting the depth of information processing is valence.

– Positive emotions activate the process of heuristic information processing. Positive emotions are a kind of trigger for safety, security for people, which has a positive effect on making a decision.

– Negative emotions activate the process of systematic information processing. Negative emotions are a signal about danger, which affects thoughtful decision-making.

5. Decision speed. As noted above, emotions affect the decision of consumers, reduce or increase the speed of decision making. Under the influence of emotions, consumers tend to make faster decisions that provide immediate benefits.

The authors of the article identified the following situations when brands need to use emotional appeals: immediate decisions, independent decisions, uncertain decisions, consumption situations.

In order to reduce the time for the consumer to make a decision about interacting with the brand, you need to:

1. Reduce decision time for hedonic goods. If the product is sufficiently emotional in its characteristics, such as luxury shoes, then the decision-making process can be shortened by the following factors:

- emphasis on the limitations of the product;
- provision of temporary discounts;
- minimization of product availability.

2. Applying an emotional appeal before the sale. If the product is sold online and e-mail distribution is automated, then the correct alignment of the chain of emotional appeals for interaction with the brand is the necessary condition.

3. Placement of hedonistic goods at the checkout. In retail chains, impulsive purchases of hedonistic goods, such as chocolate, magazines, chewing gums, according to the analysis of various sources, fall on the checkout area. Since the decision-making time by the consumer in this case is limited.

4. Reducing the waiting time for emotional benefits. Most consumers want to get emotions right away. For example, buying stylish clothes online. By purchasing this product, the consumer will be able to get emotions, evaluate the benefits of this product only after a time. Therefore, a necessary condition is the provision of another benefit, for instance, access to a video with stylist advice on the purchased product.

In Russian and foreign literature, there are quite a few ways to control different types of emotions [1; 4]. The authors of the article identified the following.

1. Time of day of advertisement broadcast. Most consumers are highly active in the late morning, while in the evening and at night, most feel tired. Based on time, you need to plan a segmentation strategy. Thus, in the morning, emotional, exciting products can be recommended to consumers, and at night – more soothing.

2. Location. It is always necessary to take into account the logistics of placing an outlet, the flow of people.

3. Color orientation. Warm colors, such as red, yellow, are associated with a sunny day, and therefore increase consumer arousal. Cold colors, on the contrary, are associated with relaxation, reduce excitatory processes.

4. Use of storytelling. One of the most effective ways to immerse the consumer in the history of the product, its use. This method allows to simply and accessibly describe to the consumer the importance and necessity of this product.

Summarizing the above, we can conclude that the management of emotions, through the use of the emotional concept of marketing, is an integral part of any brand strategy. It is necessary to remember that emotional marketing is primarily about human emotions that allow you to attract an audience, cause a certain reaction and encourage action. Based on this, companies should carefully approach the study of consumer emotions and behavior and thoroughly analyze emotions at each stage of consumer interaction with the brand. The effective use of the emotional concept of marketing in brand activities can lead to a number of advantages, such as standing out from competitors, increasing consumer loyalty, supporting consumers pursue for a dream and evoking the necessary emotions with the help of an ideal image.

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ENERGY-EFFICIENT TECHNOLOGIES FOR THE DISPOSAL OF OIL-CONTAMINATED SOIL

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Abstract. Oil-contaminated wastes (hereinafter OCW) are wastes containing hydrocarbon mixtures of different compositions and physical and chemical properties. They are generated during oil storage, transportation or use. The purpose of this paper is to consider energy-efficient technologies for the disposal of oil-contaminated soil used at enterprises engaged in the disposal of these types of waste, as well as modern methods of disposal that have the potential to be used in the future.

Keywords: oily waste, recycling, energy-efficient technology, soil, ecology.

ЭНЕРГОЭФФЕКТИВНЫЕ ТЕХНОЛОГИИ УТИЛИЗАЦИИ ЗАГРЯЗНЕННОГО НЕФТЬЮ ГРУНТА

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Аннотация. Нефтеcодержащие отходы (далее НСО) – это различные по составу и физико-химическим свойствам отходы, содержащие углеводородные смеси. Они образуются в процессе хранения нефти, транспортировки или ее использования. Целью данной работы является рассмотрение энергоэффективных технологий утилизации загрязненного нефтью грунта, применяемых на предприятиях, занимающихся утилизацией данных видов отходов, а также современных способов утилизации, которые имеют потенциал применения в будущем.

Ключевые слова: нефтеcодержащие отходы, утилизация, энергоэффективные технологии, экология.

More than 1 million tonnes of OCW and oil-contaminated soils are generated in the Russian Federation annually, and the main contribution to the formation of which is made by oil companies [1].

Soil contaminated with oil or oil products is classified as Hazard Class 4 (low-hazardous waste), hence it has a low degree of negative impact on the environment. Recovery time after damage is at least three years.

The main components of OCW are oil products, water, resinous-asphaltene substances and solid mineral impurities of various sizes in the form of coarse stones, sand, silt and metal oxides.

More than 57 large Russian enterprises carry out disposal and neutralization of OCW, their locations are shown in figure 1 [2].



Figure 1. Location of oily waste management facilities

The main methods of disposal and neutralization of OCW are [3]:

- chemical methods;
- physical methods;
- physico-chemical methods;
- biological methods.

Chemical methods include the sorption method, based on the use of humic preparations, which allows detoxification of waste in the presence of heavy metal compounds in them.

Physical methods include sedimentation, filtration, thermomechanical phase separation, decanter and tricanter treatment.

Decanters and tricanters are widely used to treat oily wastewater. The main task in oily wastewater treatment is the recovery of oil. For this purpose, tricanters are used as one of the treatment steps at refineries and petrochemical plants, capable of separating oil, water and solids into three fractions.

Physico-chemical methods include the extraction of the oily part of oily waste using surfactants.

A group of technologies based on the biological method of decontamination of OCW involves adding microorganisms to the waste that cause the biodegradation of the oil phase. Biological methods include bioremediation and phytoremediation [4].

Bioremediation of OCW and soils contaminated with oil products is a set of techniques based on the use of biological agents to clean soil and ground from pollutants.

The scheme of process of disposal and neutralization of OCW by biological methods is shown in figure 2 [5]:

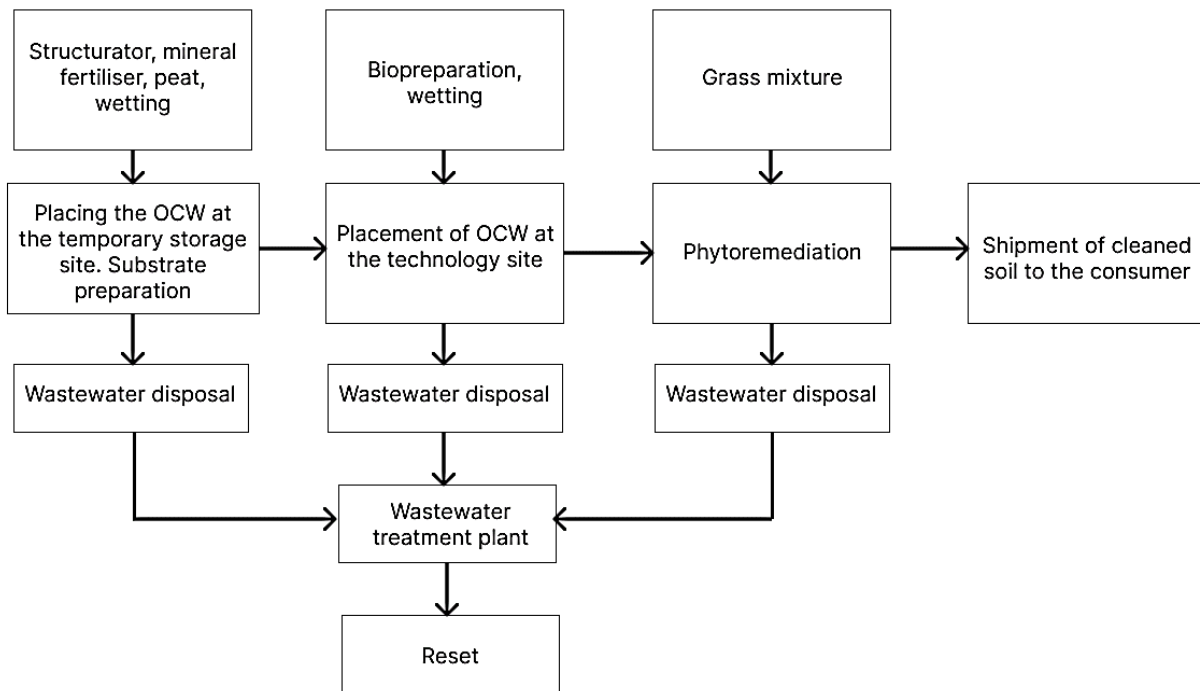


Figure 2. Technological scheme of the process of utilisation and neutralisation of oily waste by biological methods

One type of technology used in bioremediation is the use of bioreactors. Before being placed in the bioreactor, coarse stones are removed from the oily waste and the waste is mixed, making it more homogeneous. After adding water, a clay slurry is formed. This slurry is mixed with microorganisms that purify soil from pollutants, for which optimum conditions are created in the reactor.

The process in the solid-phase bioreactor requires a certain humidity and the addition of organic fillers (straw, hay, peat, sawdust, etc.). The organic filler is pre-shredded to a fraction of 1-3 mm. The required amount of filler is calculated from the specified initial moisture content of the mixture (60 to 65 %).

The scheme of the process of the decontamination of OCW in a solid-phase bioreactor is shown in figure 3:

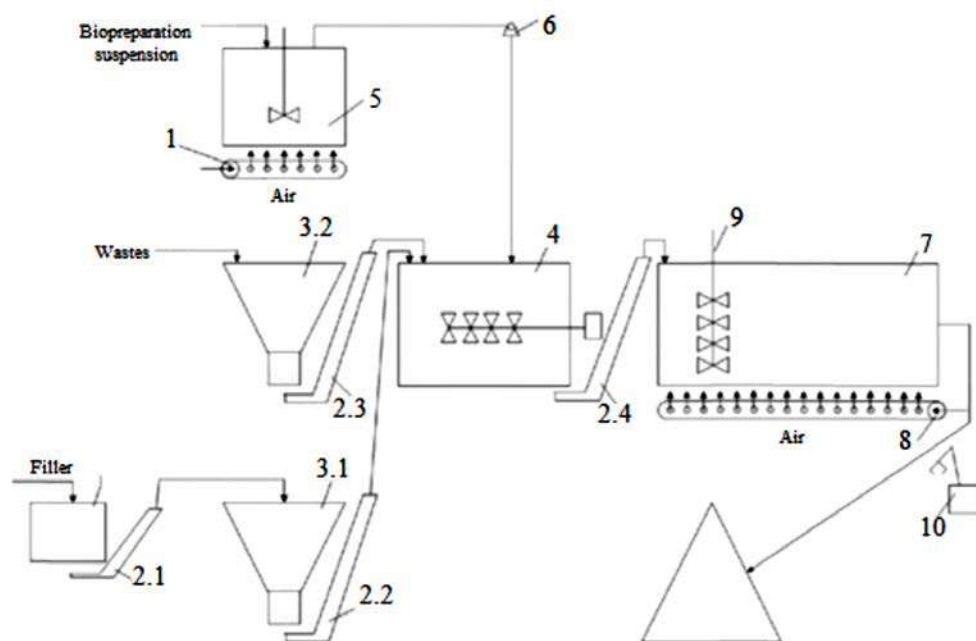


Figure 3. Technological scheme of OCW neutralization in solid-phase bioreactor: 1 – shredder; 2.1, 2.2, 2.3, 2.4 – conveyors; 3.1, 3.2 – hoppers; 4 – mixer; 5 – tank; 6 – pump; 7 – bioreactor; 8 – fan; 9 – agitator; 10 – bucket loader

The biopreparation suspension is prepared in a tank with an agitator, the bottom of which is fed with compressed air by a compressor.

Waste, organic filler and finished biological product are fed into a mechanical mixer and transferred to a solid-phase bioreactor after mixing for 20 minutes.

The solid-phase bioreactor is continuously fed with air from below during the entire process. The mixture is stirred at intervals of once every few days by a special device over the entire depth. The process is carried out until the required oil content is obtained in the neutralized medium.

Another bioremediation approach is to place the OCW on a specially constructed site and provide it with aeration, nutrients and water to stimulate the growth and metabolism of the bioremediating microorganisms. Compared to bioreactor treatment, this technology requires more space and takes more time [6].

In one of the options, oily waste is spread in a thin layer over an area specifically fenced around the perimeter to prevent the spread of contamination beyond the area. Waste is ploughed in to allow oxygen access to soil micro-organisms and substances stimulating their growth are added. Water is also sprayed over the waste to maintain optimum humidity and reduce airborne dust [7, p. 4].

OCW can also be deposited in a thick layer 1-3 m high. Aeration by ploughing is replaced by aeration by means of a pipe system that delivers air to the waste to stimulate biodegradation. Fertilisers are also added to the oily waste and humidity is maintained at a certain level.

When mixing waste with large amounts of flowable substances (hay, cornhusks, straw) aeration can be done with vacuum pumps or fans, or by mixing in special tanks. Another option is to place oily waste with flowable substance in long piles, which are

regularly agitated by tractors. After each mixing the waste is covered, which allows to maintain the required temperature and humidity [8].

Communities of Bakterium, Actinomyces, Artrobactes, Thiobacterium, Desulfotomasilium Pseudomons, Hydiomonas, Bacillus [9] and others, as well as lower forms of fungi, are commonly used for cleaning

The preparations effectively oxidize oil products, aromatic hydrocarbons in the temperature range 15 °C - 45 °C at significant initial concentrations of contaminants in the soil.

The studies of the preparation “Oleovorin” at the industrial sites of the Northern Railway showed that after 3 months the soil was cleaned by 78 %. The preparation “Putidoil” effectively cleans the ground from oil pollutions and phenol-containing sediments of sleeper plants by 90 % [10, p.51].

The bacterial preparation “Soilex” has a wider range of application: pH = 4.5-8.5, temperature 10 °C - 42 °C. After 20 days, the soil containing up to 1 % oil becomes cleaner up to by 90 % [11].

When the bacteria are fed deficiency-free, the purification efficiency is more than 90 % [12, p. 91-96].

To summarize, bioremediation is the most energy-efficient technology for the disposal of oil-contaminated soil. This method allows to remove pollutants from the soil and ground almost completely.

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IMPROVEMENT OF THE INVENTORY MANAGEMENT SYSTEM AT DNS RETAIL LLC

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Abstract. The article considers analysis of inventory at the warehouse of DNS Retail LLC. The analysis identified a number of problems and recommendations for solutions.

Keywords: logistics, warehouse, stock, inventory, goods.

СОВЕРШЕНСТВОВАНИЕ СИСТЕМЫ УПРАВЛЕНИЯ ЗАПАСАМИ В ООО «ДНС РИТЕЙЛ»

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Аннотация. В статье рассматривается анализ товарных запасов на складе ООО "ДНС РИТЕЙЛ". В результате анализа выявлен ряд проблем и даны рекомендации по их решению.

Ключевые слова: логистика, склад, запас, товарные запасы, товар.

Improving inventory management is a hot topic in many organizations today. Every business is trying to improve its operations and reduce its costs. Improving the inventory management system comes at the cost of allocating its resources intelligently and benchmarking them. Inventories are material products waiting to enter the process of productive or personal consumption, or of sales. It is a form of material flow with a velocity of movement equal to zero [1, p. 13]. Lukinsky puts it this way: "Inventories are industrial and technical products, commodities and other inventories in various stages of production and circulation, waiting to enter the process of production consumption, transportation (shipment) or sale (final consumption) [2, p. 167].

The aim of inventory management can be formulated as follows: to determine the number of items and the volume of goods in stock and their proper allocation for a smooth turnover process.

Management tasks can include:

- Identification of consumption characteristics, which allows for an assessment of these characteristics in a future period;
- An assessment of possible methodological techniques and a preliminary calculation of supply characteristics;
- Agreeing delivery characteristics with the supplier. Pre-calculation - agreeing the terms of delivery with the supplier. This part of the job involves selecting a supplier and defining the terms of the contract with that supplier;
- Determining the characteristics of supplies. Knowing the specific conditions of the supplier i. e. calculating the parameters of the inventory management system [3, p. 279-280].

All trade turnover indicators (sales, inventories, receipts) are analyzed together (comprehensively), as they are closely related to each other. For example, an increase in inventories may lead to a decrease in the amount of goods sold. The increase in receipts can lead to an increase in sales or an increase in stocks, which is assessed differently in terms of competitiveness of the enterprise and the effectiveness of trade activities [4, p. 171].

In order to assess the effectiveness of inventory management, it is necessary to study inventory-rationing methods as the most relevant area in warehouse logistics. The main methods of inventory rationing are to develop ways to optimize and increase inventory sales, and to determine the optimal level of inventory to keep in stock by analyzing the current state of inventory.

The main methods of reducing inventory costs:

- Inventory optimization using a computer system that performs volume-based ABC analysis and automatically calculates optimum order quantities
- inventory shrinkage
- dividing inventories into demand groups and managing them;
- reducing and optimising the cost of inventory, management, transport, service;
- increasing the accuracy of demand forecasting.

The right inventory management model allows you to keep a minimum of financial resources in stock without compromising the satisfaction of demand [5, p. 111].

Nevertheless, each company develops its own methods for measuring the effectiveness of its logistics performance, taking the most effective ones as a basis and adapting them to its own needs and requirements.

The object of the study is DNS Retail LLC. The subject of the study is inventories. The purpose of the study is to improve the inventory management system of DNS Retail LLC.

In order to understand what problems, the company may be experiencing, we need to analyse the inventory management system at DNS Retail LLC. Table 1 shows sales dynamics by quarters.

Table 1 – Dynamics of sales, works and services of DNS Retail LLC by quarters

Period	Years					
	2019		2020		2021	
	RUB th.	s.w., %	RUB th.	s.w., %	RUB th.	s.w., %
I quarter	16 562	24,3	23 347	31,31	24 361	23,24
II quarter	12 351	18,11	10 369	13,91	17 566	16,75
III quarter	18 327	26,88	19 164	25,7	29 327	27,97
IV quarter	20 942	30,71	21 679	29,08	33 588	32,04
TOTAL	68 182	100,0	74 559	100,0	104 842	100,0

Based on our analysis, we can conclude that the most profitable quarter in 2019 and 2021 was the 4th quarter. This is explained by the seasonality of sales, as at the end of the year people often take appliances as gifts, and in the second quarter demand decreases, because many people go on holiday and appliances are needed less by customers at that time.

It is also necessary to analyse the structure and dynamics of average inventory of these commodity groups.

Table 2 – Structure of stock of goods of DNS Retail LLC for 2019-2021 th. rub.

Category	2019	s.w., %	2020	s.w., %	2021	s.w., %
Refrigerators	8280	20,43	9650	19,74	10364	18,91
TVs	12960	31,98	15640	31,99	17630	32,16
PCS	2400	5,92	3600	7,36	4800	8,76
PC monitors	1920	4,74	2700	5,52	3100	5,65
Washing machines	7650	18,87	8340	17,06	9020	16,46
Ovens	3744	9,24	4630	9,47	4920	8,98
Vacuum Cleaners	1800	4,44	2310	4,72	2700	4,93
Electric kettles	270	0,67	360	0,74	410	0,75
Ovens	540	1,33	620	1,27	700	1,28
Microwave ovens	480	1,18	530	1,08	580	1,06
Hairdryers, straighteners	480	1,18	515	1,05	580	1,06
TOTAL	40524	100	48895	100	54804	100

The following conclusions can be drawn from this analysis:

1. In the categories of refrigerators, washing machines, microwave ovens, demand is fading
2. In the categories of ovens, irons, hairdryers and irons, demand has not changed much over the three years.
3. The categories of electric kettles, TVs, PCs, PC monitors and hoovers show an uneven rise in demand.

The following is an analysis of the dynamics of average inventories by group, based on growth rates.

Table 3 – Growth rate of average inventories of DNS Retail LLC for 2019-2021, %

<i>Category</i>	<i>2020/2019</i>	<i>2021/2020</i>	<i>2021/2019</i>
Refrigerators	16	7	25
TVs	20	12	36
PCS	50	33	100
PC monitors	40	14	61
Washing machines	9	8	17
Ovens	23	6	31
Vacuum Cleaners	28	16	50
Electric kettles	33	13	51
Ovens	14	12	29
Microwave ovens	10	9	20
Hairdryers, straighteners	7	12	20
TOTAL	20	12	35

The efficiency of inventory management can be judged by the turnover rate.

Table 4 – Inventory turnover of DNS Retail LLC in 2019-2020

<i>Indicator</i>	<i>Changes</i>			
	<i>2019</i>	<i>2020</i>	<i>2020/2019</i>	
			<i>amount</i>	<i>%</i>
Revenue from sales,	59230	74761	15531	26
RUR thous.	14700	24707	10007	68
Costs, thousand rub.	44530	50054	5524	12
Profit from sales, RUR thous.	40524	48895	8371	20
Average inventory, thousand rub.	1,4	1,5	0,1	7
Turnover of inventories, turnover	257,1	225	-32,1	-12
Duration of one turnover, days	157,6	217,3	59,7	37

The following conclusions can be drawn from the data in table 4:

1. Sales revenues increased by 26 % in 2020, indicating the saleability of the product; costs also increased. This could be the impact of more expenditure on coronavirus protection, which started in the spring of 2020;

2. However, profit on sales is also increased despite the large number of expenses; inventories, as well as their turnover, also increased. They are increased by 20 % and 7 % respectively

3. Average daily turnover is increased by 37 %, indicating an increased consumer desire to buy;

The only indicator that has decreased is the duration per turnover. This is a good prognosis for the company, because the less a product is on the shelf, the faster it will make a profit.

In order to understand the current state of the warehouse, an ABC analysis

should be carried out.

Table 5 – ABC analysis of DNS Retail LLC

1	2	3	4	5
<i>Category</i>	<i>Revenue per day, th. rub</i>	<i>Share, %</i>	<i>Share on an accrual basis, %</i>	<i>Group</i>
Refrigerators	142,547	29,27	29,27	A
TVs	119,998	24,64	53,91	A
1	2	3	4	5
PCS	71,998	14,78	68,69	A
PC monitors	59,998	12,32	81,01	B
Washing machines	34,998	7,18	88,19	B
Ovens	19,999	4,1	92,29	B
Vacuum Cleaners	12,997	2,67	94,95	B
Electric kettles	7,497	1,54	96,5	C
Ovens	6,998	1,44	97,94	C
Microwave ovens	4,999	1,02	98,96	C
Hairdryers, straighteners	4,998	1,02	99,98	C
TOTAL	487,027	100	–	–

According to the results of this analysis, the product categories of smartphones and televisions should be assigned to group A, as the most popular and most purchased goods on a daily basis.

Group "B" includes refrigerators and other large household appliances. This group includes gas cookers, washing machines, ovens, dishwashers, etc. These products are wrapped in bubble wrap for transport.

Group "C" includes small appliances and other related products. It includes electric kettles, microwaves, blenders, hairdryers, curling irons, floor scales, hoovers, irons, steamers, etc. In this group, stocking is an integral part of small appliances only merchandise sales.

Thus, ABC analysis has shown that the higher the turnover of a certain product category, the less space it takes up in the warehouse, and the lower the movement of goods, the more space it takes up in the warehouse.

Also, to better understand warehouse operations and identify any shortcomings in the organization, let's conduct an XYZ analysis.

Table 6 – XYZ analysis of DNS Retail LLC

<i>Category</i>	<i>Variation coefficient</i>	<i>Group</i>
Refrigerators	8,4	X
TVs	10	X
PCS	19	Y
PC monitors	17	Y
Washing machines	4	X
Ovens	11	Y
Vacuum Cleaners	13	Y
Electric kettles	15	Y
Ovens	7	X
Microwave ovens	5	X
Hairdryers, straighteners	4	X
TOTAL	–	–

The following conclusions can be drawn from table 6:

1. The analysis does not identify a group Z that is not predictable.
2. 6 out of 5 categories fell into group X and the remaining 5 into group Y, indicating that only slightly more than half of the commodity types are more likely to be predictable.
3. Group X contains goods which are bought every day, several models each, they are needed in everyday life of almost any buyer.
4. Group Y is an average group of goods, the demand for which can not always be predicted, but it can reveal patterns

Despite the fact that goods are sent to the Kazan warehouse and there are as it were fewer goods, their profitability still decreases.

Thus, the condition of the stock is average for such an organisation. From summary table 3, we draw the general conclusion that despite the increase in revenue, inventories are increasing, which increases the costs of maintaining them and decreases the profitability of the goods. Based on the ABC analysis, we conclude that the goods that are sold the least - lie on the shelves of the warehouse, which are also unprofitable inventories. They take up most of the stock as each model has at least one sample stock. Based on the XYZ analysis, we conclude that there are six product categories in group X that generate daily revenue, while group Y consists of five categories that could fall into group X if there is a large promotion.

The analysis of the storage space revealed a number of problems that need to be solved by the following measures:

- 1) marketing advertising to stimulate sales of stock, introducing a system of penalties and incentives for employees to be more careful with the organisation's assets;
- 2) producing a constructive and detailed report and letter from the storekeeper to the regional warehouse to settle the stock levels;
- 3) motivating employees to sell more stock instead of selling more stock at a higher cost.

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SAFE NUCLEAR REACTORS – THE FUTURE OF SUSTAINABLE ENERGY

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Abstract. The article presents the concept of introducing safe nuclear reactors that would ensure sustainable nuclear energy. The use of low-waste technologies which allow solving one of the main problems of nuclear energy – the problem of spent nuclear fuel is considered.

Keywords: safe nuclear reactor, atom, energy, lead, nuclear power plant.

БЕЗОПАСНЫЕ ЯДЕРНЫЕ РЕАКТОРЫ – БУДУЩЕЕ УСТОЙЧИВОЙ ЭНЕРГЕТИКИ

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Аннотация. В статье представлена концепция внедрения безопасных ядерных реакторов, которые бы обеспечили устойчивую атомную энергетику. Рассматривается использование малоотходных технологий, позволяющих решить одну из основных проблем атомной энергетики – проблему отработанного ядерного топлива.

Ключевые слова: безопасный ядерный реактор, атом, энергия, свинец, атомная электростанция.

Around the world, rising oil prices have led to an overall increase in the prices of manufactured goods. As a result, the cost of energy produced from various gas and carbon fuel sources has risen sharply. In this regard, in the modern world, nuclear energy has gained immense popularity – stable, cheap and environmentally friendly. However, not only the increase in the cost of oil influenced the development of nuclear energy, but also some of its advantages, which include: the possibility of reusing fuel,

reducing the greenhouse effect and the high energy intensity of radioactive fuel. Also, the construction of new stations creates additional jobs, which affects the development of the economy. These factors played a huge role in the development of nuclear power plants (NPP).

With proper construction and operation of nuclear power plants, reactors don't produce greenhouse gases during operation, and are more efficient (and safer) than wind and solar per unit of electricity. Facing steep emission reduction requirements, a variety of countries are looking to expand nuclear capacity or to begin planning for their first reactors [1].

According to the International Atomic Energy Agency (IAEA), in recent years, electricity generated by nuclear power plants has shown steady growth worldwide, with an increase of more than 13 % since 2012. There are currently 192 NPPs operating worldwide. The list of leaders is headed by the USA, France and Japan. Russia, on the other hand, ranks 8th out of 31 countries in the world that produce nuclear energy. Nuclear energy in the world is developing systematically, providing sustainable energy in producing countries [2]. France is the world leader in terms of the share of nuclear power plants in the national electricity production. Figure 1 shows the distribution of the top 15 nuclear power producers by % of electricity generation in the country [1].

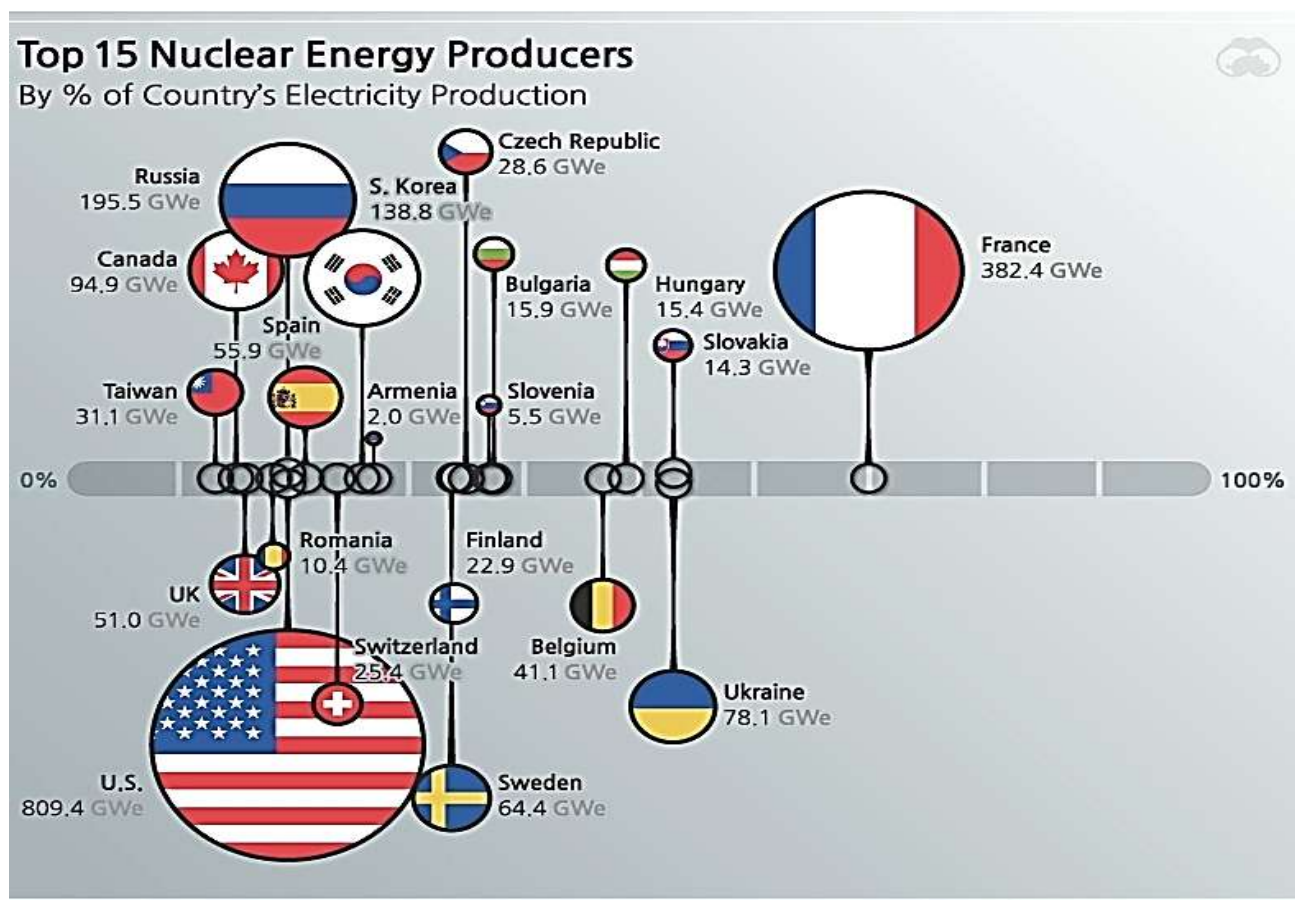


Figure 1. Top 15 Nuclear Energy producers by % of country's electricity production

However, despite the increase in nuclear power plants, it is necessary to improve the safety of their most dangerous areas. In particular, the nuclear reactor itself, in order to prevent such man-made disasters as the Chernobyl NPP, which was caused by insufficient power supply to the circular pumps and, accordingly, insufficient cooling of the reactor, which caused it to overheat and explode.

One of the most promising areas for improving safety is the introduction of 4th generation reactors. We are talking about the so-called natural safety fast reactors with a lead coolant (BREST-OD-300 – the “Proryv” project of the State Corporation Rosatom) [3]. Those nuclear reactors that are being built today for industrial use are referred to by experts as the “three plus” generation. Compared to them, the fourth generation of nuclear reactors should be safer and more efficient, and this should be achieved not through "smart" electronics and other settings, but through design features and better use of physical principles.

Theoretically, the efficiency of lead-cooled fast neutron reactors can reach 50 %, while for most nuclear installations in commercial operation in Russia, this figure is at the level of 30 %. The essence of the development lies in the manufacture of a reflector surrounding the reactor core from radiogenic lead (that is, lead with a predominant content of the lead-208 isotope). A reflector made of this material will have unique properties. First of all, it will hardly release the neutrons produced during the nuclear reaction outside the core, that is, almost all neutrons will be returned to the core. But, what is especially important, they will not be returned immediately, but after a relatively long time (due to the large atomic weight of lead-208). Therefore, the use of a reflector based on lead-208 in a fast reactor will make it possible to radically increase the average neutron lifetime by 3 orders of magnitude, which will significantly improve its nuclear safety in the event of an emergency injection of a positive reactivity of the order of magnitude and a more effective fraction of delayed neutrons into it. Indeed, transient processes in this case are much slower and manageable. This will avoid many accidents.

Also, the transition to fast reactors will solve the problem of spent nuclear fuel. New generation reactors will make it possible to process and use radioactive raw materials as efficiently as possible, dramatically reducing the amount of waste. Now, unfortunately, it is necessary to bury energetically valuable raw materials (uranium and plutonium) in the ground and build huge storage facilities for this [4].

Projects of this kind will make it possible to solve one of the main problems of nuclear energy – the closure of the nuclear fuel cycle, and ensure the use of nuclear energy for a long time to come [5].

The second technology aimed at improving reliability and safety is shown in figure 2.

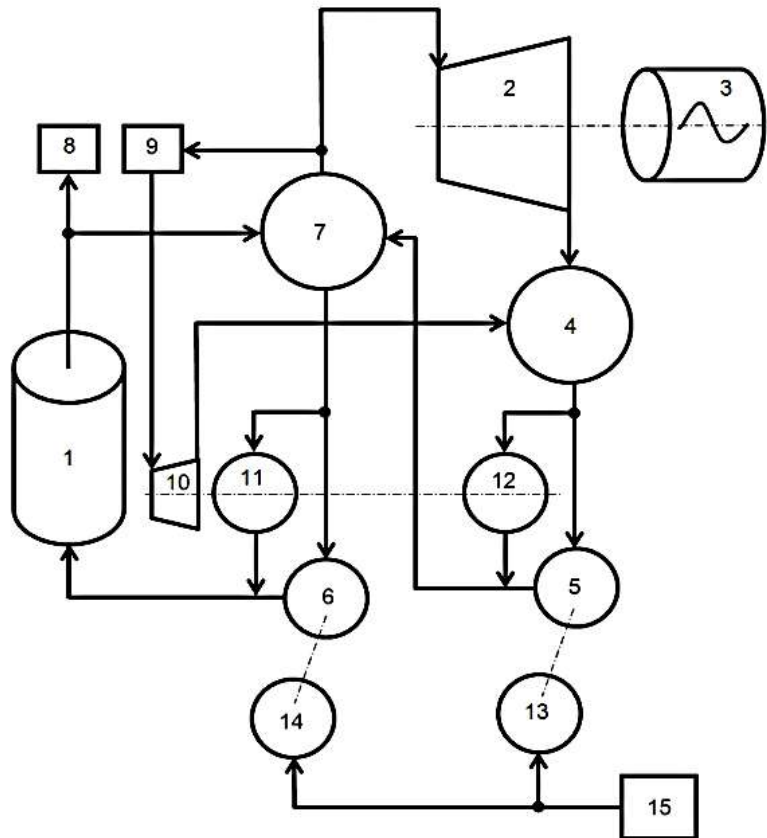


Figure 2. Scheme of NPP with increased reliability and safety

This circuit includes: reactor 1, connected by its output to volume compensator 8, and input of steam generator 7; a steam turbine 2 connected by its input to the output of the steam generator 7; an electric generator 3 connected by its shaft to the shaft of the steam turbine 2; steam generator 7, connected with one of its outputs to the input of the gearbox 9, and the other to the input of the circulation pump 6, driven by the electric motor, and the input of the circulation pump 11, driven by the pump turbine 10; with its other input, the steam generator 7 is connected to the outputs of the feed pump 5, driven by an electric motor, and the feed pump 12, driven by the pump turbine 10; the outputs of circulation pumps 6 and 11 are connected to the inlet of the reactor 1; the condenser 4 is connected by its inputs to the outlet of the steam turbine 2 and the outlet of the pump turbine 10; the output of the condenser 4 is connected to the inputs of the feed pump 5 driven by the electric motor and the feed pump 12 driven by the pump turbine 10; the output of the gearbox 9 is connected to the input of the pump turbine 10, which drives the circulation pump 11 and the feed pump 12; feed pump 5, driven by an electric motor 13; the circular pump 6 is driven by the electric motor 14; electric motors 13 and 14 are connected to power supply 15 [6].

The essence of the proposed technical solution is that the circulation pump 11 and the feed pump 12 included in the scheme of the nuclear power plant, driven by the pump turbine 10 connected through the gearbox 9 to the steam generator 7, allow the NPP to operate when the power supply to the electric drives of the circulation pump 6 is turned off and feed pump 5. Moreover, with an increase in power in the reactor 1,

the work of the circulation pump 11 and the feed pump 12 intensifies. Accordingly, the coolant supply to the reactor 1 increases, protecting it from an explosion with subsequent destruction and environmental pollution with radioactive elements.

Of course, not everything is so simple with the implementation of these tasks. While a number of questions on the physics of nuclear decay remain unresolved, it is necessary to study the possibility of shutting down and restarting the reactor, the influence of temperature effects, and the like. It will also be necessary to solve a number of technological problems, such as reliable heat removal using a liquid metal or gas coolant. The problem of structural materials for such reactors is also very difficult due to the large radiation load on structural parts. And yet, the schemes and characteristics of the discussed safe reactors listed above give reason to believe that this type of reactor can play a major role in solving energy, and at the same time, environmental problems, at least for the next thousand years.

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**STRATEGY FOR THE DEVELOPMENT OF COOPERATION
IN THE FIELD OF TRADE RELATIONS BETWEEN RUSSIA AND INDIA
IN THE CONTEXT OF CURRENT CHALLENGES OF MODERN TIMES**

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Abstract. This article is devoted to the analysis of priority areas of cooperation between Russia and India in the trade and economic sphere. Foreign economic activity is one of the main aspects in the international arena. Despite the positive indicators according to the customs service, there are a number of problems between the countries that need to be resolved in order to further increase trade turnover.

Keywords: international cooperation, trade turnover, foreign economic activity, trade and economic relations, logistics.

**СТРАТЕГИЯ РАЗВИТИЯ СОТРУДНИЧЕСТВА В ОБЛАСТИ
ТОРГОВЫХ ОТНОШЕНИЙ МЕЖДУ РОССИЕЙ И ИНДИЕЙ
В УСЛОВИЯХ АКТУАЛЬНЫХ ВЫЗОВОВ СОВРЕМЕННОСТИ**

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Аннотация. Данная статья посвящена анализу приоритетных направлений сотрудничества между Россией и Индией в торгово-экономической сфере. Внешнеэкономическая деятельность выступает одним из главных аспектов на международной арене. Несмотря на положительные показатели, по данным таможенной службы, между странами есть и ряд проблем, которые необходимо урегулировать с целью дальнейшего роста товарооборота.

Ключевые слова: международное сотрудничество, товарооборот, внешнеэкономическая деятельность, торгово-экономические отношения, логистика.

The starting point of trade cooperation between the USSR and India is considered to be the significant date of April 13, 1947. Diplomatic relations were officially established on this day. After the end of the “cold war”, the economic factor took one of the priority positions both in interstate relations and in individual countries.

In the Asia-Pacific region (APR), economic prosperity is seen as a contribution and an opportunity to preserve and maintain stability in the world.

India is considered a country with rapid economic growth. Special attention in the sphere of Russian-Indian trade relations should be paid to participation in international organizations such as: BRICS and SCO. Thanks to these unions, countries can resolve issues of an economic, political and financial nature. 75 years have passed since the beginning of cooperation between India and Russia, and more than 250 bilateral agreements have been signed between the countries. Meetings of the heads of state are held regularly, which allows us to talk about a positive aspect in connection. The “Treaty of Friendship and Cooperation between the Russian Federation and the Republic of India dated October 11, 1993” is considered to be the primary and fundamental document in the field of cooperation between both countries [1], a little later the “Declaration on Strategic Partnership” was signed [2]. The intergovernmental Russian-Indian commission on priority areas of cooperation is considered to be the main mechanism of interaction on a bilateral basis.

The Republic of India is distinguished by its potential in the field of automotive industry, high-tech technologies. Pharmacology is flourishing in the country and IT companies are being transformed. No wonder India is called the fifth economy of the world. The privatization of enterprises, the deregulation of industry and the reduction of control over investment and foreign trade – all these actions have affected economic growth in the country. Russia exports military equipment, weapons, as well as coal and oil. It is one of India's main partners in the peaceful use of nuclear energy. Military-technical cooperation is one of the highest priorities in the current geopolitical situation. Back in 2019, both states set a common goal – to increase the volume of foreign trade to thirty billion US dollars by 2025. At the meetings, Prime Minister Narendra Modi and President of the Russian Federation (RF) Vladimir Putin identified the most priority areas of cooperation: trade, nuclear energy and scientific and technical cooperation. India adheres to the policy of attracting foreign investment and new technologies. The total inflow according to the data in the period from 2020 to 2021 amounted to 58.37 billion dollars.

In connection with the implementation of anti-crisis measures that affect the financial burden of the country and its state budget, there is an urgent need to attract investment from abroad. The countries of the East are well versed in the technique and strategy of conducting economic development. The region is developing foreign markets in a special array, the structure of exports from eastern countries has also changed: manufacturing products (machine-building industries) have increased. Thus, some countries have received the status of “world exporter of engineering products”, for example, new industrial countries (NIC).

Problematic aspects can be noted in the field of logistics, since there is no land transport corridor between the countries, this greatly complicates the transit of cargo, because of this, deliveries can go in the range from 24 to 60 days, depending on the route chosen. As for oil, in 2020 an agreement was signed between the countries on exports through the port of Novorossiysk. In the future, there is a need for a land route

between India and Russia, however, this is problematic, because according to geographical conditions it is necessary to resort to agreements from third parties.

All deliveries of goods are carried out via sea and air routes, for example, “The St. Petersburg – European Port – Port of India sea” route passes about 70-80 % of the total cargo volume along this route. The “Vladivostok – Chennai” route is the most convenient, because it allows deliveries not only to the countries of the West, but also to the East. However, in terms of timing and financing, this trajectory of cargo dispatch is costly and long. In this regard, the Russian transit route is inferior in terms of the number of deliveries from Qatar and Oceania to India.

Russia agrees to deals and major contracts with Indian companies. This includes the reconstruction of industrial facilities that were built before the collapse of the USSR and the construction of modern and new centers. It is impossible not to note certain problems in the field of crediting supplies from Russia to the South Asian country. This can be explained by the fact that propaganda activities were curtailed in India by the forces of the Russian Federation.

At the moment, India is increasingly adhering to cooperation with Russia rather than with the United States and is afraid of sanctions from Western countries. According to the Indian newspaper The Tribune, “India does not intend to reduce dependence on Russian oil and fertilizers” [3]. This suggests that India and Russia intend to continue to cooperate in the field of economics and finance.

The outbreak of coronavirus infection left a serious imprint on the life of any state, it was not only a powerful blow to the economy, but also to the social sphere of activity. Lockdowns have been introduced in many countries to reduce the risks of morbidity around the world. The most affected countries are the Caribbean and Latin America, according to statistics from the World Bank. Countries facing a growing crisis have begun to take measures to overcome the consequences of the pandemic, this applies to the energy, automotive and tourism industries, Russia and India are no exception. In India, the consequences of the coronavirus were expressed in the following parameters: the decline in industrial activity, the growth of unemployment and migration of the population. For the most part, the prevailing part of the population from the service sector moved from small settlements and villages to megacities in order to earn more. Accordingly, then the borders were closed, many Indians found themselves without means of livelihood. To the question of cooperation between Russia and India, it should be added that after the pandemic, promising areas have emerged, for example, the digitalization of healthcare and medicine systems.

The government's policy on the recovery of the country's economy from the crisis contributes to the improvement of forecasts for the stabilization of the economic situation in India. The “Make in India” program was launched in India [4], aimed at improving all sectors of the economy. Measures have also been taken to improve the field of education, for the most part it concerns distance learning. All these measures have been included in the list to support the economy by the Government of India. If we analyze international cooperation at the moment and in the long term, we can say

with confidence that every year Russia and India are only getting closer to each other, and already represent an interdependent relationship that is almost impossible to break.

Based on the current situation in the sphere of foreign economic activity of the Russian Federation, a crisis situation has emerged in terms of cooperation with “unfriendly” countries. According to the customs service [5], the foreign trade sector of the Russian Federation has increased in exports and imports with friendly countries several times. The list includes countries in Europe, Asia, Africa, America and Oceania. Considering the statistical data of India in the economic sector, it is worth noting a positive balance according to data for 2020 and 2021. As a percentage, there is an increase in trade relations between Russia and India: for exports – an increase of 36.5 %; for imports – an increase of 21.8 %. Which indicates a positive growth rate of trade turnover. Quarterly reports for 2022 were not posted on official websites, so it is only possible to predict further prospects and problems of cooperation in the field of trade. The total annual turnover can be traced only in 2023. India is not among the top-10 major buying countries. However, there is a positive trend. Exports of goods from Russia exceed imports, which indicates a trade surplus.

Thus, in the future, it is possible to predict positive growth rates and development of cooperation in the field of trade relations between Russia and India. According to the statistics of the customs service, it is possible to note a positive trajectory of development of relations between the countries since 2015. Despite the current crisis after the COVID-19 pandemic and the geopolitical restructuring in the world, it is worth counting on multiplicative effects in the trade and economic sector by mutual agreement of India and Russia. As one of the tasks facing the Russian Federation is the assessment and analysis of production in the regions of the country, due to this it will be possible to identify a number of goods for import substitution. This may be not only the export of mineral raw materials, but also other items that will be of interest and importance to the Republic of India. International cooperation leads to strategic stability not only in Asia, but also throughout the world.

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INTELLIGENT PRIVATE COUNTRY HOUSE MANAGEMENT BY USING SMART HOME SYSTEM

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Abstract. The material presented in the article touches upon the issues of the possibility and necessity of implementing intelligent information systems in private country houses. It describes the improvement of comfort, safety and reduction of housing and communal costs, thanks to the use of Smart Home technology.

Keywords: energy saving, Smart Home system, security management.

ИНТЕЛЛЕКТУАЛЬНОЕ УПРАВЛЕНИЕ ЧАСТНОГО ЗАГОРОДНОГО ДОМА ЗА СЧЕТ ИСПОЛЬЗОВАНИЯ СИСТЕМЫ «УМНЫЙ ДОМ»

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Аннотация. Материал, представленный в статье, затрагивает вопросы возможности и необходимости внедрения интеллектуальных информационных систем в частные загородные дома. Описывается повышение комфортности, безопасности и снижения жилищно-коммунальных затрат, благодаря использованию технологии «Умный дом».

Ключевые слова: энергосбережение, система «Умный дом», управление безопасностью.

For centuries, mankind has been inventing new ways to make life easier, tools, mechanisms, and now the era of electronic computing machines (ECM) has dawned. Many processes have been put under the control of computers, first individual machines (machines), and then the whole production. Today, one person can control an entire plant or enterprise with the help of a computer. Production, accounting and control of energy resources are performed by computers. Developments in technology have led to the creation of Smart Home, an intelligent control system that ensures the automatic operation of all engineering networks in the house. It is possible to control

the energy system, heating, ventilation, security and other processes in a residential house by means of this technology.

The Smart Home system is a system of home devices capable of performing actions and solving certain tasks without direct human involvement (Figure 1). The concept of this system has radically changed the views on the principles of organization of life in a modern apartment or cottage house. Technical progress has made it possible to create a unified digital control system for lighting, climate, water, gas and electricity, video surveillance, access control, security and fire alarm, home cinema and multimedia system, designed for the distribution of audio and video signals in the room or outside of it.

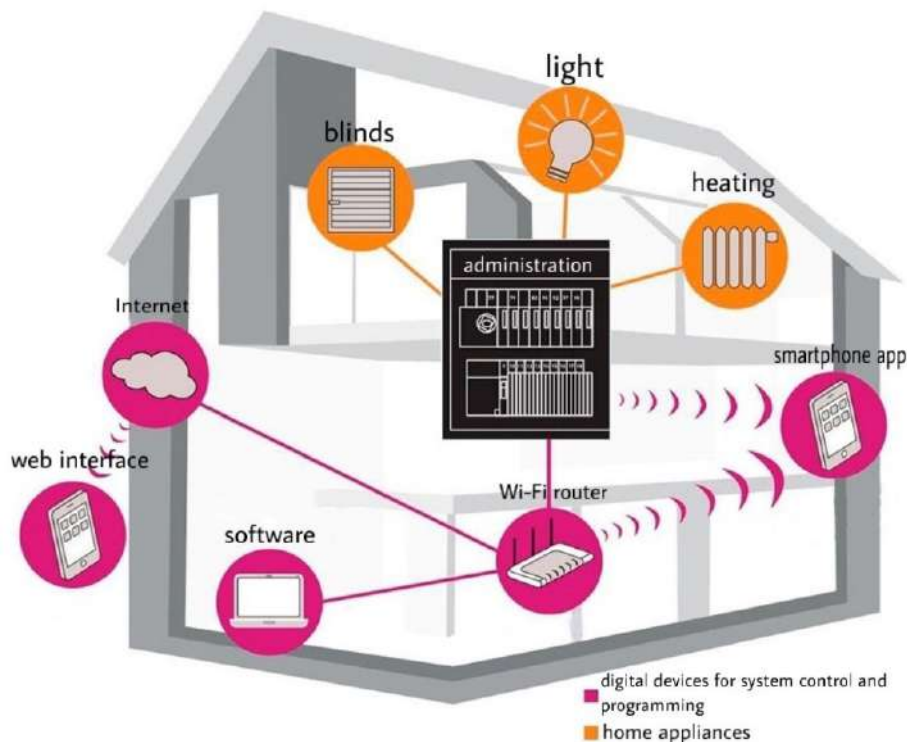


Figure 1. Possibilities of Smart Home system application in a private house

In addition to controlling the above systems and other devices that can brighten up your leisure time, the Smart Home system allows you to control complex electronic complexes designed to perform all kinds of household functions. Perhaps one of the most interesting systems in an automated building is the equipment designed to save energy, resulting in lower utility bills. Today, the introduction of this technology will save up to 30 % of energy resources.

The unique quality of this system is its flexibility: the user configures the optimal parameters for his needs, and the system optimizes the settings by minimizing the use of resources, which saves time and money for the user. The system can also be upgraded to allow the use of new devices without changing the entire system, but by replacing or adding only those devices that will give the highest efficiency.

The Smart Home system ensures the coordinated work of all appliances and prevents conflicts and inconsistencies in the work of household equipment and devices. Automation of home processes eliminates situations of irrational consumption of

energy resources. For example, the system is able to independently turn off the air conditioners when the temperature drops and the heating devices turn on, significantly reduce electricity consumption, control the use of water and gas, independently regulate the heating system.

Energy management is a function designed to improve the energy efficiency of a residential building. Rational use of resources is one of the basic principles that guide architects and engineers in the design of automated structures.

A lot of energy is used to keep rooms and apartments warm. Smart thermostats and temperature sensors can adjust to your home's heat needs. When no one is home, less heating and cooling is needed. With a smartphone, you can set the thermostat so that the heater doesn't work when no one is home, but manages to warm the room before the occupants arrive at a certain hour. These gadgets are also connected to heating and cooling systems to automatically regulate the temperature in the house and keep it at a certain level. Among the standard functions of the thermostat are automated scheduling, providing data on energy use. Such a smart device (Figure 2) can save 10-12 % on heating bills and 15 % on cooling bills.



Figure 2. Wall thermostat with remote control function

Lighting accounts for about 15 % of energy consumption in a typical home. Being able to dim your entire house or apartment is a great way to eliminate unnecessary energy consumption. A smart home system will turn on only the lights and lamps you need at the moment, adjusting their wattage at the same time. Smart lights are a simple way to save on electricity. Each such device is an LED bulb that uses 75 % less energy overall and lasts 25 times longer than conventional bulbs. Some smart bulbs (Figure 3), such as those from SberDevices, are equipped with motion sensors. They will automatically turn on and off when a person enters or leaves a room. And to avoid wasting electricity during daylight hours, they can be set to run on a schedule.



Figure 3. SberDevices smart lamp with motion and light sensors

Power consumption can also be reduced by installing smart outlets. For this purpose, you can use smart outlets (Figure 4), such as those from Xiaomi, which allow users of a smart home system to control connected devices remotely, setting all appliances to turn on and off according to an individual mode. The ability to set a timer and monitor energy consumption are important options designed to save the homeowner's budget. Setting a schedule for the most energy-intensive devices, such as electric heaters, ventilation system, will reduce electricity costs by 3-4 times.



Figure 4. Xiaomi Smart Socket

Water is also one of the most consumed resources in a residential home. Usually, a meter is installed to control the consumption of water in apartments and private houses, but even with it, the problem of saving is still relevant. Consumption of extra cubic meters is often associated with inattention to consumption or water leaks. Leak detectors can easily handle the latter problem. For example, Hidrolock sensors (Figure 5), connected to a central unit, react to an abnormal situation and promptly block the cold and hot water supply. The system reacts instantly to burst pipes, leaking faucets, overflowing water from sinks and bathtubs.

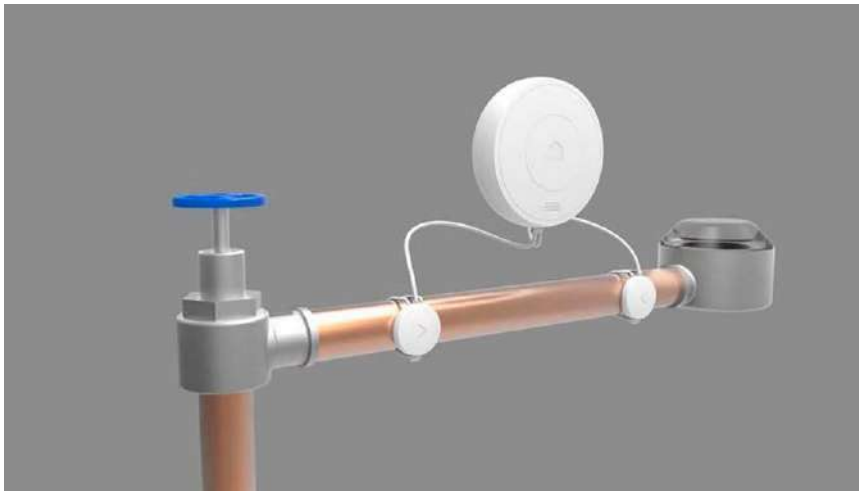


Figure 5. Wireless smart sensor for water leakage control

Another option for automatic control of water consumption are sensor faucets, such as those from Xiaomi (Figure 6), which are able to automatically turn on and off. A sensor installed on the faucet reacts to movement in a preset sensitivity zone (range from 1 to 30 cm). The sensitivity zone is set automatically or manually. The user can determine the distance at which the sensor is triggered by himself. It is also possible to set the time of water supply and shut-off from the tap or other source. The operation of "smart" taps will reduce the cost of water supply by at least 2 times.



Figure 6. Touch faucet with motion sensor

In addition to saving resources, the system is also able to take care of the safety of the households, for example, a fire in the apartment due to an iron left unattended is completely excluded.

The elements of the system are controlled via the Smart Home app installed on your smartphone (Figure 7). Some of the most popular utilities are: Mi home; SST Cloud; Phillips Hue; Panasonic Home Network; Netatmo Welcome. As part of the smart home control applications regulate the water supply, the degree of lighting, the operation of synchronized electrical appliances, the execution of a given scenario with an additional condition (you prescribe conditions for the automatic execution of the command or set a timer).

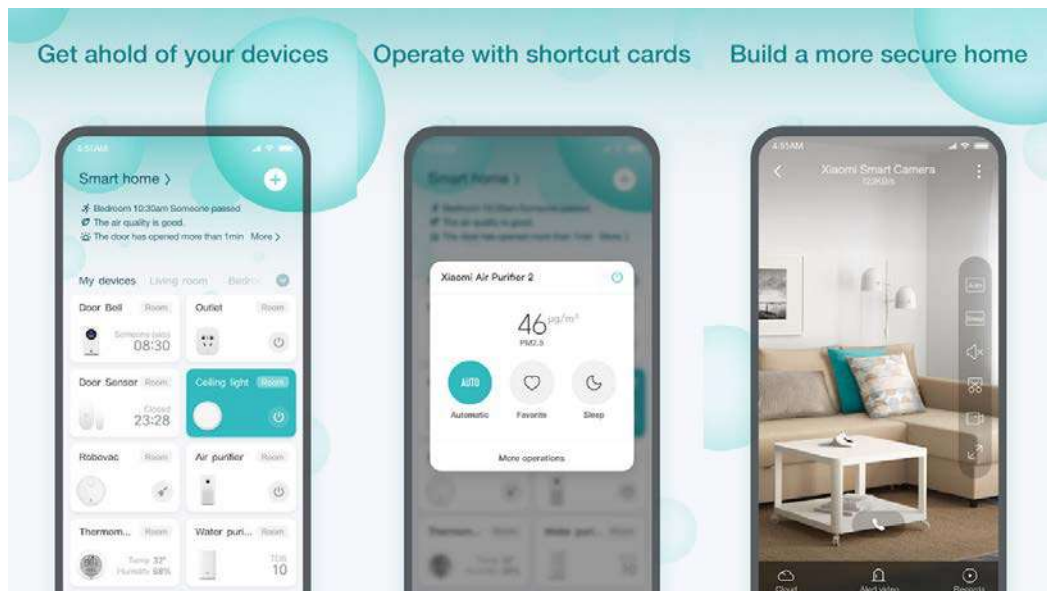


Figure 7. Application for Smart Home system management

Since 2010, the number of tech devices in people's homes has increased by 21 %, while consuming 25 % less electricity, according to a 2017 U.S. Consumer Technology Association study. The global market for smart home devices is \$78.8 billion in 2020, and is expected to grow to \$207.8 billion by 2026 (Figure 8), despite a lower market forecast in 2021 due to the effects of the pandemic.

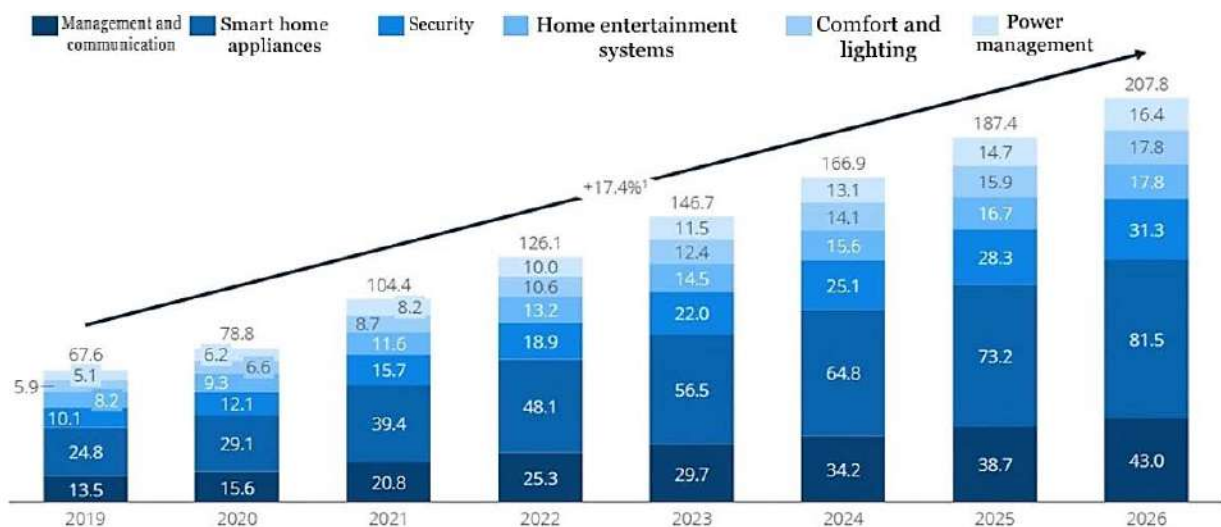


Figure 8. Smart Home systems sales market volume, 2019-2026

In general, the use of energy-saving technologies in cottages allows you to save on utility bills. Rational use of resources by increasing the efficiency of Smart Home system is exactly what modern man needs. The mass application of innovative technologies will make it possible to make not only individual private households more economical, but also entire sectors of the economy nationwide. This explains the fact that many countries welcome the construction and operation of "smart" automated structures, as well as promote the introduction of new technologies in production.

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ENVIRONMENTAL AND ECONOMIC ANALYSIS OF CHEMICAL INDUSTRY ENTERPRISES

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Abstract. This paper analyzes the existing structure of the report on sustainable development. As a result of the analysis, we have developed our own methodology to assess the environmental responsibility of enterprises by determining the amount of funds allocated to support the environment. A correlation and regression analysis was carried out to identify the relationship between shareholder value and eco-costs.

Keywords: environmental costs, environmental activities, environmental management, environmental safety, non-financial reporting, sustainability report.

ЭКОЛОГО-ЭКОНОМИЧЕСКИЙ АНАЛИЗ КОМПАНИЙ ХИМИЧЕСКОЙ ПРОМЫШЛЕННОСТИ

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Аннотация. В работе произведен анализ существующей структуры отчета об устойчивом развитии. В результате анализа разработана собственная методика, позволяющая оценить экологическую ответственность предприятий путем определения объема средств, направляемых на поддержку экологии. Для выявления взаимосвязи между стоимостью акций и эко-затратами проведен корреляционно-регрессионный анализ.

Ключевые слова: экологические затраты, природоохранная деятельность, рациональное природопользование, экологическая безопасность, нефинансовая отчетность, отчет об устойчивом развитии.

Relevance. It is known that society and nature are two interrelated elements, which are not capable of being isolated from each other, especially now, in the current context of globalization and the increasing importance of corporations in the world, when the interdependence of ecosystems and humans has rapidly increased. The peculiarity of this interaction is that in addition to the qualitative transformation of the natural environment in the direction of improving living conditions on it (growth of

cities, development of industries, etc.), serious damage is also caused to the environment by aggressive consumption of resources, which turns out to be large-scale and disastrous for all living things. This issue is becoming more and more urgent every year. Regular poisonous discharges (emissions) “poison” our earth, creating enormous risks for the environment, and if no action is taken in time to rectify this colossal problem, the entire world will face a catastrophic situation.

Industrial production has always been one of the key factors in the growth of negative human impact on nature. The search for new options for achieving success in industrial activity – not to the detriment of nature – has prompted a conscious transition to sensible consumption. Society's comprehension of the significance of this transition has become a new turn in the development of relations in the system “society-nature”.

Nowadays the most important source of information on the participation of the company in environmental activities is the reporting on sustainable development [1]. From year to year the enterprises try to expand the list of the data presented in it, making it more open. However, in practice it is not enough, and interested parties find it difficult to form an opinion about the company's participation in environmental activities [2], therefore we believe that the Russian practice of disclosure of non-financial information requires systematization and expansion, as it is an important factor motivating companies to create strategies and business models, taking into account the requests of interested parties.

Thus, the relevance of creating a methodology to assess the environmental responsibility of enterprises, by determining the amount of funds allocated to support the environment, and the analysis of relative indicators calculated on the basis of this information increases.

The purpose of the study is to develop a methodology for analyzing the environmental activities of organizations and improve the quality of its information support by substantiating the provision of additional non-financial reporting by companies on the results of their activities in the field of sustainable development.

Due to the fact that the harm caused to the environment by the commitment of industrial enterprises to the aggressive policy over a long period of time is somehow related to all aspects of modern society, we want to prove the relevance of our study by conducting a comprehensive analysis of various factors of companies' activities in the field of sustainable development and demonstrate on the example of the largest Russian chemical enterprises Akron, KuibyshevAzot, PhosAgro.

Research methods. The following research methods are used in this work:

- 1) Theoretical (analysis, synthesis, concretization, generalization, method of analogy);
- 2) Diagnosis;
- 3) Empirical (methodology of correlation and regression analysis, mathematical and statistical methods);
- 4) Experimental (forming conclusions, specific practical recommendations and suggestions).

Scientific novelty of the research. To achieve the goal, it is required to solve the following tasks, which form the main points of scientific novelty:

- priority definition of the main drivers for the implementation of a sustainable development model in Russia;
- identification of shortcomings in the existing system of providing information to stakeholders for the correct formation of conclusions about the effectiveness of environmental costs incurred by enterprises;
- development of a set of indicators to assess the environmental responsibility of enterprises and its testing on the published materials of reports on the sustainable development of organizations of the chemical industry;
- to form the directions of qualitative restructuring of non-financial reporting of enterprises in the field of ecology in order to increase both its relevance and “transparency” of companies' activities in the field of sustainable development;
- establishing a correlation between the cost of implementing environmental measures and the value of the shares of public companies.

Main results of the study. Based on the 2019 and 2020 sustainability reports published by the studied companies [3; 4; 5; 6; 7; 8], we analyzed the ratio of the amount of costs for the implementation of environmental protection measures, which showed that the growth of environmental costs does not always depend on the financial result of the company. Figure 1 shows that the enterprise KuibyshevAzot PJSC in 2019-2020 carried out significantly more expenses for environmental protection than Akron PJSC, although the net profit indicator in the years under study is higher in the latter. PhosAgro PJSC is the leader in terms of expenses among the analyzed enterprises. However, despite a significant increase in this company's profits in 2020 (growth rate of 68.11 %), the level of environmental costs remained virtually unchanged (an increase of only 10.88 %).

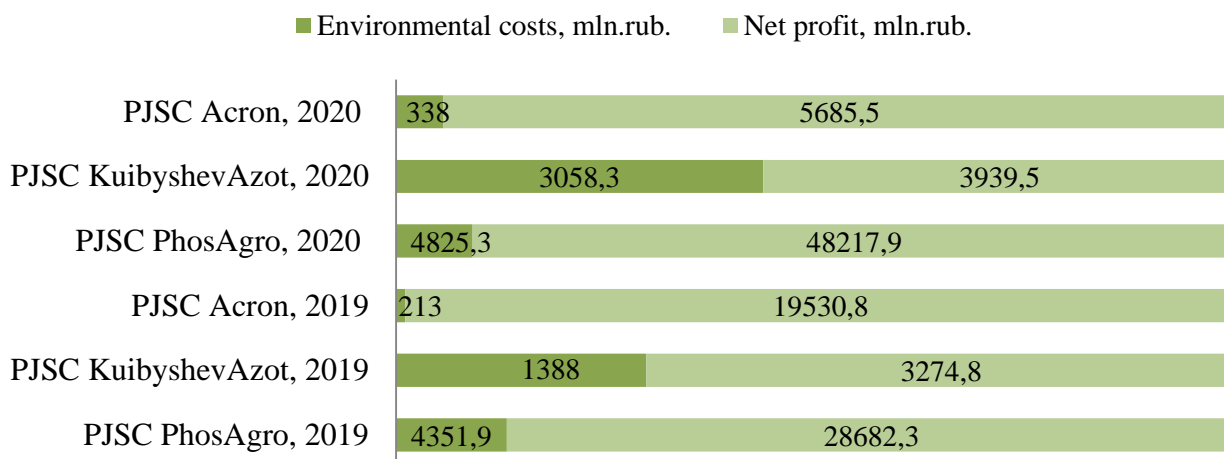


Figure 1. Ratio of net profit to environmental costs at Acron, KuibyshevAzot and PhosAgro, 2019-2020

In addition, based on the data of public reports, we can also determine the ratio of the growth rate of environmental costs and the growth of emissions in kind by enterprises. The results of the calculations are presented in table 1, reflected in the illustrative material.

Table 1 – Ratio of the growth rate of environmental costs to emissions growth, 2019-2020 [3; 4; 5; 6; 7; 8]

<i>The company</i>	<i>Indicator</i>	<i>2019</i>	<i>2020</i>	<i>Growth rate, %</i>
PJSC Acron	Emissions into the atmosphere, tons	32800	39800	121.34
	Costs of implementing environmental protection measures, mln.rub.	213	338	158.69
	Ratio of the growth rate of environmental costs to the growth rate of emissions in kind	1.31		
PJSC KuibyshevAzot	Emissions into the atmosphere, tons	4000	3368	84.20
	Costs of implementing environmental protection measures, mln.rub.	1388	3058.3	220.34
	Ratio of the growth rate of environmental costs to the growth rate of emissions in kind	2.62		
PJSC PhosAgro	Emissions into the atmosphere, tons	28874.9	30189	104.55
	Costs of implementing environmental protection measures, mln.rub.	4351.9	4825.3	110.88
	Ratio of the growth rate of environmental costs to the growth rate of emissions in kind	1.06		

Thus, the analyzed companies implement the policy aimed at reducing the negative impact of production activity on the environment, as the calculated ratios gave the result above 1. However, the environmental protection activity of KuibyshevAzot PJSC shows a more than 2-fold increase in environmental costs, which is accompanied by a corresponding decrease in emissions of harmful substances into the atmosphere by 15.80 %. In contrast, Acron and PhosAgro saw a 21.34 % and 4.55 % increase in gross pollutant emissions, respectively. But while PhosAgro compensated for the increase in emissions with a 10.88 % increase in environmental costs, Acron's environmental spending, which increased by 58.69 %, does not cover the harm caused to the environment and remains consistently low. In other words, we can conclude that there is no logical relationship between these indicators, and an increase in one of the values does not entail a consistent change in the other value in a certain direction. On this basis, it is necessary to develop the methodology in terms of the use of relative indicators in the disclosure of information by enterprises in ESG reporting. As the main it is proposed to introduce the following indicators, the results of the calculations of which are presented in table 2.

Table 2 – On the costs of KuibyshevAzot, Akron and PhosAgro for environmental protection and environmental activities, 2019-2020

<i>Indicator</i>	<i>PJSC KuibyshevAzot</i>		<i>PJSC Acron</i>		<i>PJSC PhosAgro</i>	
	<i>2019</i>	<i>2020</i>	<i>2019</i>	<i>2020</i>	<i>2019</i>	<i>2020</i>
Share of environmental costs in net profit, %	35.23	93.39	1.09	5.94	15.17	10.01
Share of environmental costs in revenue, %	2.57	6.52	0.32	0.51	16.28	7.67

Share of environmental costs in the cost of production, %	3.16	7.92	0.52	0.81	119.79	124.94
Coefficient of coverage of the average annual value of non-current assets by environmental costs	0.031	0.062	0.002	0.002	0.064	0.039
Coefficient of coverage by environmental costs of damage caused by environmental violations	0.384	0.908	0.012	0.058	0.167	0.097
Concentration coefficient of environmental costs in the total cost structure	0.028	0.065	0.004	0.007	1.198	1.249
Emission intensity of production, t/million rubles	0.074	0.072	0.489	0.599	1.080	0.480

Thanks to the calculation of these indicators an external user immediately without additional data processing is able to assess the level of environmental responsibility of enterprises, as well as their differentiation for the selection of priority companies for the purpose of subsequent cooperation with them by the stakeholders. Obviously, the enterprises of the chemical industry we analyzed are highly differentiated. For example, the net profit of KuibyshevAzot in 2020 was mainly directed exclusively to environmental activities (93.39 %), while the enterprises of Akron and PhosAgro contributed much less to environmental support (5.94 % and 10.01 % respectively). In addition, at PhosAgro PJSC, the value of this indicator in the dynamics for 2019-2020 decreased, previously amounting to 15.17 %, although the company's profit in 2020 increased significantly. Accordingly, KuibyshevAzot PJSC, covering the environmental damage almost in full by environmental costs, demonstrates itself as a more responsible enterprise, thereby occupying the leading position in the stakeholder ratings.

Let us verify in practice the theoretical arguments about the significant influence of drivers on the implementation of a sustainable business model by organizations [9]. On the example of the studied enterprises, which are public joint stock companies, we will establish the relationship between the value of their shares and the level of environmental responsibility, which is very important in today's market conditions. Due to the current situation and the withdrawal of foreign investors from stock exchanges, the enterprises are left to focus only on domestic investors. The formation of an attractive image and reputational component, as well as gaining confidence among business partners, investors (shareholders) are linked to the organized conduct of a competent environmental policy within the company itself [10].

To confirm this assumption, we will conduct a correlation and regression analysis, which will reveal the interdependence between the cost of shares (the resultant trait) and the costs aimed at implementing environmental measures (the factor trait).

Indeed, the ESG factor has a correlation with the value of shares of public companies. The resulting models are of good statistical quality, as the estimates at X are statistically significant at the 3 % significance level by the Student's test. According to Fisher's criterion the models are significant as a whole at the significance level of 3 %. In addition, the R^2 values are close to one, which indicates a good explanatory power of the models.

Let's move on to the construction of correlation fields according to the data of each of the enterprises (Figure 2; Figure 3).

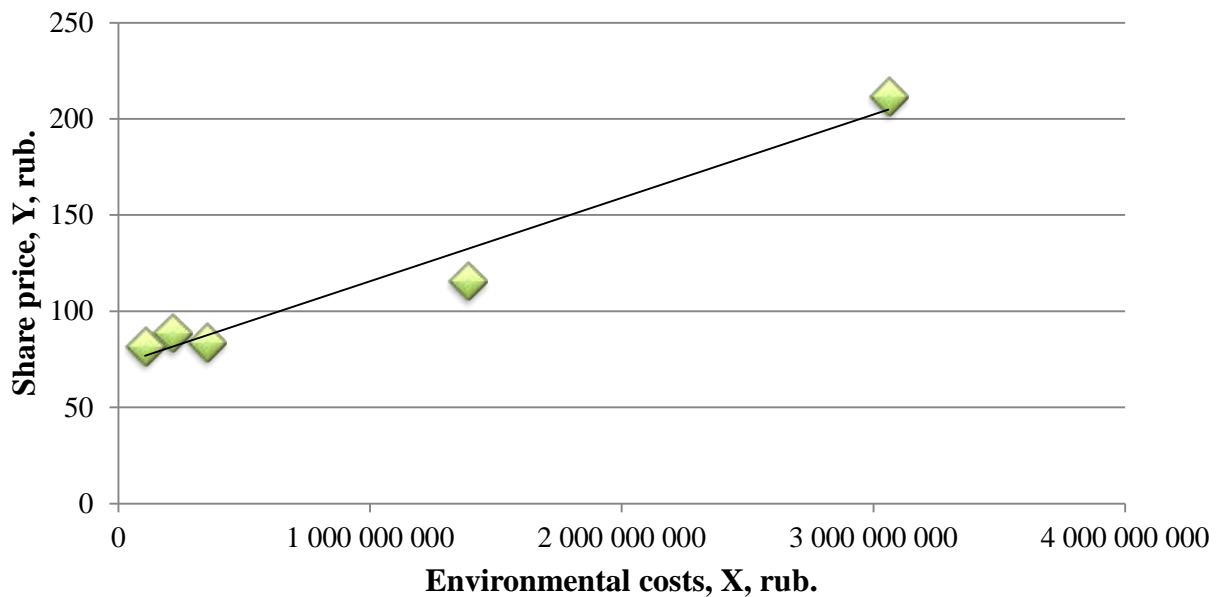


Figure 2. KuibyshevAzot PJSC correlation field

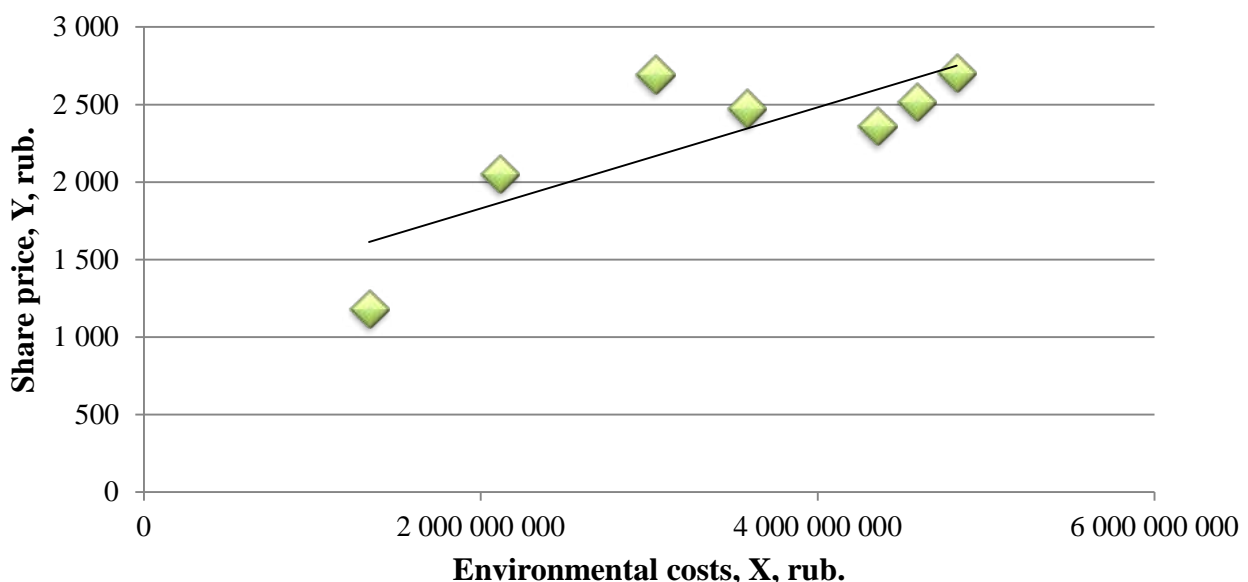


Figure 3. PhosAgro PJSC correlation field

According to the location of points on the correlation field plotted on the data of KuibyshevAzot PJSC (Figure 2), it can be seen that there is a direct almost linear relationship between the share price and the amount of costs allocated to environmental

protection. The empirical regression equation would be: $y^{\wedge}=72.22+4,34^{-8}X$. Consequently, if the environmental costs of KuibyshevAzot PJSC increase by 1 rub. $4,34^{-8}$ rubles, all other factors remaining unchanged.

Similarly, Fig. 3 traces the presence of a direct almost linear relationship between the share price and the amount of environmental costs. The empirical regression equation would be: $y^{\wedge}=1178.46+3,26^{-7}X$. Thus, we can say that if PhosAgro's environmental costs increase by 1 ruble, the share price will on average increase by $3,26^{-7}$ rubles, all other factors remaining unchanged.

So, we can establish a pattern between the two indicators, which is based on both theoretical research and practical materials of enterprises.

Thus, following the new trends in environmental and economic activities is directly in the interests of the companies themselves [11], and the methodology we have developed will increase the efficiency of the process of analysis and evaluation of the activities of enterprises in the field of ecology. One of advantages of a technique is absence of complex mathematical models and possibility of realization in information systems of the company or MS Excel.

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SOME ASPECTS OF JUVENILE DELINQUENCY: THE CAUSES OF CRIMES AND POSSIBLE WAYS OF THEIR PREVENTION

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Abstract. The article examines the reasons and conditions of crimes committed by minors; as well as the main factors leading to crimes among minors.

Keywords: juvenile delinquency, crime prevention, juvenile delinquency officers, peer influence.

НЕКОТОРЫЕ АСПЕКТЫ ПРЕСТУПНОСТИ НЕСОВЕРШЕННОЛЕТНИХ: ПРИЧИНЫ СОВЕРШЕНИЯ ПРЕСТУПЛЕНИЙ И ВОЗМОЖНЫЕ ПУТИ ИХ ПРЕСЕЧЕНИЯ

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Аннотация. В работе рассматриваются причины и условия совершения правонарушений несовершеннолетними, а также основные факторы, приводящие к совершению преступлений среди несовершеннолетних.

Ключевые слова: преступность несовершеннолетних, профилактика преступности, сотрудники по борьбе с преступностью несовершеннолетних, влияние сверстников.

The purpose of the scientific research is to identify conditions of delinquent acts and to determine the main factors leading to crimes among minors. The issue is relevant due to the fact, that the number of minors committing crimes is still large. Juvenile delinquency has traditionally attracted attention of scientists and law enforcement bodies for many reasons.

According to the Ministry of Internal Affairs, the involvement of minors in illegal activities is greater than that of adults [1]. Therefore, consideration of the causes and conditions of juvenile delinquency, prevention of this phenomenon is especially relevant today.

Juvenile delinquency is a term used to describe illegal actions by a minor. This term is broad in range and can include everything from minor violations like skipping school to more severe crimes such as burglary and violent actions.

In law, the term minor (also infant or infancy) refers to a person who is under the “age of majority” – the age at which a person is legally recognized as an adult. For instance, minors accused of criminal conduct might not be tried or charged as an adult.

Traditionally, teenagers have a great influence on negative consequences of the social crisis. Criminal minor’s behavior can show the “health” of a society. People are usually afraid of the unknown and definitely crimes. It is thought that many of the juveniles committing crimes when they are underaged will repeat the criminal action in future, when they become adults [2, p. 80].

There are some special characteristics which can describe juvenile delinquency. Usually acts of juvenile delinquency are spontaneous, impulsive, and have a low detection rate. Furthermore, such crimes are motivated by self-confidence.

Comparing the juvenile delinquency with the criminal acts committed by adults, it can be seen that juvenile delinquency is characterized by a narrower range of crimes, a reduced level of felonies, as well as a low number of negligent crimes. This is largely due to the variety of social roles performed by adolescents, as well as increased latency. A number of crimes (committed at work, military crimes, a number of crimes against the family and minors, etc.), as a rule cannot be committed by minors. At the same time studies reveal striking facts concerning a high level of domestic crimes. Family members of a minor and persons belonging to his/her family microenvironment happen to be their victims.

Most minor crimes are committed in juvenile groups. 75 % of all minor cases are group offending. As part of groups, minors are founded to commit 2-2.5 times more crimes than adults. This phenomenon is associated with group behavior typical of the age. Therefore, most often they commit crimes with peers whom they spend their free time. Such groups of juveniles commit about 80 % of the total number of minor group crimes. One of the factors is peer rejection affecting the child’s ability to be socialized properly, and often leads to anti-social groups [3, p. 32].

Juvenile delinquency is also characterized by a special area prevalence. Traditionally, it was believed that juvenile delinquency is more common in the city than in rural areas. Indeed, juvenile delinquency in cities is almost 75 % [4, p. 32]. At the same time, there is a negative trend towards an outstripping increase in juvenile delinquency in villages compared to urban areas.

The most common crime among juveniles is theft (60 % of all crimes). It proves to be 20 % higher compared to adult crime. First of all, minors steal money, clothes; vehicles (motorcycles and bicycles); audio and video equipment; food; alcohol and drugs [5, p. 159].

An alarming trend is the growing involvement of minors in drug trafficking. The criminal drug addiction has increased two to three times in recent years.

One more disturbing factor should be considered. It appears that the majority of violent crimes, especially serious crimes against the life and health of citizens are committed by minors under the influence. Each fifth crime is perpetuated by juveniles while intoxicated [6, p. 116].

The risk factors for juvenile delinquency are usually categorized into four groups: individual, family, peer, school and community.

Individual risk and protective factors are defined as an individual's genetic, emotional, cognitive, physical and social characteristics.

Family risk factors include lack of parental supervision, family violence, divorce, and others.

Peer factors are associated with deviant peers and peer rejection.

School and community factors: includes poor school performance, low-income household, low academic aspirations, access to weapons, neighborhood disadvantage, etc. [6, p. 116].

Despite the fact of the increasing crimes with the use of weapons and under the influence, it is important to point out that the data has shown the decrease in juvenile delinquency. Table shows the comparison of juvenile delinquency indicators from 2020 to 2022 [1].

Table – Comparison of the juvenile delinquency rate from 2020 to 2022

		January – September 2020	January – September 2021	January – September 2022
Juveniles committed crimes	throughout the country	24572	1227	19379
	in Leningrad region	233	201	181

We believe that this tendency is due to the improvement of measures taken by the government as well as the effectiveness of the work of special juvenile officers of law enforcement bodies on the other. Juvenile police officers are often selected and trained to communicate with young people, deal with relevant legal issues and are sensitive to the special needs of young offenders.

The prevention of juvenile delinquency is carried out in differently and in different directions in relation to various children and adolescents. It is characterized by a significant variety of educational, preventive and special punitive measures. These measures are aimed at preventing illegal behavior among minors: to deter their criminal activities, as well as to prevent the possibility of recidivism. First of all, it is the result of purposeful work with difficult families, where parental abuse or neglect can be seen, purposeful work at school, labor education of minors, organization of their leisure time, as well as some improvement in the effectiveness of police juvenile units performing work with juveniles.

It is important to say that nowadays there is a good tendency in juvenile delinquency prevention. The research has shown that due to work of special crime officers in juvenile units of Ministry of Internal Affairs, work of psychologists and increasing effectiveness of social organizations level of juvenile delinquency has dropped in comparison with previous years.

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DEVELOPMENT OF A DIGITAL MODEL TO IDENTIFY THE MOVEMENTS OF THE PROCESS OPERATOR

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Abstract. The paper presents a study aimed at creating a digital model for a system of automated monitoring of quality control of technological processes based on soft computing by machine vision methods. The main problem is the control and monitoring of operators in technological processes, and monitoring the condition of technological equipment.

Keywords: quality control monitoring, working time accounting, automated monitoring, technological processes, monitoring system.

РАЗРАБОТКА ЦИФРОВОЙ МОДЕЛИ ДЛЯ ИДЕНТИФИКАЦИИ ДВИЖЕНИЙ ОПЕРАТОРА ТЕХНОЛОГИЧЕСКОГО ПРОЦЕССА

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Аннотация. В работе представлено исследование, направленное на создание цифровой модели для системы автоматизированного мониторинга за контролем качества технологических процессов, базирующихся на мягких вычислениях методами машинного зрения. Основной проблемой является контроль и мониторинг операторов в технологических процессах и контроль состояния технологического оборудования.

Ключевые слова: мониторинг контроля качества, учет рабочего времени, автоматизированный мониторинг, технологические процессы, система мониторинга.

Introduction. Automation of mass production processes is widely present in the modern industrial sector, but the share of human participation remains unchanged. The classical tasks of timekeeping and equalization of capacity utilization have evolved and the tasks of creating synchronized production meet the challenge of the new reality and fully comply with the provision of the national project "Labor Productivity" to ensure the formation of a new production culture in the Russian Federation [1]. Synchronization of production processes, with the participation of a greater proportion of the labor intensity of human labor performed routine operations, depends on the degree of influence of the human factor. Approaches are needed to create new disciplinary approaches in the field of digital control of the actions of operators of

technological equipment, the creation of a behavioral model of the operator of technological equipment and recommendations for ensuring the quality of technological processes of production systems in order to increase overall productivity and corporate production culture [2; 3].

Materials and Methods. To date, there is no ready-made software that would allow us to find a systematic approach to managing the technological processes of production systems that take into account costs, process parameters, operator fatigue, excessive part processing, etc. Thus, there is a need to research and develop a systematic approach for automated monitoring of quality control of technological processes in the "man – equipment" system by soft computing models using machine vision methods.

Examining the operator-equipment-process-product system (Figure 1) in multi-nomenclature production, it is necessary to control not only the main processes, but also the time cycles of technological readjustment operations, and other processes that do not create significance for the end user, but are necessary to create production value. Monitoring of the production and organizational problem identified above should be carried out using lean production methods, such as: timekeeping of working hours, mapping of the technological flow, identification of 3M (Muda, Mura, Muri) [4].

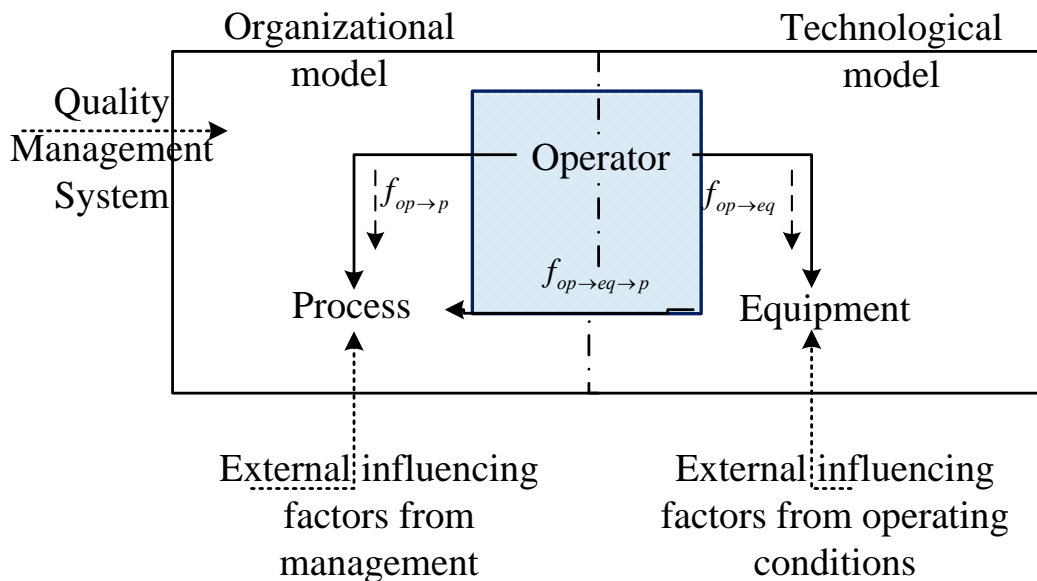


Figure 1. Organizational and technological efficiency

The existing control systems of the system elements in Figure 1 are scattered and do not correlate with each other. In such conditions, timekeeping accounting methods are reduced to manual registration and updating of existing technological modes of production systems, locally for the organization [5]. The proposed solution is an automated model aimed at comprehensive monitoring of manual and semi-mechanized operations using technical vision (Figure 2).

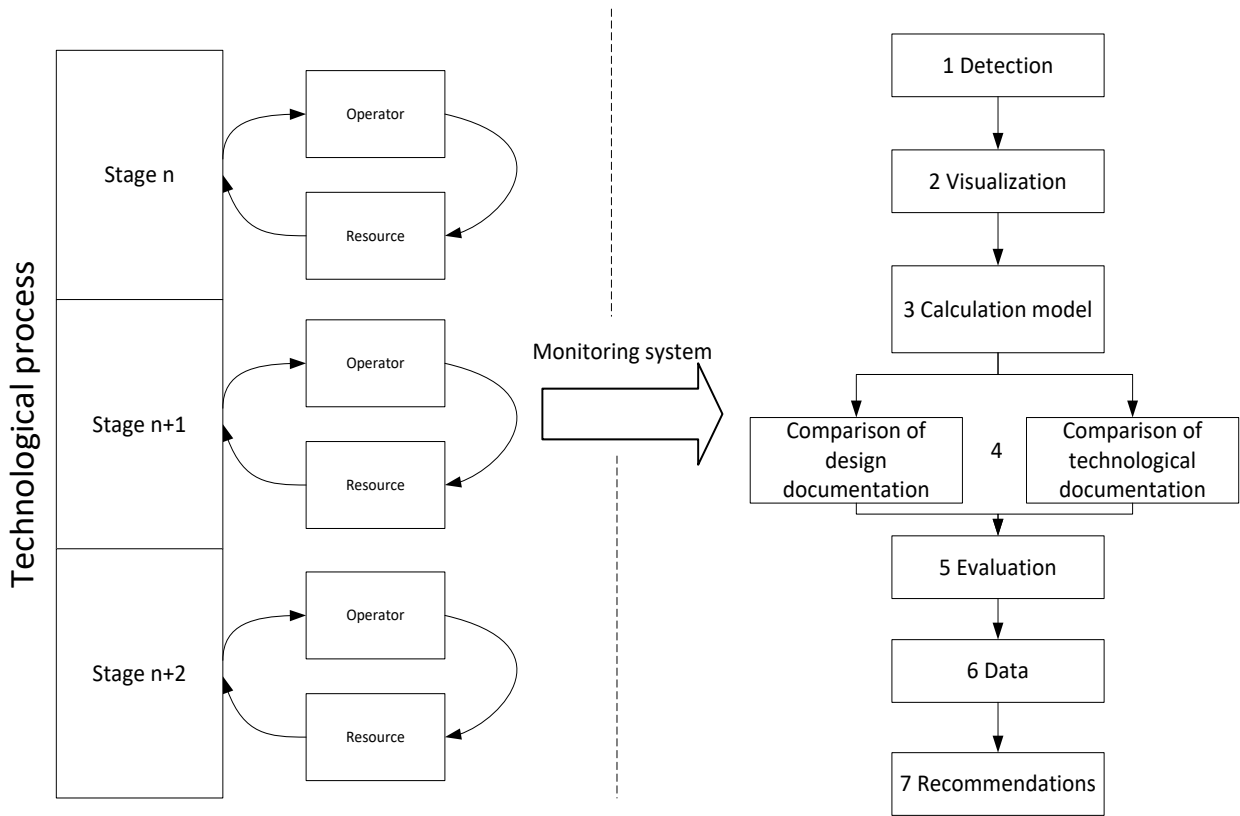


Figure 2. Organizational monitoring system

The assessment of the technological process will be calculated as a complex summary parameter that takes into account each indicator of the monitoring system [6]. The model for evaluating the technological process is presented in general form:

$$(1): Q_{TP} = \begin{cases} x_{a_{1,1}} + x_{a_{1,2}} + x_{a_{1,3}} + \dots + x_{a_{1,n}} \\ x_{g_{2,1}} + x_{g_{2,2}} + x_{g_{2,3}} + \dots + x_{g_{2,n}} \\ x_{p_{3,1}} + x_{p_{3,2}} + x_{p_{3,3}} + \dots + x_{p_{3,n}} \\ x_{d_{4,1}} + x_{d_{4,2}} + x_{d_{4,3}} + \dots + x_{d_{4,n}} \\ x_{q_{5,1}} + x_{q_{5,2}} + x_{q_{5,3}} + \dots + x_{q_{5,n}} \\ x_{k_{6,1}} + x_{k_{6,2}} + x_{k_{6,3}} + \dots + x_{k_{6,n}} \end{cases}, \quad (1)$$

$$x_{i_{m,n}}(y; z)$$

where $X_{i_{m,n}}$ – is the estimated parameter of the monitoring system, y – is the quality level, z – are resources.

Results. The developed digital model for the identification of the operator's movements, based on machine vision methods, will allow, based on contour visualization, to establish the working radius of the operator's movements and their sequence of corresponding technological documentation in the implementation of technological operations. The main difference from the known control models is the use of an optical hardware and software complex for remote recording of the timing of technological operations and identification of incorrect operator actions.

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FORMATION OF CREATIVITY IN THE CONTEXT OF SOCIO-PSYCHOLOGICAL ADAPTATION

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Abstract. This paper discusses ways of creativity formation in the context of socio-psychological adaptation. Being in a creative learning environment helps children develop physically, socially, emotionally and cognitively. Creative opportunities stimulate the curiosity, creativity and imagination of children and contribute to the development of communication skills.

Keywords: formation, creativity, development, psychology.

ФОРМИРОВАНИЕ КРЕАТИВНОСТИ В КОНТЕКСТЕ СОЦИАЛЬНО-ПСИХОЛОГИЧЕСКОЙ АДАПТАЦИИ

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Аннотация. В данной статье рассматриваются пути формирования креативности в контексте социально-психологической адаптации. Пребывание в творческой учебной среде помогает детям развиваться физически, социально, эмоционально и когнитивно. Творческие возможности стимулируют любознательность, креативность и воображение детей, а также способствуют развитию коммуникативных навыков.

Ключевые слова: становление, креативность, развитие, психология.

When we think about creativity, we often think about creativity such as dancing, sculpture, painting and drawing, but it is also possible to be creative in a scientific way. Creative scientific research can include problem solving, testing an idea to see if it works or if it is correct, research, discovery and invention. Traditionally, it was believed that creativity is limited to a special group of "creative" people, but we can all be creative, given this opportunity. Babies and toddlers take their first steps in creative exploration from birth, when they begin to make connections and make sense of the world; they are natural explorers. Developing our creative thinking skills is widely recognized as a key skill of the 21st century. Our world is changing rapidly, and adaptation and innovation skills are becoming increasingly important. In addition, we know that babies and toddlers need nutrition to thrive and reach their potential. There

are many areas that nourish us. We need to have a balanced healthy diet, exercise, rest and sleep, social and emotional interaction and, above all, the freedom to play and develop our creativity [1, p. 97]. Being creative is good for our sense of well-being and mental health. This is true for everyone, children and adults. There is a huge amount of evidence that children learn and develop best through play, in fact, play is often called the "highest form of learning". Through the game, children and toddlers get the opportunity to develop their confidence, self-esteem, communication and attitude (or predisposition), which are crucial for learning. While they are playing, they can rely on their natural curiosity and desire to explore and make sense of the world around them. These provisions represent attitudes and behaviors such as perseverance, resilience, cooperation, and risk. They provide a foundation for learning. Thanks to the game and our support, children will naturally develop skills to develop their creativity.

There are many types of creative play offered, such as risk taking, active choice, making connections, transformation and understanding, using imagination and exploring possibilities. It was argued that the "thought of possibility" underlies all creativity in children, regardless of whether they work alone, in parallel or together with others. Opportunities are created by children (and adults) in all areas of learning, whether it's creative play, learning music and composition, cooking, brand building or writing, outdoor physical play, mathematical development, or early understanding of the world. Thinking about possibility is a means by which questions are asked and explored. One way to think about this is how children often consider the question "what if? Cognitive skills are one of our six development streams in the first five years. Creative play supports the development of cognition in several ways, basically, creative play allows children to freely explore their thoughts and feelings and find new and original ideas. The study also supports creativity as a way to develop cognitive skills. Psychologist Lev Vygotsky believed that creativity is present when making any discoveries, whether artistic, scientific or technical [2, p. 103].

Vygotsky also believed that creativity is connected with previous experience, saying: "the more a child sees, feels and experiences, the more he knows and learns, the more elements of reality he will have in his experience, and the more productive the work of his imagination will be. These highlights how creativity and cognitive skills intertwine in early childhood, how creativity supports cognition and vice versa. In support of this, more recent research by Durham University has also highlighted the importance of creativity in various aspects of development and growth, stating: Exposure to a creative learning environment helps children develop physically, socially, emotionally and cognitively. Creative opportunities stimulate the curiosity, creativity and imagination of children and support the development of communication skills; creativity helps children cope with their feelings and fears, manage their emotional states and develop positive tendencies to challenge, change and spontaneous learning." In her work on creativity with infants and children, Professor Tina Bruce suggests the idea of "cultivating" creativity, emphasizing the role of adults in supporting, not imposing ideas. This recognizes the vital role that parents and other adults can play in the early years, following the child's example as they explore and explore. Bruce argues that without sensitive interaction with children, "the emerging creative opportunities that every child has either do not develop or can be quickly

extinguished." Positive interactions allow the child to take the initiative and allow him to be responsible for his play and research. When children have a place to make their own decisions and choices, they will develop creative abilities. It can be difficult not to intervene with a warning word or advice, but children need the freedom to take risks and make mistakes. There is often a dilemma between structure and freedom, which is individual for each parent and child. The balance may lie in careful observation and reflection, and often subject to adjusting your interactions according to your child's reactions. It's a learning curve for everyone.

When we think about encouraging creativity, we are really talking about encouraging the thinking skills that lead us in the direction of creativity. These skills are creative thinking skills (essentially generating ideas) and critical thinking skills (Thinking when children analyze and reflect on what they are experiencing). Collaborative communication can be important for their development as part of a collaborative process, supporting children to keep them flowing and enthusiastic. Not focusing on the final product, but noting your child's ideas and interacting with him through "open" questions as they are studied, new opportunities open up. For example, "what do you notice..?" and "I wonder if there are other ways to do this...". This approach helps them to notice and develop their thinking. Unplanned time can be a catalyst for more creativity. Fewer plans leave more free time for unplanned tasks. Walking around the world with babies and children can lead to creative moments, and simple things can trigger ideas and lead to creative surprises. Slowing down, embracing the vacuum and exiting the program allow ideas to boil and flourish.

Nature can be a wonderful source of inspiration for children's creative research. It is a changing landscape that offers many opportunities to explore, play with shadows, create with natural free parts, or explore and experiment with sand, water and mud. This is a great way to relax and notice, and connect with nature, clouds, birds, insects, new shoots and leaves. Older children can draw, take pictures, or collect some of the things they see, and this can inspire further research [3, p. 55]. Exploring the natural world is a great way to contribute to problem solving and creative play. Your child can use outdoor resources to explore, mark-make (creating models and shapes), negotiate with pebbles, or even create a habitat for the creatures they see in the garden with the things they find.

Bulk parts are simply collections of objects that can be moved and combined temporarily. There is no predetermined way to play with them, instead the possibilities of how they are used are open and determined by the child. Encourage your child to go on a journey to search and collect by choosing things they like, and from this they can create a collection. For example, pebbles, sticks, buttons, wooden blocks, fabrics, lids, containers, etc.

Offer your baby or toddler several supports for marking on different surfaces and at different scales. Children often appreciate the sensory and physical aspects of marking. Marking outdoors is also a lot of fun and offers several possibilities. For example, children can draw whirlpools in the sand or earth with their fingers. When children get older, drawing is an opportunity for children to present their thoughts and ideas and "put them on paper" in an open way. In this way, they can make their thoughts and ideas visible, which will help you understand their thinking and interact with it.

You may notice emerging topics in these brands that you can talk about together, such as fences or mapping. Creative and pretend play engages children creatively. It is often self-managed and self-managed, following the interests and experiences of the children. It's a lot of fun to support the game by taking on a role and adding props. For example, if children are interested in animals, you can suggest collecting toy animals and playing together with veterinarians. However, it is important to let the child lead the game and decide which direction it will follow, tempting even if it may be to take over! More open play and creative thinking can be triggered by providing a number of "open" objects, allowing children to create their own "whatever they want" game. It can be anything from old cardboard boxes, simple rolls of old wallpaper and old pieces of fabric. It is important to recognize the crucial role in the development of early childhood. Support for games should be integrated into early childhood development programs. For example, healthcare professionals may be trained to interact with a child by giving a vaccine, or to check and offer parents information about the benefits of the game.

Support is crucial to help parents and carers understand how important play is to children and give them ideas on how to work with what they have. For example, simple household items such as cups and spoons can serve as toys. Play is a defining characteristic of human development: the impulse is built into us and cannot be suppressed. It is extremely important that we realize that, although the gaming impulse is one thing, understanding the nuts and bolts of the game is actually not always so natural and may require careful improvement. That's why the play approach involves learning initiated by children and learning supported by teachers. The teacher encourages the learning and questioning of children through interactions aimed at expanding their thinking to higher levels. There are other fundamental thinkers who have built Piaget theories that support this; educators such as Montessori and Stanley Greenspan have recognized that the way a child is taught is in their own interests, and have developed specific strategies for this. For example, while children are playing with blocks, the teacher may ask questions that encourage problem solving, prediction, and speculation. The teacher can also draw the child's attention to math, science, and literacy concepts. How high can he climb? How many blocks do you need? Can you blow up the house? Who else does it? These simple questions raise the simple stacking of blocks before applying the training. Thanks to this game, children can develop social and cognitive skills, grow up emotionally and gain the self-confidence necessary to participate in new experiences and environments [4, p. 60].

When children engage in real and imagined activities, the game can challenge children's thinking. Children learn best through first-hand experience-the game motivates, stimulates and supports children in their development of skills, concepts, language acquisition, communication skills and concentration. During the game, children use all their senses, must convey their thoughts and emotions, explore the environment and connect what they already know with new knowledge, skills and relationships. It is in the context of the game that children test new knowledge and theories. They recreate the experience to strengthen understanding. And it is here that children learn and express symbolic thinking, a necessary harbinger of literacy. The game is the first form of storytelling. And this is how children learn to negotiate with

peers, solve problems and improvise. At stake are basic social skills, such as sharing and alternating, that are learned and practiced. Children also bring their own language, customs and culture to the game. As an added bonus, they learn about their peers in the process. Participation in the game stimulates the child's desire for research and discovery. This motivates the child to master the environment, promoting concentration and concentration. It also allows the child to participate in the higher-level flexible thought processes that are considered essential for a 21st-century student. These include the processes of research, problem solving, analysis, evaluation, application of knowledge and creativity [5, p. 215]. Finally, the game supports a positive attitude towards learning. These include imagination, curiosity, enthusiasm and perseverance. The type of learning processes and skills promoted in the game cannot be reproduced using traditional learning by heart, where the emphasis is on memorizing facts.

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CHARACTERISTICS OF THE INVESTMENT CLIMATE IN REPUBLIC OF SOUTH AFRICA

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Abstract. This article is devoted to the analysis of the current state of the investment climate in Republic of South Africa (RSA). The authors highlight the advantages of the RSA's investment climate in comparison with other countries of the African continent, determine the role of transnational corporations in the investment processes in RSA.

Keywords: Republic of South Africa (RSA), the investment climate, investments, BRICS, transnational corporations.

ХАРАКТЕРИСТИКА ИНВЕСТИЦИОННОГО КЛИМАТА В ЮЖНО-АФРИКАНСКОЙ РЕСПУБЛИКЕ

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Аннотация. Статья посвящена анализу современного состояния инвестиционного климата в Южно-Африканской Республике (ЮАР). Авторы выделяют преимущества инвестиционного климата в ЮАР по сравнению с другими странами Африканского континента, определяют роль транснациональных корпораций в инвестиционных процессах в ЮАР.

Ключевые слова: Южно-Африканская Республика, инвестиционный климат, инвестиции, БРИКС, транснациональные корпорации.

One of the fundamental criteria for the economic development of a state is a favorable investment environment. Favorable investment environment is an environment that contributes to attracting investment resources in the most different ways and is aimed at their competent and efficient use. As a rule, experts identify the following main directions of the state's investment environment:

– to find and establish credible for each period of time investment volumes, as well as their structure

- to choose the right priorities
- to create a favorable investment climate
- to increase the efficiency of the investment use

In the contemporary world, states can afford to introduce the latest achievements of scientific and technological progress, increase the quantitative and qualitative indicators of economic activity and implement structural changes in the national economy thanks to the investment resources.

The relevance of the research topic is caused by the fact that today the characteristics of the investment climate in the Republic of South Africa (RSA) are quite poorly studied. That is why this topic is not fully covered in the scientific literature, but only partially. The study of the characteristics of the investment climate in South Africa remains important, because today RSA is a leading state in Africa and is becoming a bigger player in the international arena.

Various opinions of experts in the field of economics and international relations, their articles published in scientific journals, and works on the economic development of African countries, and in particular of South Africa, are presented in the article.

The investment climate characteristics in South Africa

The investment climate is interplay of socio-economic, financial, organizational and legal, geographical and political factors that determine the feasibility of investment in the economy of a country, region or company.

In comparison with other countries of Africa, the investment climate of the countries of RSA has the following advantages:

- Presence in the BRICS

Enhancement of access to global markets for RSA. Presence in the BRICS allows RSA to gain access to new technologies, to share experience with other member-states and to export more goods.

The first democratic government of South Africa, which was established in May 1994, defined large-scale foreign policy goals. Declared in speeches and statements by the leadership of the South African Foreign Ministry, those goals included:

- 1) transformation of foreign policy and security bodies, including;
- 2) training of foreign policy personnel to ensure state priorities in the field of foreign policy;
- 3) ensuring the recognition of South Africa by the world community and establishing;
- 4) relations with other states, creating a favorable image of South Africa in the world;
- 5) expansion and diversification of trade and economic relations and attraction of foreign investments;
- 6) drawing the attention of the international community to respect and observance of human rights and democracy;
- 7) promoting international security and stability (including the prevention and control of international crime);
- 8) priority of interests and development of Africa;

9) strengthening of relations between developing countries, promoting their interests in international organizations and changing relations between developing and developed countries.

The result of South Africa's entry into the BRICS was the growth of the rand against the dollar, which then quickly reached its highest level in three years. And in general, after the entry of South Africa into the BRICS, it showed the rapid growth of the country's economy as a whole, which had a positive effect on the investment climate.

– Large volumes of natural resources

Its subsoil is rich in many different valuable mineral resources such as manganese, platinum group metals, chromium, vanadium etc. For instance, there is about 90 % of world reserves of manganese in RSA [1], and in 2019 RSA was the world's largest producer and exporter of manganese ore [2]. The volumes of the exported ore were estimated at \$3,1 billion.

– Growth in consumption of the RSA people

Over the past 30 years, South Africa has seen an increase in the consumption of public goods [3]. This phenomenon can be explained mainly by two main reasons: rapid population growth and the same rapid growth in income of the population. According to the UN department of Economic and Social affairs data, the population of South Africa in 2021 is more than 60 million people [4]. This means that there are a lot of people who consume the goods.

– Large domestic market

A wide range of goods intended for the domestic market is produced on the territory of South Africa. The South African textile industry is an advanced branch of the country's economy, fully meeting the needs of South Africa in textile products and allowing it to increase exports [5]. The textile production of the RSA is developing dynamically, being a fairly capital-intensive and high-tech industry. Following the requirements of the modern market, the local textile industry is constantly expanding its range and today offers a full range of products, both from natural and synthetic fibers: non-woven and woven products, yarn and quilted products, knitwear, dyed and processed fibers and fabrics.

In spite of the fact that all these competitive advantages make RSA attractive for Foreign Direct Investment (FDI), the matter of the highest significance is that the government of RSA realizes the value and is aware of all the benefits of FDI. The government has designed a long-term plan, which implies investment attraction to the infrastructure projects in RSA in the amount of \$2,3 trillion in the next 10 years [6, p. 29]. These projects, in turn, are expected to create about 1,8 billion working places, which will have a positive impact on society.

Today the RSA government implements projects in many spheres, among which we would like to highlight the projects aimed at the transition from the use of traditional energy sources to the exploitation of renewable energy sources. On 20 October 2022 South Africa's cabinet made a statement regarding an investment plan to the energy sector. According to this plan, the government is planning to move quicker to the use of green energy. In order to aim the goal, the cabinet decided:

– to attract four crucial investors such as Red Socket SA, Mainstream Renewable Power Developments South Africa, HDF Energy South Africa and Sola Group, which conduct their activities in the field of production of electrical energy. It is expected that these companies will increase the volume of electricity on the territory of the country in size of 2000 megawatts [7].

– to build new environmentally friendly energy capacities at the investors' expense in the province Mpumalanga, where nowadays two large power stations Majuba and Tutuka are operating.

It is also worth drawing attention to the field of the investment attraction to the sphere of waste management. It is directly related to the Greater Lanseria Master Plan (GLMP), according to which the smart city is expected to be built on the territory of the RSA. Mention of such a massive project is highly relevant due to the fact that the project implies not only technological base development and the housing problem resolution but also contribution to sustainable development and enhancement of effectiveness of the policy of recycling.

From the authors' point of view, building of the smart city has a positive effect on the investment attraction activities because the project represents a project, conducted within the framework of pursued policy aimed at providing for social equality and justice. That is why it is attractive to investors. The head of the office of the Presidency investment and infrastructure Kgosientsho Ramokgopa's words confirm this. For example, he stated that the smart city building and development main goal was not to develop the technology sector but to provide for social equality [8].

The RSA government has already attracted investment to this sector in size of \$50 million that will allow it to create more than 300 working places and conduct many internships and professional retraining programs. For example, an agreement was concluded that would provide opportunities for 36 technical specialists, such as mechatronics or recycling technicians, working in an Australian company ALPLA Group. According to the RSA's cabinet, the training program will start in 2023.

The role of South African transnational corporations in the investment processes in RSA

Transnational corporations (TNCs) contribute immensely to the growth of the investment climate in RSA by making financial transactions there, launching projects in different spheres and developing local infrastructure. The authors distinguish three TNCs that stimulated the growth of investment activities in RSA in recent years. These companies are:

– Naspers

Naspers is a South African company, conducting activities in the sphere of digital and print media. Its headquarter is located in Cape Town. The company's activities are limited not only within the borders of the country, it also operates on territories of such regions like Asia, Europe and North America. According to the report of the United Nations Conference on Trade and Development (UNCTAD), the volume of foreign direct investment had increased several times and was at the level of more than \$40 billion by the end of 2021 [9].

Such a dramatic increase was seen due to the fact that the company in cooperation with Prosus (Nasper's division) carried out the Capital Restructure, during

which Nasper received almost 1130 billion shares, while Prosus acquired 197 billion shares [10]. This transaction, according to the UNCTAD report, led to this strong increase.

– FirstRand

First Rand Ltd. is a holding company that, through its subsidiaries, provides banking, insurance and investment products and services to individual, commercial, corporate and government customers. It operates through the following segments: FNB, RMB, WesBank, Aldermore, FCC and Others. The FNB (First National Bank) segment represents the Company's activities in the retail and commercial segments. The RMB (Rand Merchant Bank) segment includes the Group's activities in the Corporate and Investment Banking segments. The WesBank segment includes installment loans, fleet management and related services in the retail, commercial and corporate segments. The Aldermore segment focuses on specialty lending in the following areas: asset financing, account financing, small and medium business, commercial mortgages, residential mortgages and buy-to-let. The FCC (FirstRand Corporate Centre) and Other segment performs the functions of the entire Group, including Group Treasury, Finance, Tax, Corporate Risk Management, Conduct Risk Regulation and Management, and Internal Audit. The company was founded in February 1998 and is headquartered in Johannesburg, South Africa.

– MTN Group

It is a transnational company which operates in many states of African and Asian continents. Its headquarters are located in Johannesburg. This company specializes in the provision of telecommunication services and more than 280 million people are using their services by 2020. MTN Group is a top 8 telecommunication company and it operates in more than 20 countries, but one third of the company's revenue comes from Nigeria.

In mid-November 2021, one of the largest independent owners, operators and developers of general telecommunications infrastructure in the world in terms of the number of towers, IHS Holding Limited, signed agreements with MTN Group to acquire 5.7 thousand towers in South Africa in the amount of 6.4 billion South African rand. The deal to sell the tower infrastructure of Africa's largest mobile operator closed in the first quarter of 2022.

The proceeds from the sale will be reinvested in additional spectrum in South Africa and will also allow the MTN Group more flexibility in managing its finances. The deal provides IHS Holding Limited with access to Africa's most developed economy and additional revenue of about \$220 million in its first year of operation.

Conclusion

Thus, today the RSA investment climate does have a number of advantages such as the presence of the country in BRICS, where it can interact with superpowers like China and Russia, tremendous reserves of natural resources, the consumption growth of the RSA population and large domestic market. All of those factors contribute to the gradual increase of the volumes of attracted FDI and improvement of the investment climate itself. Moreover, it is discovered that the RSA government conducts an efficient policy in the sphere of the investment activities by launching a number of new projects.

In addition, the role of South African TNCs in the investment processes on the territory of the country was analyzed. The authors believe that TNCs favor the investment climate improvement through reinforcement of the economic influence of South Africa not only in the African region, but also in the world, bringing profits to the state and improvement of local infrastructure.

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APPLICATION OF APCS IN LEATHER RAW PRODUCTION

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Abstract. This article discusses the process of production of leather raw materials. The author provides a detailed description of this procedure with the use of automated process control systems (APCS). The need for the introduction of automated process control systems in the field of light industry is analyzed.

Keywords: automation, industry, production, functions, enterprise, system, technologies.

ПРИМЕНЕНИЕ АСУТП НА ПРОИЗВОДСТВЕ КОЖЕВЕННОГО СЫРЬЯ

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Аннотация. В данной статье рассматривается процесс производства кожевенного сырья. Автором приводится подробное описание данной процедуры с применением автоматизированных систем управления технологическими процессами (АСУТП). Анализируется необходимость внедрения АСУТП в сферу легкой промышленности.

Ключевые слова: автоматизация, промышленность, производство, функции, предприятие, система, технологии.

Automated process control systems were used at various industrial enterprises as early as the 19th century, but they received active and widespread development only in the 1950s and 60s with the advent of computers and programming. Now these systems have reached a completely different level and huge opportunities have opened up before a person, because the area of use of automated control systems was simply huge: from the simplest household tasks to use in the largest industrial complexes. To begin with, it is worth understanding the theoretical part and understanding what an automated control system is.

Automated process control systems (APCS) is a set of software and hardware designed to create automation systems for the control of technological equipment and production processes at enterprises (production automation).

In other words, it is a set of methods and tools that allow you to manage production operations with minimal human intervention. Typically, such systems are installed where the finished product is obtained at the output, and this may be the entire workshop or only part of the line. Since we are talking about automation, it is assumed that all devices will be controlled by a person, an operator.

The construction of an automated process control system involves the use of the following related blocks: automatic control elements, automated devices, process control panels and programmable logic controllers. All this works in a complex, and most of the functions for the passage of the technological process are assigned just to an automatic system that operates according to a given algorithm.

In order to automate management in light industry at a high rate, it is necessary to improve almost without interruption all available technical tools for managing in this area. It is currently characterized by the use of computers specially prepared for management and other systems of automatic control over the activities of the enterprise. They allow you to shift all responsibility from human staff to machine control, which guarantees a reduction in the frequency of failures, emergencies and the release of the highest quality products in the shortest possible time.

The purpose of this work is to study the automation of technological processes for the processing of leather raw materials, as well as to study the full cycle of its processing and familiarity with automation systems that are used in production.

Research objectives: to analyze the use of automation systems in the processing of raw hides, to explore their functions and features in this production complex, and to draw a conclusion about the importance of using automation of technological processes (ATP) in this area.

In the leather industry, a large number of high-performance machines and units of the through-type type operate, i. e., equipment that processes raw hides as they pass through it (for example, skin skinning – removing the lower layer from the skin with the remnants of fat and meat, drying and smoothing the skins, measuring area of treated skins). This creates the conditions for the widespread introduction of simple and inexpensive automatic manipulators that perform simple movements of leather from one leather finishing machine to another or when loading raw hides into equipment.

The first stage of production is the processing of hides. It is believed that the highest quality leather is made from the skins of cows (ox, calf). It is used for shoes, clothing, furniture upholstery, etc. Leather from sheep or goat skins (sheepskin, goat skin) is mainly used with hairline (like fur). Pigskin leather is elastic, but has a persistent characteristic odor, which is why it is valued lower than others. Skin from crocodile, python, stingray, ostrich and other exotic animals is used for the production of leather goods, clothes, shoes and other business lines [1, p. 78].

There is a rule that the higher the quality of the skin, the fewer stages in the technological cycle of its processing to the finished skin. The challenge in processing

skins with good face quality is usually to keep the face preserved and even emphasized. On the finished product, the natural pattern of the face is preserved – wrinkles and pores, which are present on the raw skin. By placing your palm on the surface of the skin with a natural face, you get the feeling of a natural elastic product.

The second step is dressing the skin. Dressing is one of the simplest ways of processing leather, and at the same time the most ancient of them. The production of finished leather is a rather labor-intensive and lengthy process, which consists of three main stages of leather production: soaking-ash processes, preparatory processes and tanning, chemical finishing and dyeing-greasing processes.

The modern theory of tanning considers tanning as a process consisting of a number of physical and chemical phenomena and proceeding in two stages. The first stage is the diffusion of the tanning agent into the thickness of the skin, the second is the interaction of the tanning agent with collagen molecules. In this case, both processes occur simultaneously.

To set the tannins, the skin is laid out in layers and dried. Folding (rolling) serves to equalize the thickness of the skin. Neutralization: The remaining acids in the skin are carefully neutralized with slaked lime. In subsequent processing steps, skin groups are established.

The end product of leather production is leather, i. e. the entire technological process of production is nothing more than the transformation of the skin into finished leather.

Leather (usually vegetable tanned leather) can be lubricated with certain oily substances to improve its water resistance. This increases the amount of natural fats found directly in the skin, which are washed out during the operation of leather products, which can be exposed to intense moisture. Frequent lubrication of leather products with mink oil, refined oil or similar substances will keep the leather soft and prolong the life of the product.

The technological process of leather dyeing is a complex and one of the most important stages in leather production. Even a relatively small deviation from the rigid framework of the technological process can introduce an irreparable defect into the final product.

For the study of process control systems in the leather industry, it is important to understand the stages of leather production.

APCS provides:

- 1) fully automatic operation of dyeing drums and mechanisms directly related to it; management of a chemical station responsible for the preparation and dosage of chemicals for the process; control of the block of preparation and supply of water for the process; manual process control (processing of experimental batches);
- 2) higher level of control and analysis of ongoing technological processes;
- 3) exclusion of human factors from the dosing process of chemical materials;
- 4) removal of existing restrictions on changes in the programs of technological processes.

The technological process of dyeing takes place on special equipment for dyeing, which is a wooden drum with a volume of 6 m³, installed on a fixed base and driven by an electric motor. Each drum has supply lines, a container and valves for dosing chemical reagents, a water supply line, channels for draining the spent mixture from the drum and additional control and signaling elements. The preparation and supply of water of a given temperature to the drum is carried out by a water mixer, and therefore, all drums are divided into sections of 4 pieces each. Each section is served by a separate water mixer. The automated technological process of leather dyeing can be divided into the following main components, alternating in time with each other.

The next stage is shaping, that is, dividing the skin into topographic sections. Large raw materials are subjected to shaping, the topographic sections of which are most differentiated in terms of thickness and microstructure.

Today, artificial leather (leatherette) is a high-quality and environmentally friendly material that surpasses natural leather in some respects. At the request of the customer, in terms of aesthetic appearance, artificial leather is no different from natural leather, both from the front and back sides. At the same time, it is possible to make artificial leather with a texture and color that is not characteristic of natural leather, which designers skillfully embody in their fashionable modern projects.

Nowadays, most types of leather are made from cow hides, but skins from other animals are also used. The skins of lambs and deer are used to produce soft leather, from which the most expensive clothes are sewn. Kangaroo skin is used as a raw material for the production of products that must be strong but flexible, such as leggings. Leather made from the skins of more exotic animals, in particular some types of reptiles, was very popular at one time. Products from it were considered the most beautiful and refined. For this reason, the hunting of certain species of snakes and crocodiles has become so widespread that it has put the above species of reptiles and cold-blooded animals on the brink of extinction.

Modern production uses a wide range of equipment used at various stages of leather processing.

During the production process, the skins are moved from a horizontal position to a vertical position, from a vertical position to a horizontal position, and are turned 180° in the horizontal and vertical planes. Unloading and unloading of equipment are carried out using storage platforms and trolleys. When examining and sorting the skins, they are moved in an oriented position from one storage area (or trolley) to another.

Depending on the type of skin movement, two main classes of automatic manipulators are used – specialized and universal. The former performs only one operation for loading and unloading the skins or for their orientation. They are designed to work with leathers of the same type: soft -- for the top of shoes or hard – for the bottom of shoes. These automatic manipulators structurally consist of an actuator (hand, clamp, grip), a drive mechanism and a control unit. They work according to a rigid cyclic program and are most often single-program.

Universal automatic manipulators have a large number of degrees of mobility and perform operations for loading, unloading and orienting all types of leather, placing

them on trolleys or storage areas. Robots of this class, as a rule, have two hands rigidly connected to each other with appropriate grips. The presence of two hands allows you to simultaneously perform two operations: with one hand to place the skin to be processed in the processing area of the unit, and with the other hand to take the upper skin from the accumulation platform to prepare it for loading into the equipment, or with one hand to remove the treated skin from the transport device, and the second - put the previous removed skin on the storage trolley [2, p. 104].

In general, today, almost the entire process of leather processing can be called automated, because each stage is performed by special installations with minimal human involvement. Even the smallest and simplest work is performed by a separate device. So, for example, manual and walk-through marking, grinding, carding, shearing, ironing and many other machines are used.

Longboats are the main type of equipment used in dressing skins for carrying out liquid physical and chemical processes – soaking, pickling, tanning, neutralization, dyeing, washing and other operations. Depending on the volume of dressing, various standard sizes are selected that differ in their characteristics: working volume, installed power, weight, etc. Centrifuges designed to squeeze moisture out of fur and fur sheepskins, as well as other types of fur raw materials in the process processing.

For the skinning of small and medium-sized skins (sheepskin, calf, deer skins, outgrowth, etc.), special skinning machines are used, the productivity of which can reach 400 sheepskins per hour. As for hauling and skinning, it is worth noting the use of hauling drums. They provide kneading of the skin tissue, restoring its elasticity, cleaning the surface and hair from undigested particles, dye, fat and dirt [3, p. 215].

Industrial robots used in the leather industry have two main types of grippers - tongs and vacuum.

Pincer grippers are used, as a rule, in specialized robots for gripping and laying soft and hard leathers, and vacuum grippers are used in universal robots for feeding, receiving and stacking all types of leather.

The design and principle of operation of some industrial robots used in the leather industry will be considered using specific examples [4, p. 156]. Thus, the process of processing raw hides is developing quite rapidly and more and more advanced automation systems are being introduced to facilitate the work of a person, increase the pace of production, and also make it as safe and convenient as possible for workers.

All areas of light industry use a whole range of complex technological processes to create the final product. This feature of the work of this industry makes the automation of the production process at light industry enterprises diverse and functionally very complex.

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SOCIAL NETWORKS AS A MODERN EFFECTIVE WAY OF COMMUNICATION

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Abstract. This paper describes the positive impact of using social networks as a way of communication. Social networks are also often used to promote small business, hobbies, arts, etc. There are also some examples of what social networks contain.

Keywords: social network, communication, Instagram, V Kontakte, TikTok.

СОЦИАЛЬНЫЕ СЕТИ КАК СОВРЕМЕННЫЙ ЭФФЕКТИВНЫЙ СПОСОБ КОММУНИКАЦИИ

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Аннотация. В работе рассматривается положительный аспект использования социальных сетей как способа коммуникации. Социальные сети также часто используются для продвижения малого бизнеса, хобби, искусства и т. д. В работе представлены примеры того, что содержат в себе социальные сети.

Ключевые слова: социальная сеть, общение, Инстаграм, Вконтакте, Тик Ток.

A social network is an Internet platform that is used to interact with people around the world [1]. There are many social networks which differ in their design, target audience, structure and so on.

Over time social networks have become more than just a tool for communicating in a distance. People have started sharing music, videos, photos and even their own addresses on social networks. Moreover, many people have turned their social networks into one of the ways to make money. Social networks are engaged in advertising both famous brands and promoting small businesses, hobbies, arts and so on. It's not surprising that social networks influence our lives and are an integral and important part of it [2].

The development of social networks can be divided into three stages:

1. The first stage includes social networks of the mid-90s, pioneers with the simplest functionality (ARPANET);
2. The second stage is the creation of social networks with broader functionality for basic interaction (classmates.com);
3. The third stage involves the development of social networks that solve specific tasks: employee search (business networks), games (gaming networks), information search (content networks), etc. [3].

According to this theory, now we have moved from the second stage to the third one. In January 2022 there were 4.62 billion social media users worldwide. This is 58.4 % of the entire world population. In addition, in January 2022, there were 106 million social media users in Russia [4].

Like any phenomenon social networks have both positive and negative aspects.

Let's have a look at the positive aspects more in detail.

The advantages (pros) of social networks are the following:

1. They provide the ability to communicate regardless of location. All you need is to log into a social network is a smartphone or computer, which almost everyone has nowadays, and access to the Internet, which is available in most localities. We can quickly receive and transmit the information we need, we have the opportunity to process it fast with minimal effort of mind and body to direct energy to some other field of activity – and this is certainly an advantage.

2. Social networks make it easier to find people one of the ways to find a person you haven't seen for a long time and want to find. Most of the world's population is registered in social networks, which makes it easier to find an old acquaintance, childhood friend or colleague.

3. It is difficult to imagine services which don't require physical contact have not been implemented in social networks yet. Social networks provide a high speed of obtaining information. Unlike newspapers and television programs that come out at a set time, social networks provide instant access to any information. Everything we observe in our endless feeds has been based on our interests.

4. They offer really a lot of features. As mentioned above, social networks have ceased to be just a tool for communicating over long distances. One social network can contain millions of songs, movies, articles, photos, videos and various services: taxi, delivery, games, various online stores. In the social network you can sell your goods, find a job, track your physical activity or just check the weather.

5. Personal promotion and earnings. In social networks there are many options for promoting small businesses and generating regular income by selling ads in your account to large advertisers. Business owners and other types of professional organizations can connect with current customers, sell their products and expand their reach using social media. There are actually lots of entrepreneurs and businesses out there that thrive almost entirely in social networks and wouldn't even be able to operate without it.

6. We have to admit that social networking is just a sort of fun sometimes. A lot

of people turn to it when they catch a break at work or just want to relax at home. Since people are naturally social creatures, it's often quite satisfying to see comments and likes show up on our own posts, and it's convenient to be able to see exactly what our friends are up to without having to ask them directly.

7. Due to social networks, one simple search is all that is necessary to access the current events notifications that we want to see. You can even go a step further and set alerts through your social networking profile so that you receive notifications when a specific page has new information to review. This process allows you to customize your news feed, allowing the information discovery experience to follow the exact path you want.

8. Social networks can help students to do better at school. Approximately 3 in 5 students say that they use social media to discuss educational topics if they have access to the Internet. Half of students say that they talk about their school assignments with their friends thanks to the tools offered by these platforms.

9. Social networking helps people who are shy or socially isolated to connect with others. About 1 in 4 teens say that their experiences on social media have helped them to feel less shy while interacting with others in real life. Almost 30 % of young people in that group say that these encounters help them to feel more outgoing, while 1 in 5 say that their confidence got a boost.

10. Social networks are a useful legal enforcement tool. 73 % of law enforcement officials in the United States say that they believe social networking sites help them to solve crimes more quickly. 85 % of the police departments in the U.S. use social media to investigate local offenses. It is a tool that helps officers to track down and arrest those who brag about their crimes online [5].

All such opportunities attract users. Currently, social networks control not cities, but entire continents.

However, you should be careful, because there are a lot of frauders on the Internet who are ready to make money on you.

No matter how terrible the negative impact of social networks on a person's life is, there is no denying that this is a very useful and convenient invention. After all, anything can lead to bad consequences when used irrationally, for example, excessive use of sugar and salt can lead to serious deterioration of health. Social networks are developing at a tremendous rate. In Russia, there are such popular social networks as Vkontakte, YouTube, Instagram and TikTok. TikTok is a social network that empowers everyone to be a creator directly from their smartphones, and is committed to build a community by encouraging users to share their passion and creative expression through their short videos. This platform has attracted the users' attention with a simple interface and a system of recommendations that can adapt to interests of any person [6].

Instagram is a photo and video sharing social networking service owned by American company Meta Platforms. The app allows users to upload media that can be edited with filters and organized by hashtags and geographical tagging. Posts can be shared publicly or with preapproved followers [7]. Vkontakte is a Russian online social

media and social networking service based in Saint Petersburg. VK is available in multiple languages but it is predominantly used by Russian speakers. VK users can message each other publicly or privately, create groups, public pages and events; share and tag images, audio and video as well as play browser-based games [8].

YouTube is a video sharing service where users can watch, like, share, comment and upload their own videos. The video service can be accessed on PCs, laptops, tablets and via mobile phones. YouTube is used to watch music videos, comedy shows, how to guides, recipes, hacks and more [9]. In conclusion, we would like to note that the Internet has not yet exhausted its full potential and, undoubtedly, it has a future, including in the field of social networks. In our opinion, more attention should be paid to social networks, both negative aspects and their elimination as well as positive ones and their development.

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“DARK ACADEMIA” AS A CULTURAL PHENOMENON

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Abstract. This paper discusses the phenomenon of “Dark Academia”, which is gaining popularity. The main attention is paid to the definition of the specifics of this concept and its meaning in modern culture. It also examines the key genre features of the “Dark Academia” on the example of its main representatives in literature and cinema.

Keywords: “Dark Academia”, subculture, genre, aesthetic, academic novel.

«ТЕМНАЯ АКАДЕМИЯ» КАК КУЛЬТУРНОЕ ЯВЛЕНИЕ

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Аннотация. В работе рассматривается набирающий популярность феномен «темной академии». Основное внимание уделено определению специфики данного понятия и его значению в современной культуре. На примере основных представителей в литературе и кинематографе рассмотрены также ключевые жанровые особенности «темной академии».

Ключевые слова: темная академия, субкультура, жанр, эстетика, академический роман.

The phenomenon of “Dark Academia” rose in popularity in the last couple of years and became an integral part of modern culture, especially among young adults. It gained extreme popularity during the lockdown in 2020, mostly due to the shutdown of schools and universities, and remained at the top of the young people’s interest ever since. However, the origins of “Dark Academia” predate the pandemic. First appearing at Tumblr as a hashtag (“many users discovered it on Tumblr” [1]), it later developed into an internet aesthetic and went viral on social media.

An internet aesthetic is an art style that lies somewhere between a subculture, a visual philosophy and a lifestyle. Sarah Spelling of Vogue mentions that aesthetic in this case “has evolved from an academic word and something utilized by artists and auteurs to something to categorize our own identities by. It can mean both personal style and a vague stand-in for beauty” [2].

The category of “Dark Academia” is not defined nor specified: an internet aesthetic, a subculture, a lifestyle... With numerous book publishers capitalizing on that aesthetic, “Dark Academia” is often considered a fiction microgenre. Many see it as a fashion trend. Nevertheless, the key features of this phenomenon are rather defined. It revolves around “a celebration and romanticization of literature and a deep thirst for learning” [3], as well as the “journeys of self-discovery” [4]. Despite the fact that the proponents of the “Dark Academia” are interested in literature in general, they pay special attention to ancient Greek literature and art. A gothic architecture, along with a dark color palette are the parts of the aesthetic as well.

Though appeared only in 2014, “Dark Academia” has its roots stretched far into the past. The traits of that aesthetic can easily be found in the “academic novel” also known as the “campus novel”, a genre that dates back to the early 1950s. This genre has much in common with the “intellectual novel”, in the common plot of which different, and sometimes completely opposite, methods and systems of thought collide. The most important principle in the “campus novel” is the rethinking of previously established orders and systems of cultural and educational values. The very formation of the genre is attributed to the Anglo-American cultural space, since the educational system occupies the dominant position in the foundation of civic education.

One of the canonical works of “Dark Academia” aesthetic is a 1989 American drama film “Dead Poets Society”. Set in 1959 at the fictional elite boarding school, it tells the story of an English teacher John Keating who inspires his students through his teaching of poetry. For example, he tells them to rip out the introduction of their poetry books, which explains a mathematical formula used for rating poetry, and makes them think freely, analyze poems without strict formalities. He uses Latin expression *carpe diem* (“seize the day”) to inspire his students to make their lives extraordinary. The expression became one of the most recognizable and crucial for “Dark Academia” fans.

Despite the fact that the main action in “Dark Academia” is set in and around the campus of a university, the crucial difference from an “academic novel” is the prefix “dark”. It suggests that aesthetic “involves “dark” aspects, typically in the form of death and moral corruption” [4] and refers to the presence of the dark side of human consciousness, namely human vices. If the “Dark Academia” genre is more about inner change against the background of existentialism, fixation on one's own ideals and obsessive dependence on someone or something, the “academic novel” is specifically about the system of educational and cultural values formed by the youth in the process of learning, about the relationships between people, about morality and moral duty.

It is this factor that explains “Dark Academia” proponents’ love of the moral decay of the individual, a theme that is clearly expressed in the works of Oscar Wilde, George Gordon Byron, Mary Shelley, William Shakespeare, and Fyodor Dostoyevsky.

In that context, “Dark Academia” is much closer to the subgenre of the “campus murder mystery”, where the closed university setting substitutes for the country house of Golden Age detective novels. The dominant feature of the genre is the element of suspense – the anxious state of waiting for the conclusion, something that is more common in a dark detective or thriller rather than in an “academic novel”.

Indeed, several “Dark Academia” stories include a murder, usually the mysterious one. For instance, Donna Tartt's novel “The Secret History”, published in

1992, tells the story of a group of classics students at an elite New England college whose “morbid longing for the picturesque at all costs” [5, p. 5] propels them to be responsible for two deaths. The novel is “credit[ed] <...> with creating the genre” [6]. Later “other novels similar to Tartt’s have begun to define the genre” [6]. The story includes a charismatic classics professor who helps a group of clever, eccentric misfits to “discover a way of thinking and living that is a world away from the humdrum existence of their contemporaries” [5].

The traits of romanticism of the nineteenth century are also notable in the “Dark Academia”, as readers get to see the extraordinary characters in the extraordinary circumstances, for instance, committing a murder, as it is portrayed in the film “Kill your darlings” (2013). The film tells the story about the college days of some of the earliest members of the Beat Generation and Lucien Carr's killing of his long-time friend David Kammerer. It also develops the relationships between Carr and Allen Ginsberg as of young and intellectual students and captures the feeling of freedom in the college atmosphere accurately.

Both “Dark Academia” and romantic era also share an emphasis on emotion and individualism, an idealization of nature and distrust of the human world, instead of which they create their fictional one. Characters of both movements are usually young men disappointed in life and sinking into melancholy. They cannot find a use for their abilities, thus do something dreadful. “Dark Academia” comments on commonplace social relationships by showing different, unconventional ones between the characters. In doing so, the genre emphasizes that the students are unprepared for the cruel reality that awaits them off campus. University becomes their safe place, the whole another world.

“Dark Academia” comes even closer to a literary sub-genre of romanticism named “Dark Romanticism” that reflects popular fascination with the irrational, the demonic and the grotesque. It is often conflated with Gothic fiction, a genre that also inspired “Dark Academia”. Dark Romanticism focuses on human fallibility, self-destruction, judgement, punishment, as well as the psychological effects of guilt and sin. All of this can easily be addressed to the “Dark Academia” novels and films.

When it comes to “Dark Academia”, one of the most important things is its influence on today’s world. As it was mentioned before, the rise of that aesthetic came with a pandemic, as it was “nostalgic and a form of escapism during these uncertain times” [3]. Kathryn Mechaley explains that “during a time when in-person school appeared to be a distant reality and the online world was inescapable, it is not surprising that an aesthetic honoring the appeal of traditional institutions <...> and older technology, like typewriters and quills, would gain a large following” [4].

Many students desired to rest from online-education, and “Dark Academia” encouraged a return from techno-centric world to pre-digital eras. This happened to coincide with fatigue from an extremely practical approach to education. Unlike those who see an education only as a tool for future employment, “Dark Academia” highlights an education as an end in itself, paying tribute to why it is important personally, not professionally, and how knowledge can shape a person.

Nowadays, the humanities are devalued. Benjamin Schmidt analyzed American colleges’ reports and came to the conclusion that since 2008 financial crisis “almost every humanities field has seen a rapid drop in majors” and that “the number of English

majors has fallen by nearly half since the late 1990s” [7]. “The humanities are in retreat” [7], he concludes. However, “Dark Academia” centers the humanities. Liberal arts are essential for the aesthetic. Professor Keating from “Dead Poets Society” tells his students that despite the importance of all the occupations, beauty and art are what people live for. Hence, “Dark Academia” reaffirms the importance of the humanities as an education of the soul and of the individual.

“Dark Academia” likewise opens up new ways of reading the text. Litovskaia E. V. notes: “...the younger generation of literature enthusiasts demonstrates new ways of interpretation” [8, p. 293]. She also believes that literary aesthetics “become a guide to the world of literature for people with visual perception” [8, p. 296], which is extremely important in the digital era. Litovskaia views the subject from an educator /teacher’s point of view and points out that the discussion about an aesthetic can help students to analyze the text and to realize that their opinion is valuable and that their point of view can be taken into account.

As any subculture or internet aesthetic, “Dark Academia” has its controversies. It has been criticized for perceived Eurocentrism, lack of diversity and encouragement and glamourizing of unhealthy lifestyle choices, such as studying all night long, smoking, stress and procrastination related to education, unhealthy sleep habits and excessive consumption of coffee. Moreover, an elitism, “the privilege required for the aesthetic – social, cultural, and economic” [9] is also bothers many people as it is an example of class inequality. Others argue that “Dark Academia” places too much emphasis on the aesthetics of art and higher education instead of proper study and analysis of these works, leading to a misinterpretation of the source material. Toxic educational environments and abusive relationships between young people are also being criticized. The solution of these issues is to be seen.

Thus, even though “Dark Academia” shares similar elements with many genres and movements, it has managed to separate itself into a distinct and important cultural phenomenon with vibrant key features. “Dark Academia” is yet to be a fully formed aesthetic or a genre. Its definition “is murky” [6] and there are plenty of controversies it has to overcome and resolve. However, one cannot deny the significance of that phenomenon in our post-covid era, especially considering that it reclaimed the humanities in a way and brought back the interest to it among younger generation.

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ECONOMICS OF NATURE MANAGEMENT IN THE CONCEPT OF SUSTAINABLE DEVELOPMENT OF RUSSIAN REGIONS

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Abstract. The article discusses important aspects of the concept of sustainable development of Russian regions. The meaning of the concept of "economics of nature management" is explained. The importance of the process of training specialists of this profile, the prospects for their participation in ensuring the sustainable development of regions is emphasized.

Keywords: nature management, resources, economy, environmental component, sustainable development.

ЭКОНОМИКА ПРИРОДОПОЛЬЗОВАНИЯ В КОНЦЕПЦИИ УСТОЙЧИВОГО РАЗВИТИЯ РЕГИОНОВ РОССИИ

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Аннотация. В статье обсуждаются важные аспекты концепции устойчивого развития регионов России. Объясняется значение понятия «экономика природопользования». Подчеркивается значимость процесса подготовки специалистов данного профиля, перспективы их участия в обеспечении устойчивого развития регионов.

Ключевые слова: природопользование, ресурсы, экономика, экологическая составляющая, устойчивое развитие.

One of the main assets of Russia are the most important strategic resources:

- mineral resources;
- land resources;
- resources of "untouched nature".

Under the mineral resources we mean minerals in the bowels of the earth. Russia is very rich in minerals. It is difficult to reliably determine their exact number. In most types of raw materials, Russia provides for its needs. It has good export opportunities. However, there is a problem of depletion of old deposits. There is not always enough money for the development of new deposits. In addition, new deposits are often discovered in hard-to-reach areas of the Far North. For Russia, the threat of exhaustion of explored and available oil resources in the next thirty years has become tangible. The process of restoring oil reserves is proceeding at a slow pace. The deadlines for the exhaustion of profitable exploited reserves of many minerals are approaching. The reserves of minerals in the West Siberian and Volga-Ural regions are gradually depleted. This is largely due to the low level of exploration work in recent decades. In promising regions, they need to be continued.

An important component of Russia's natural capital is its land resources, the largest in the world. Agricultural lands are inferior in size to forest lands, which occupy more than half of the entire territory of Russia. Agricultural lands (land resources) in Russia are often located in not very favorable climatic conditions. Fertility is one of the most important properties of soils, which in turn have a great influence on the development of the country's agriculture. One of the acute problems of using land potential is the degradation of agricultural land. Practically in all regions of the Russian Federation the tendency to deterioration of the state of lands persists. Salinization, deflation, erosion, flooding, swamping, overgrowing with small forests and shrubs, desertification of agricultural lands – they are intensively developing. All these processes lead to the loss of agricultural land fertility and their withdrawal from economic circulation. Many territories are included in the risk zone for the manifestation of degradation processes.

Yield and product quality are the main indicators in agricultural production. Each step of increasing the amount of fertilizer applied must be strictly controlled and studied. An analysis of the experimental material led to the conclusion that regular the use of fertilizers improves soil fertility [1, p. 293]. At present, for the effective use of fertilizers, it is necessary to look for new ways to increase crop yields and environmental conservation. It is important to develop new agricultural technologies with different levels of intensification.

Natural ecosystems form the resources of "untouched nature". They produce clean water, air and soil. Forests are very important for the functioning of the entire ecosystem of the Earth. In Russia, they are located on the territory of ten climatic zones [2, p. 24]. Natural ecological systems should be subject to protection both in their "natural form" and after they have been given the legal status of specially protected natural areas. Currently, in the European part of Russia, in the Urals, in Eastern Siberia, natural ecosystems are significantly deformed. This is largely due to the high degree of development of these territories. Natural ecosystems are threatened by hydrotechnical construction, plowing of land, deforestation, rapid growth of cities, and an increase in the number of enterprises. The destruction of natural ecosystems threatens the vital interests of future generations of mankind. Natural ecological systems are evaluated by experts as a guarantor of environmental stability, the foundation of life [3, p. 104]. A significant part of the territory of Russia is not

developed by economic activity, which allows our country to play an important role in regulating the stability of the biosphere of the entire planet.

In the concept of sustainable development, economic growth is closely linked to the efficient use of natural resources, to reducing damage to the environment, and to increasing the volume of wealth created for future generations. The main task of environmental economics is to assess the environmental component of the processes of everyday life and material production at all stages of environmental management, which include:

- exploration of mineral deposits;
- extraction of minerals;
- processing of minerals;
- use of processed products;
- waste management;
- protection and protection of the environment;
- reproduction of natural resources.

The issues of nature management form the ecological component of the sustainable development of regions. To assess it, a number of indicators are used, in particular [4, p. 98]:

- volume of polluted wastewater discharged into surface water bodies;
- volume of various pollutants emitted into the atmosphere;
- the ratio of treated pollutants to the total amount of these substances leaving the pollution source.

An integrated approach is important for solving environmental problems, today the connection between the economic development of the region and the deterioration of the environment is obvious. One of the options for solving the problem can be targeted programming, including the creation of effective organizational structures and measures to develop the economic interest of executors in the success of the project. The priority should be the prevention of an environmental problem, and not its subsequent elimination.

It is important to develop environmental management at different levels of government. It represents the activities of specially authorized state authorities, local governments and officials regulated by the norms of law. Environmental management also includes the activities of legal entities and citizens aimed at creating specific legal relations in the field of environmental protection, rational use of natural resources, compliance with environmental rights and fulfillment of environmental obligations.

Responsibility for industrial environmental management lies primarily with legal entities and individual entrepreneurs. Their powers are closely related to the field of activity they carry out. The main ones are the following:

- carrying out an assessment of the impact on the environment from the proposed economic activity;
- sending materials on the state environmental review to the authorized bodies;
- development of industrial safety declaration;
- development of draft environmental impact standards and their approval;
- implementation of industrial environmental control;
- implementation of environmental insurance;

– environmental certification of technologies and products.

Russia needs a new development paradigm that can ensure the well-being of society without excessive pressure on nature. The interests of the economy, on the one hand, and the conservation of nature, on the other hand, must be balanced and must be oriented towards the long term. At the same time, both energy-efficient and innovative growth of the green economy model is needed.

An important task is to move away from the commodity-export economy. It is based on the use of natural capital and the sale of raw materials. Even with high world energy prices, the Russian economy showed minimal growth rates. Innovations and modernization in the economy can act as the main drivers of moving away from the raw material export model of the economy. The conceptual foundations of the new model are laid down in the strategic documents of the country's development until 2030, decrees of the President of the Russian Federation and decisions of the Government of the Russian Federation.

Another challenge for the Russian economy will be a sharp deterioration in the demographic situation in the coming decades. According to the forecast of Rosstat, by 2030 the ratio between the population of retirement and working age will worsen by more than one and a half times (it increases from 33 to 52 %) [5, p. 269].

Realizing the vast potential for energy efficiency improvements requires urgent action to ensure economic incentives for energy conservation at all levels, from households to entire industries. It is important to ensure the installation of water and heat meters in homes, to introduce energy saving incentives for enterprises. The role of the state should be both stimulating and regulating, and sometimes even coercive.

Specialists of the profile "Environmental Economics" are familiar with the system of forecasting, planning, monitoring and control in the field of protection, reproduction and use of natural resources. They have tools for determining the amount of environmental payments, for assessing the economic efficiency of environmental protection measures, and for identifying environmental production costs. Economists of this profile establish causal relationships between the state of the environment and economic impact. They develop mechanisms for compensating damage caused to nature; compare environmental impacts and the size of production efficiency.

Graduates of the profile "Environmental Economics" have a broad knowledge in the field of environmental management and economics. They are in demand in organizations working in areas related to natural resources. In particular, specialists of this profile work in the economic, marketing, analytical and financial services of organizations.

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DIGITAL TWIN AS A TOOL FOR INCREASING ENERGY EFFICIENCY OF PRODUCTION PROCESSES

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Abstract. This article discusses the technology of the digital twin when it is used to improve the energy efficiency of production processes. The definition of the term "Digital twin" is given, its three varieties are considered depending on the level of integration into production, and the opportunities that technology provides at each of the levels of integration. The capabilities of the software product for designing simulation models "AnyLogic" are also presented.

Keywords: digital twin, energy efficiency, simulation model, digitalization, automation, energy saving.

ЦИФРОВОЙ ДВОЙНИК КАК ИНСТРУМЕНТ ДЛЯ ПОВЫШЕНИЯ ЭНЕРГОЭФФЕКТИВНОСТИ ПРОИЗВОДСТВЕННЫХ ПРОЦЕССОВ

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Аннотация. В данной статье рассматривается технология цифрового двойника при ее применении для повышения энергоэффективности производственных процессов. Дано определение термина «Цифровой двойник», рассмотрены три его разновидности в зависимости от уровня интеграции в производство, и возможности, которые технология дает на каждом из уровней интеграции. Также представлены возможности программного продукта для проектирования имитационных моделей "AnyLogic".

Ключевые слова: цифровой двойник, энергоэффективность, имитационная модель, цифровизация, автоматизация, энергосбережение.

There are many activities aimed at energy saving and rational use of energy resources in the modern world. The simplest things we can imagine are energy saving lamps, double-glazed windows, mini-solar panels for generating energy for the home and renewable energy.

The interest in energy saving and energy efficiency is due to several reasons. But the most pressing problem is the depletion of minerals [1].

According to research of the International Energy Agency (IEA), electricity demand is projected to grow by 50 % by 2035 year. Moreover, the IEA predicts an increase in oil, gas and coal prices.

It's necessary to understand that rising energy prices lead to increasing prices in industry. Thus, increasing energy efficiency solves a number of problems such as:

- reducing energy costs for the population,
- saving resources across the country,
- increasing the productivity of industrial sector,
- reducing of the fuel costs,
- reducing the cost of production,
- limitation of emissions into the environment [2].

Obviously, it's impossible to solve the problem of increasing energy efficiency in industrial enterprises by only using the energy saving lamps and more extensive measures are needed.

Currently, digitalization and automation are becoming an important part of all human activities. And power engineering and industry are no exception. Digitization can also help improve energy efficiency. One of the main trends in digitalization is the “Digital Twin” technology.

“Digital Twin” (DT) is typically understood as a virtual model of a real object, a product or a process. But actually, the term is broader. The Digital Twin can be considered in three ways: Digital Twin Prototype (DTP), Digital Twin Instance (DTI) and Digital Twin Aggregate (DTA). Each of these types of DT corresponds to a certain level of the product life cycle. And the possibility of using this technology at any stage of the product's life cycle makes it universal [3].

The Digital Twin Prototype is needed to describe and create a physical object. It contains a simplified 3D model giving answers how to create the product and how it will work.

The Digital Twin Instance corresponds to a specific physical object throughout its life cycle. It contains and updated model of the object and gives the service history, the results of processing and the information about monitoring of the technical condition of the object. It can also predict the technical conditions according to the information taken from the sensors.

The Digital Twin Aggregate is the most complex type of the technology. It's a digital platform for collecting data from all DTI and can control the real object.

The solution to the problem of energy efficiency can already begin with the implementation of the Digital Twin Prototype.

The implementation of the DTP is carried out by creating a simulation model of the enterprise. The technology of visualization a production line before it is actually developed is more accessible than ever.

Using this technology allows specialists to solve the following tasks:

- finding out the throughput of the conveyors,
- simulation the line maintenance process and its impact on the technological process,
- Identifying the most efficient equipment placement and etc.

For example, a simulation model can be designed in the “AnyLogic” software product. Software developers in their guide give tips on creating models in

“AnyLogic”. There is also a guide for creating the simulation model for the production of lead batteries.

The model consists of conveyors, industrial cranes and transporters and takes into account the following steps:

1. Applying the paste to the electrodes and combining the electrodes in batches.
2. Transportation of batches to drying chambers using forklifts with arbitrary navigation.
3. Wrapping the electrodes in special envelopes and assembling the groups.
4. Assembling the battery: placing the electrode groups into containers using an industrial crane.
5. Fixing the covers, welding jumpers between the blocks, checking the battery insulation, adding battery acid.
6. Delivery of batteries to the charging area using forklifts moving along predetermined paths.
7. Creating a custom block to separate the electrode production process into anodes and cathodes.
8. Modeling the production of electrodes from lead rolls [4].

The final visualization of the model is shown in figure 1.

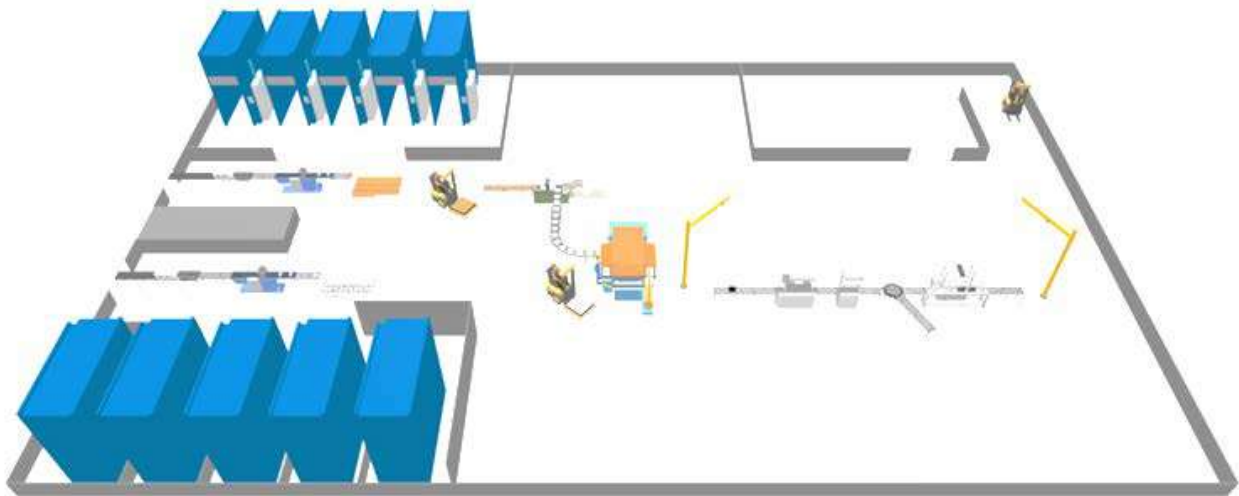


Figure 1. The simulation model for the production of lead batteries

Of course, you can use any other equipment instead of lead batteries. However, the detail capabilities of the model are impressive. This simulation allows the user to set many parameters of the production line, namely, the processing speed of the equipment and the speed of the conveyor, the length of the conveyor, the location of individual technological equipment, the control mode. And the most important thing is to see how the system works with a variety of settings and inputs. Animated simulations often reveal potential line design issues that are difficult or impossible to recognize with a traditional view of line layout, much less a spreadsheet.

Moreover, the program allows creating simulation models of the maintenance. For example, a wind farm maintenance simulation model was implemented. The model takes into account the types of damage to the wind turbine and, depending on them,

sends a signal to the service center so that the right team leaves. It was done with state charts. Figure 2 is a state diagram of wind turbine blades. It simulates 2 types of damage on the blades and gives a message - critical failure occurred or not.

Digital Twin technology allows you to realize the condition-based maintenance. It helps to increase the duration of the life cycle of equipment, reduce the cost of critical failures and increase the energy efficiency [5].

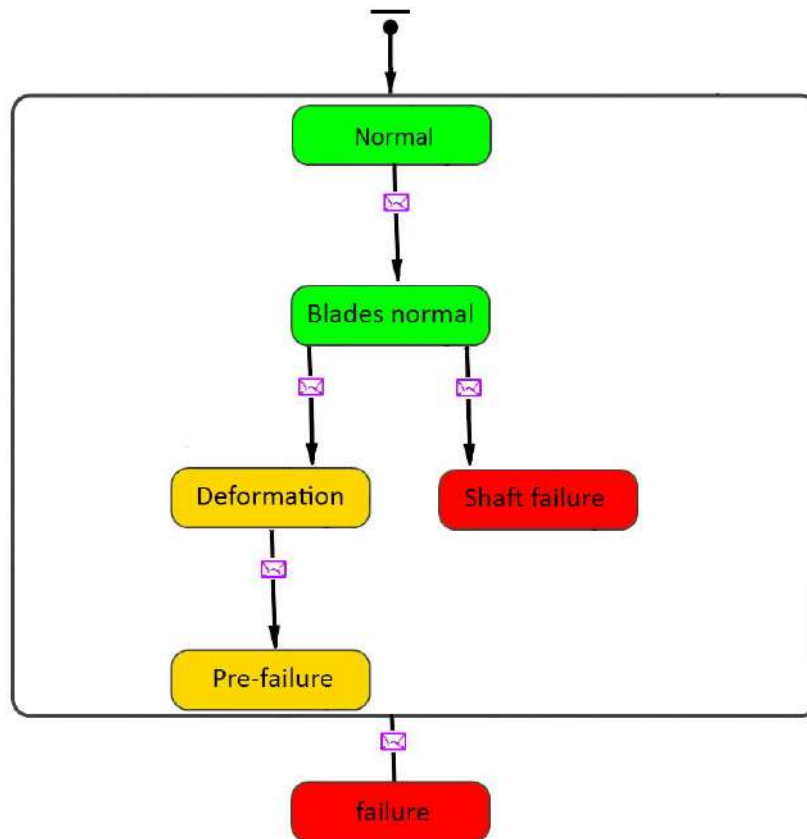


Figure 2. Wind blades state char

The last but not the least is the fact that it is often impossible to solve the problem with field experiments. It may be too expensive, dangerous for employees, or impossible. In such cases, a model of a real system is used. Despite the difficulty of mastering the skill of such modeling, the effort expended will give a good result in the form of a high-quality analysis of a complex detailed dynamic system.

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METHODS OF IMPROVING THE CONVERSATIONAL SKILLS OF ELEMENTARY LEVEL STUDENTS

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Abstract. Speaking is one of the most important skills to develop and improve as a means of effective communication. For elementary level learning, the question of how to improve communicative competence has been and remains the most important.

Keywords: speaking skills, communicative competence, enhancing, methods, oral communication background, motivation, psychological competence.

МЕТОДЫ ПОВЫШЕНИЯ РАЗГОВОРНЫХ НАВЫКОВ УЧАЩИХСЯ НАЧАЛЬНОГО УРОВНЯ

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Аннотация. Разговор – это один из самых важных навыков, который необходимо развивать и совершенствовать как средство эффективного общения. Для начального уровня обучения вопрос о том, как повысить коммуникативную компетентность, был и остается наиболее важным.

Ключевые слова: навыки устной речи, коммуникативная компетентность, повышение, методы, фон устного общения, мотивация, психологическая компетентность.

In a short time, English supplanted other languages and became the main means of communication throughout the world. His domain continues to expand. Moderna world of media, mass communications and Internet requires a good knowledge of English, especially spoken language. Everyone who wants to benefit from modern education, research, science, commerce, etc., knows that without practical knowledge of English and good communication skills, it is Moderna not possible. A person who has no ability to speak suffers in this competitive era and may have difficulty achieving a higher position.

The main reason for the weakness of the conversational skills of Russian students is the unwillingness to communicate due to a variety of factors.

Therefore, the problem of teaching English to students, especially in oral communication, has not yet been solved, and a lot of interesting things can be found in

this field. Since most researchers believe that conversation is one of the four main skills needed to communicate effectively in any language, language skills must be developed alongside other skills so that these integrated skills improve students' communication skills. Effective communication through speech usually offers a number of benefits for both speakers and business organizations. In general, it is important for students to understand the words spoken and provide appropriate answers. In this way, communicative competence, sociability and alertness (understanding through speech and hearing) are formed. To do this, students must be given comprehensive tasks that will help them develop both skills. Studies have shown that the comprehensive application of modern methods can produce positive results lead to greater communicative competence. Learning English using new teaching methods and traveling and working abroad encourages students to learn the language, develop their fluency and help overcome the language barrier [1, p. 62]. Recently, interest in English as an international means of communication has grown noticeably. English has become the language of professional communication in various spheres of life. Most students want to learn to speak English; therefore, spoken language plays an important role in learning spoken language.

According to numerous studies, spoken language is considered one of the four Macro skills needed to communicate effectively in any language, especially when speakers do not use their native language. Since English is widely used as a means of communication, especially on the Internet, it is necessary to develop English skills along with other skills so that these integrated skills increase communicative competence. In Russia, as in many other countries, the question of conversational skills is very important. A number of researchers have studied this field and concluded that students have low speaking ability and their inability to speak confidently and fluently. As noted by Trent and other related studies, there may be concerns about mistrust and mistakes. Most college students are unsure of their ability to learn to speak; teachers must overcome their reluctance to change this situation [2, p. 23]. Typically, the desire to communicate is part of fluency in a second language, which is often the ultimate goal of language learners. Other factors affecting communication readiness can be divided into individual differences in linguistic and non-linguistic outcomes of language learning, such as motivation, skills, language learning strategies, linguistic anxiety, and others. They have been the main focus of second language research for over 50 years. More recently, mcintre drew attention to the student's decision to volunteer to speak the language when the opportunity presented itself, even when basic language skills were acquired. However, despite the conventional wisdom that modern language pedagogy emphasizes communication and that students require conversational experience to learn, some language learners generally choose to remain silent. In addition to the above, some researchers point out that there is not enough time for various exercises and opportunities to improve speech. Students often complain that their teachers quarrel and get frustrated with incorrect pronunciation. Although both teachers and students are responsible for the latter's poor orality, teachers with professional knowledge and skills have more responsibility [3, p. 92]. At English language teaching (ELT), each teacher chooses specific methods to improve students' language skills. Currently, traditional and modern technologies can be used both individually and in a complex. Internet means of communication have been used in

education, especially in the teaching of English. New technologies complement traditional methods of teaching English. Using technology in schools, students learn faster and easier than before. If they are students during school years, they are learning language and technology at the same time. Learning English on the Internet and applying the new educational trends in schools and colleges makes students want to learn the language. Learning English is easier than ever, thanks to the numerous sources that help people read effortlessly and with pleasure. E-based learning is one of the fastest growing areas of education. It is widely recognized that advances in information technology and new developments in pedagogy enable well-designed, student-oriented, interactive, accessible, efficient and flexible E-learning environments. For this reason, it can be assumed that online browsing is an alternative way to learn English.

Students must learn to develop effective communication skills:

- 1) communicate using digital media and the medium to support individual and group learning;
- 2) share information efficiently and efficiently using the appropriate digital media and medium;
- 3) clearly and effectively communicate thoughts and ideas to different audiences using different media and formats.

Basic communication skills are at the heart of any organization. As teachers, it is crucial to help students develop these life skills in the 21st century. It all depends on our creativity and the use of modern teaching methods. Below is a recommended list of such activities:

- Read aloud
- Students express their thoughts on the topic provided by the teacher
- Students listen to the thoughts of classmates and respond
- Oral diary; weekly oral report
- Group presentations on the completed project
- Oral report on the book
- Picture description
- Narration, chain narration
- Make riddles
- Role-playing game
- Debate
- Dramatic Monologues
- Radio programs,
- Songs

We can choose any method in ELT because they all help us develop conversational skills. To achieve positive results, they can be used in supplementation or individually. As mentioned above, given the important role of the spoken word, Baile and Guo proposed methods to improve the development of the spoken word by developing curricula, learning principles, types of tasks and materials, and evaluation of the spoken word. Other factors that improved participants' ability to communicate included frequent listening to English-language material, such as listening to music, watching movies, listening to the radio, watching TV shows, and visiting multimedia sites. Previous research has supported the conclusion that speaking and listening skills

are generally correlated in terms of language learning and development. In addition, suggestions for improving the spoken language of students included various course activities, encouraging more listening through the media and looking for opportunities to speak in real-world situations. In addition, practicing and familiarizing yourself with both listening and speaking in real situations seems to be a practical way to increase confidence in conversation. Classroom interaction is also necessary and useful as an educational strategy to improve speaking skills. The role of interaction in the classroom context in improving speaking skills comes from understanding its basic types: teacher-student interactions and student-student interactions, in which special attention is paid to the discussion of meaning and the provision of feedback. Classroom interaction involves verbal exchange between students and teachers. Teachers need to know that because language skills require practice and impact, students need to perform most of the speech to reinforce the speech [4, p. 157].

So, at the beginner level, you need to listen and repeat as much as possible. The best way to express what you think is with simple words and phrases. With the help of keywords, you can teach to understand the essence of speech. In addition, it is much more important to discuss interesting topics. Naturally, the conditions of communication must be comfortable. Sometimes, to overcome the language barrier, you need to use fairy tales, poems, jokes or be part of a situation where you have to speak only a foreign language. Otherwise, it will be impossible to improve our language skills and speak any foreign language fluently [5, p. 581]. In this study, we discussed the challenges of communicative competence, methods to improve verbal communication, motivation, and how to overcome the language barrier. It was important to know the different approaches of Russian and foreign researchers to the problem of conversational skills of students.

Thus, the purpose of this article: "to identify the strengths and weaknesses of the conversational skills of modern students in Russia and to show the possibilities of improving the language skills of students studying English" has been achieved, since we have proved that the comprehensive application of modern methods gives positive results and leads to an improvement in communication skills. Learning English using new teaching methods, as well as traveling abroad and working, awakens students' desire to learn the language, develop their fluency and help overcome the language barrier. The results of this study also suggest that the main cause of poor conversational skills of Russian students is their unwillingness to communicate.

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DETERMINATION OF THE RELIEF SHAPE FOR THE PROCESS OF PROJECTION WELDING OF A NUT AND A GALVANIZED STAMPED PART

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Abstract. The paper considers the process of determining the most optimal relief shape for the process of relief welding of a nut to a stamped part made of galvanized steel. The technology of the welding process is described, as well as control methods that make it possible to determine the shape of the relief suitable for the formation of a high-quality welded joint.

Keywords: projection welding, stamped part, welding parameters, destructive test, galvanized steel.

ОПРЕДЕЛЕНИЕ ФОРМЫ РЕЛЬЕФА ДЛЯ ПРОЦЕССА РЕЛЬЕФНОЙ СВАРКИ ГАЙКИ И ОЦИНКОВАННОЙ ШТАМПОВАННОЙ ДЕТАЛИ

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Аннотация. В работе рассматривается процесс определения наиболее оптимальной формы рельефа для процесса рельефной сварки гайки к штампованной детали из оцинкованной стали. Описывается технология процесса сварки, а также методы контроля, позволяющие определить форму рельефа, подходящую для формирования качественного сварного соединения.

Ключевые слова: рельефная сварка, штампованная деталь, параметры сварки, разрушающий контроль, оцинкованная сталь.

Projection welding is a widespread type of welding used in industry. Its advantages include ease of automation, low energy consumption, high strength of the welded joint, low requirements for the contact machine operator [1].

In the case under consideration, there is a need to weld nuts with M6 and M8 threads to a stamped part made of galvanized steel. Due to the fact that the stamping

material has a small thickness of 0.9 mm and the requirement for joint strength is 35 Nm, projection welding will be more preferable, since it will save the stamping material because the area of the reliefs is much smaller than the area of the end face of the nut.

Various types of nuts are available for projection welding. This product uses an M6 square nut with four flat reliefs located at the corners (Figure 1).

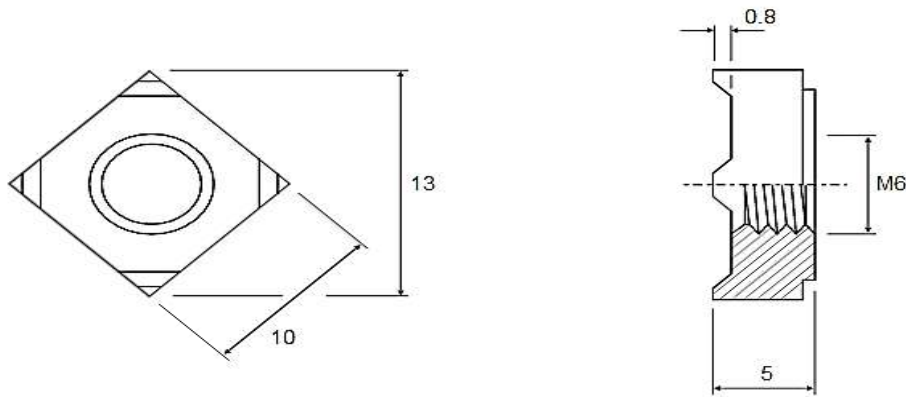


Figure 1. Nut M6 with four flat reliefs

As a nut M8, a round nut with three spherical reliefs, the diameter of which is 4 mm, is used. (Figure 2).

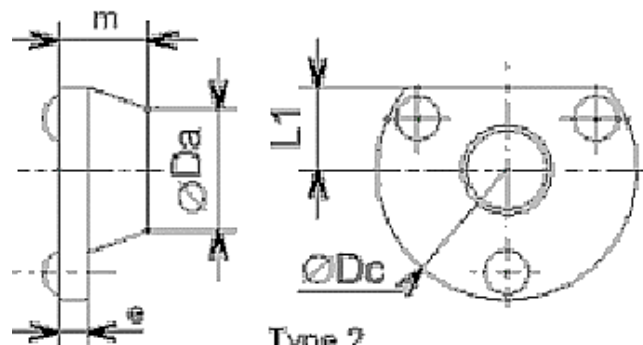


Figure 2. Nut M8 c with three spherical reliefs

The purpose of the investigation is to determine the shape of the relief most suitable for the process of relief welding.

For these two nuts, a similar welding cycle is used, it has three stages. At the first stage, the parts are pre-compressed, this is necessary in order for the components to take the required position, the nuts must evenly contact the stamped part with all reliefs, and the part must fit snugly against the surface of the lower electrode, minimizing the electrode-part resistance. In both cases, the precompression time is 500ms, which is enough to meet all the above requirements [2].

At the second stage, the process of welding parts takes place. Welding current is 20 kA, welding time for M6 nut is 40 ms, and for M8 nut is 60 ms. During the projection

welding, the reliefs of the nuts are heated and flattened with the formation of a cast core in the contact zone of the parts [3].

The third stage of welding is to maintain the welding force for a short time to cool down the parts after welding and prevent deformation of the thin metal of the stamped part. The duration of this stage is 200 ms, and the compression force for all stages of welding is 6.5 kN. These parameters are relevant for nuts of both types [4].

During the visual inspection of the welded joint, traces of reliefs of nuts on the reverse side of the stamping metal are clearly visible (Figure 3), which indicates sufficient penetration of the parts and the presence of a strong welded joint.

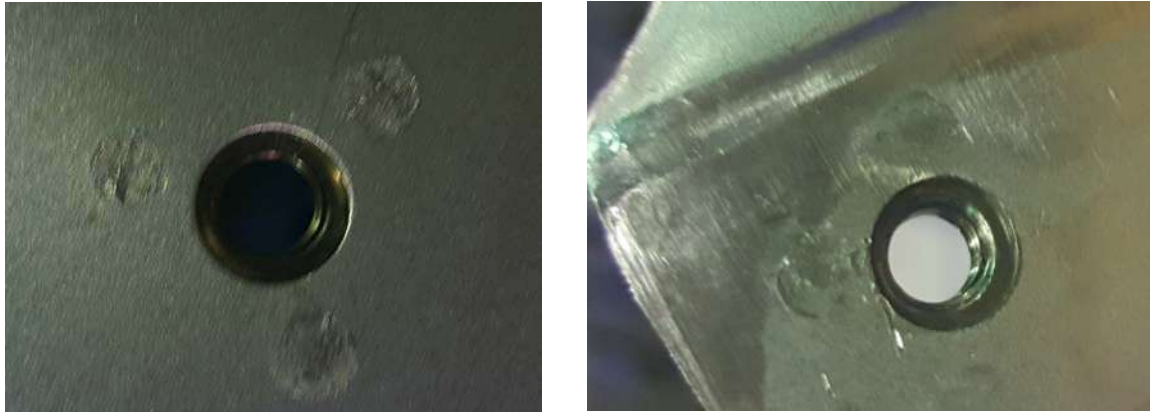


Figure 3. Welded parts

These traces are especially noticeable on the M8 nut with three spherical reliefs, this is due to the long time for the flow of the welding current. Since the reliefs of the M8 nut have a larger volume, they give a smaller draft with equal welding parameters and allow you to increase the welding time without touching the main surface of the nut on the stamping surface and, as a result, a larger size of the cast core is provided.

The control of the strength of the welded joint is carried out with a torque wrench with an applied torque of 35 Nm. When checking two joints, the nuts did not come off the part even when a moment of 65 Nm was applied, after which the deformation of the stamped part began.

When the joints are destroyed, it is possible to evaluate the uniformity of melting of all reliefs, the depth of their upsetting and the size of the weld points. As can be seen in the photo (Figure 4), uniformity of melting of all reliefs of nuts was achieved. For a nut with three spherical reliefs, the total area of weld points exceeds the area of weld points for a nut with four reliefs, which, as mentioned above, is caused by the possibility of a longer current flow and a larger volume of reliefs. It should be noted that it is not always possible to use nuts of a similar design, since they have large geometric dimensions and cannot be located on parts with a small area. Strength properties were achieved and significantly exceeded in both cases, i. e. it is possible to use the M8 nut with smaller dimensions and reliefs of a smaller area, which will reduce energy costs for obtaining a stable connection.

During projection welding of parts made of galvanized steels, the protective coating of the metal burns out, which is associated with its low melting point (Figure 5). Burnout also occurs in areas adjacent to the welded joint. The design of these

connections implies the presence of a gap between the nuts and the stamping, in which dirt and moisture can linger, provoking corrosion.



Figure 4. Nuts after the destructive test

To ensure the protection of the product against corrosion, it is necessary to program the slow melting of the coating metal with its withdrawal to the joint boundaries, avoiding splashing. This effect can be achieved due to a preliminary current pulse of lesser strength, which will be sufficient to melt zinc, followed by sedimentation of the upper electrode and the transition to the main welding current [5].

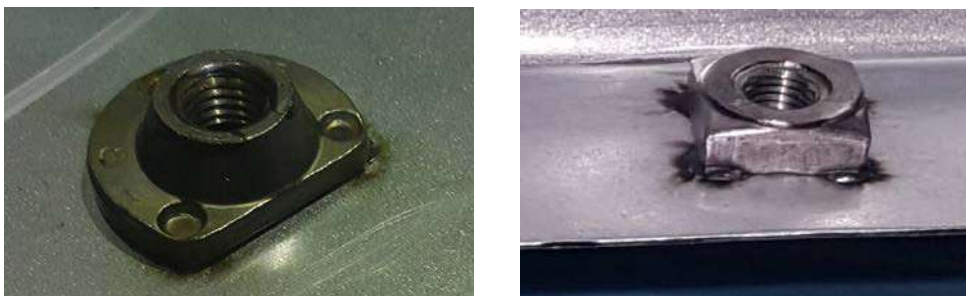


Figure 5. Welded joint appearance

As a result of the study, the most optimal form of reliefs was determined for the implementation of the process of projection welding of fasteners with stamped parts.

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THE HISTORY AND DEFINITION OF MIND MAP TECHNOLOGY IN TEACHING

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Abstract. The article presents a generalized analysis of the features of using the method of mind maps. At the present stage of the development of society the problem of constant search for pedagogical innovations that can intensify the quality learning process is of great importance. The aim of such technology is a satisfaction of educational needs, creation conditions for self-realization of the personality, its creative potential. One of the modern methods that allows to construct an educational activity taking into account the psychological mechanisms, is the mind map method.

Keywords: education, modern educational technologies, mind maps, mental maps, training.

ИСТОРИЯ СОЗДАНИЯ И ОПРЕДЕЛЕНИЕ ТЕХНОЛОГИИ ИНТЕЛЛЕКТ-КАРТ В ОБУЧЕНИИ

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Аннотация. В статье представлен обобщающий анализ особенностей использования метода интеллект-карт. На современном этапе развития общества остро встает проблема постоянного поиска педагогических инноваций, интенсифицирующих процесс качественного обучения. Подобные инновации направлены на удовлетворение образовательных потребностей и запросов обучающихся, создание условий для самореализации личности, ее творческого потенциала. Одной из современных методик, позволяющих строить учебную деятельность с учетом психологических механизмов, является метод интеллект-карт.

Ключевые слова: образование, современные образовательные технологии, интеллект-карты, ментальные карты, обучение.

A variety of terms can be found in the scientific literature: «intelligence maps», «mind maps», «knowledge maps», «mental maps», «smart maps», «memory maps», «associative maps», «associative diagrams». However, the term «mind maps» has become the most widely used. Traditionally it is defined as a way of structuring information with the help of schemes, which is an alternative to the linear recording technique information.

One of the earliest documented examples of mind mapping can be traced back

to a Greek philosopher, astrologer and mathematician Porphyry of Tyros in the 3rd century AD. This graphic image was called «Porphyria Tree», which has become one of the important stages in the development of taxonomy [1, p. 10].

Ramon Llull, Leonardo Da Vinci, and Isaac Newton also used mind mapping techniques.

In the second half of the XII c. a writer, philosopher and logician Ramon Lull presented an innovative work on the systematization of knowledge. He made a table, including sixteen trees of scientific fields following the source tree, called «arbor scientiae» («tree of logical relationships»). According to the author, the presented method will help any person not only to understand and learn all known truths of faith, but even to open new ones [2].

In the XVIII c. a Swedish botanist Carl Linnaeus proposed a biological classification (taxonomy). In the taxonomy of Linnaeus there are three kingdoms, divided into classes, and they, in turn, into lower ranks in a hierarchical order [3].

It is believed that one of the most important forefathers of mind maps belong to Charles Darwin. His «tree of life» is a research tool used to explore the evolution of life and describe the relationships between organisms, both living and extinct. In other words, presented an abstract diagram of a theoretical tree of life for species [4, p. 46].

In the middle of the XX century semantic networks, as one of the ways of presenting information, began to actively develop. A semantic network is a knowledge base that represents semantic relations between concepts in a network. This was often used as a form of knowledge representation. Computer semantic networks were first invented by Richard H. Richens of the Cambridge Language Research Unit in 1956, as an «interlingua» for machine translation of natural languages. It can be said that it was semantic networks that formed the basis of modern mind maps.

In the late 1960's, Ross Quillian introduced semantic networks as a method of modelling the structure and storage of human knowledge in the shape of a graph. Quillian wanted his system to explore the meaning of English words by the relationships between them. The method allows a person to turn to his «storehouses of memories» without the slightest hesitation. The organization of semantic memory (our understanding the surrounding world through logic and language) is similar to a library: overlapping categories or nodes represent separate characteristics or concepts related to each other. These connections are formed under the influence of personal practical experience, which means, that all of us have our own network of associations: for example, «bird» is connected with «flight» and with «sky» [5, p. 37-46].

The idea of representing knowledge by using mind maps was developed and popularized by Tony Buzen, a well-known British writer of more than 100 books, psychologist and educational consultant [4; 6; 7]. Mind maps were created by Tony Buzen in 1970 as opposed to the traditional methods of taking notes. Linear thinking does not allow the brain to work effectively, limits it. Buzen compares the mental process with tree branches, or with the human nervous system. According to the author, the most effective thinking tool can be only such a scheme or diagram that repeats the structure of cells of the human body brain [8]. While «traditional» outlines force readers to scan from left to right and top to bottom, readers actually tend to scan the entire page in a non-linear way.

It was first presented to the world in the spring of 1974 after the publication of the book «Work with your Head». Buzen says, that this idea was inspired by the general semantics of Alfred Korzybski, popularized in science fiction novels such as those of Robert A. Heinlein and A. E. Van Vogt [6]. Mindmapping is a technique of visualization of thinking and alternative recording [8, p. 28].

According to Buzen, mind map is a method of graphic representation, processing and memorizing information, creative tasks, and a tool for developing memory and thinking. The intellectual map has the following properties: visibility; attractiveness; memorability; creative approach; possibility of revision. Mind maps serve a different purpose: they help with memory and organization. [6].

A mental map is a diagram used to visually organize information. The mental map is hierarchical and shows the relationships between the parts of the whole. It is often created around a single concept, drawn as an image in the center of a blank page, to which are added related representations of ideas, such as images, words, and parts of words. The main ideas are directly related to the central concept, and other ideas branch off from these main ideas [6; 7].

According to the author, a mind map is «a powerful graphic technique which provides a universal key to unlock the potential of the brain. It harnesses the full range of cortical skills – word, image, number, logic, rhythm, colour and spatial awareness – in a single, uniquely powerful manner. In so doing, it gives you the freedom to roam the infinite expanses of your brain. The mind map can be applied to every aspect of life where improved learning and clearer thinking will enhance human performance» [6, p. 28].

According to A. N. Pogrebnova, the mind-map method demonstrates particular effectiveness in the fulfillment of creative tasks, writing thesis works, essays. It can be very helpful at the stage of repetition, consolidation of previously learned material, knowledge control and self-control [9, p. 230-246].

Frederic Le Bihan, a certified instructor and consultant, writes about simple and powerful tool, that can be used for daily activities: taking notes, hosting meetings, managing time, conducting a project, making decisions, innovating and more. He called it the heuristic card (*la carte heuristique*) [10, p. 172-173].

The results of the analysis of modern research in the field of mind-mapping technique show, that mental maps method is a product of cognitive visualization, which is not just an illustration, but also further transformation, rethinking of the subject of study [11, p. 81]. In other words, mind-mapping is an effective a tool for showing the process of thinking and for the development of cognitive abilities, analytical and critical thinking.

The term «mind map» is close to the notion «concept maps», which was first introduced in the 60-70s of the XX century by Joseph Novak, a professor at the Cornell University.

Novak developed the technique of concept mapping as a means of representing the emerging science knowledge of students and intensification the teaching process disciplines. Novak states that meaningful learning involves the assimilation of new concepts and propositions into existing cognitive structures [12]. Concept cards have been used as a tool to increase meaningful learning in the sciences and other subjects

as well as to represent the expert knowledge of individuals and teams in education, government and business. Concept cards, as well as mind maps cards, are a graphical way of providing knowledge, so sometimes they are treated as synonyms.

In our opinion, concept map is one of the types of mind maps. It typically represents ideas and information as boxes or circles, which it connects with labeled arrows, often in a downward-branching hierarchical structure

In the 40s, the American psychologist and professor of psychology at the University of California, Edward Tolman introduced the concept of a cognitive map, which has found extensive application in almost every field of psychology. Tolman introduced this idea when doing an experiment involving rats and mazes. Tolman tried to explain the behavior of rats that appeared to learn the spatial layout of a maze, and subsequently the concept was applied to other animals, including humans.

According to E. Tolman 's ideas, all incoming signals from the environment are processed and transformed by the brain. At the same time in the brain creates a kind of environmental maps, or cognitive maps.

In the wide sense, cognitive maps mean technology of finding a solution to a problem. Cognitive maps can be used to search strategies, case analysis, when developing complex projects, on different stages of training, etc. [13].

Summing up, it can be said that mind mapping is a powerful technique to help visually develop and organize ideas and information. The technique is used to develop new ideas, or to break down and better understand existing information.

Mind maps can be used to explain any notion, to collect, analyze and organize information, to make a non-standard decision, remember complex material, plan and promote projects, develop of intellectual abilities, solve personal problems, etc.

Having conducted a brief overview of existing scientific researches, it can be stated that mind-mapping technique represents itself a set of graphic objects (pictures, signs, images, symbols) that display the essential properties of the studied object/ Starting with a central idea or topic in the middle of the map, branches radiate from the center containing further themes and concepts to be explored – typically in the form of words, short phrases, and images. This gives mind maps a natural organizational structure.

The concept of mind mapping is based on the principle of Radiant thinking. This principle states that brains are radiant and our brains do not think in terms of lines and sentences, but rather in terms of imaginations and association.

At the present moment, mind maps are very popular all over the world. Mind-mapping technology allows you to activate cognitive skills, promote the development of creative thinking, find the most effective solution to the problem or generate new ideas, helps to increases the productivity and generally intensifies the learning process.

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THE PROBLEM OF ECONOMIC EDUCATION OF PRESCHOOL CHILDREN AND SCHOOLCHILDREN

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Abstract. The economic life of the public gradually increases its momentum. The material side has become an integral part of our everyday life. People begin to set the base in the knowledge of the economy from an early age. Learning the basics of economics for children is an important step, as this knowledge will be useful in any case in the future.

Keywords: economic literacy, material well-being, pedagogical process, preschool children, schoolchildren.

ПРОБЛЕМА ЭКОНОМИЧЕСКОГО ВОСПИТАНИЯ ДЕТЕЙ ДОШКОЛЬНОГО ВОЗРАСТА И ШКОЛЬНИКОВ

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Аннотация. Экономическая жизнь общественности постепенно наращивает свои обороты. Материальная сторона стала неотъемлемой частью нашей повседневности. Люди начинают задавать базу в познании экономики с ранних лет. Изучение основ экономики для детей – важный этап, так как эти знания в любом случае пригодятся им в будущем.

Ключевые слова: экономическая грамотность, материальное благополучие, педагогический процесс, дети дошкольного возраста, школьники.

Economic literacy is a skill by which each person makes the right financial decisions leading to financial well-being. Today, increasing the economic literacy of the population has become a priority for both the state and market participants.

An economically literate person should:

- know how to handle money, turn it into capital and increase it;
- control income and expenses [1];
- understand the economic situation in the country [2];
- detect signs of financial fraud;

- fulfill their obligations as a taxpayer;
- be able to work with banking services;
- to understand the features of the protection of personal data and financial information [3].

For a long time, especially before the popularity of the market economy, all people believed that knowledge in the field of finance was necessary only for specialists involved in banking, various businessmen. But in fact, OECD studies were carried out, during which it was determined how people are not prepared for difficulties, namely, for credit debt, unreasonable waste of money, and fraud [3; 4; 5].

In connection with this problem, we can conclude that the formation of a financial culture is one of the modern tasks, the solution of which must begin with children, since it is during this period that interest in the world is actively developing, the basis of culture is being formed. This is a pedagogical problem and it falls on the shoulders of educators, economists, philosophers and psychologists. At the moment, an attempt is being made to introduce financial and economic education. Financial culture is traditions, ideas and norms that show the level of economic literacy of people in the field of financial relations, with the current level of development in the society of the market and institutions that have a material relationship.

With the development of financial culture, children have become more sociable, they have also acquired the ability to use technology, many can do more than an ordinary adult and brainy person. Children begin to face the world of money. A child, being in a family, among his peers, hears various words: goods, products, prices, money, profitable, unprofitable, profit, etc. It is then that reflections begin that economic literacy can even be taught preschooler, while having the right approach. When the basics of financial education are laid in a child, he will be able to understand and perceive more in the future, since preschool age is the most productive for the formation of financial culture.

The world of finance does not seem like a child's play. If you look at the situation when children go to the store with their parents or receive money from their parents or grandparents, we can say with confidence that these are financial and economic relations within the family in which the child is directly involved. If a child realizes the whole essence of financial and economic relations at an early age, starting from 5–6 years old, the skills of logical thinking acquired already at this age will help him in the future not to face the difficulties that are usually encountered financially uneducated people.

The child goes through several stages of familiarization with the culture of finance: the first trip to the store on his own, paying for travel, receiving pocket money.

It is necessary to start teaching a child by getting to know the work of his family and close relatives. This is the best start to explore the world of economics. Then the child will understand for what kind of work they receive a salary and how it is spent. Of course, it is better to consider different options, if possible. Then the child will be able to see several aspects of life and draw various conclusions. Important is the pre-studied economic concepts and terms that can be divided into categories:

1) Money: what kind of money exists, how to spend it, count it, spend it, save it, etc.

2) Needs: what are the needs, opportunities and needs of the individual.

3) Goods: price, purchase, sale, how the price changes and what it depends on, how to determine the quality of the product.

4) Work: acquaintance with professions, labor productivity, wages.

5) Budget: what is it, what are the sources of income.

Psychologists advise starting a conversation about finances from the first manifestation of interest in this issue. Naturally, you will have to speak with the child in his language, in the language of the child, everything will have to be presented in a form that is accessible to him.

A child from an early age should understand that you can't earn all the money. Not all desires can be satisfied and that the money earned should be spent first on the most important thing.

The pedagogical process for the study of economic literacy should be manifested by parents and preferably together with them. There are several ways to increase financial awareness in a child:

– When planning a trip to the store, you can make a list of necessary products. Teach your child to properly focus attention on what is really important. In the store, the parent must adhere to this list, and the child will help collect all the necessary goods. It will be like a game in which it will be possible to avoid persistent requests to buy another toy and make the child think like an adult.

– It is very important to prepare a child for adult life and teach them to choose products, which products are of high quality and at a certain price.

– If a child breaks a toy, don't leave it unattended. A broken toy should tell the child that the money has already been spent on it, and things need to be protected. To get out of this situation, you can try to fix a broken toy, then it will be a good lesson for the child.

There are many other parenting processes in which a child will have fun learning about the adult life of finance. Since the main activity that attracts a child is a game, this means that the basis of economic literacy will be better mastered in a playful way. There are proven financial games:

1) "Shop", "Cashier", "Pharmacy" and many other variations, with the same essence.

The child and his peers or parents take turns acting as seller and buyer. Instead of real money, it can be leaves, candy wrappers, stickers.

2) "Bank"

The game introduces the child to the structure of the banking system. A child and an adult take on the role of a cashier and a visitor who needs to do various manipulations with money. Such role-playing games help the child develop an algorithm of behavior and master the culture of relationships.

3) "Professions"

The child and the parent can play the game in any profession. The parent can talk about his profession and his duties, and the child can repeat it and turn it into a game.

At school age, the pedagogical process is more complex. To attract the attention of a child with such a topic as finance is quite difficult, especially if you deal with it in depth. Nevertheless, a student encounters the world of finance much more often than a preschooler. Here, actions with finances turn into an independent activity. The choice of where to spend the funds is up to the individual. Therefore, it is very important to form a reasonable attitude towards money in a child:

- Decide with your child the exact amount of pocket money. Planning where and what the money will be directed to will protect the child from unreasonable spending in the future.

- Fraud is something none of us is immune from. It is difficult to predict the actions of blackmailers. The child is very irritable in such situations. It is necessary to discuss with the child what needs to be done when you are being blackmailed, how best to keep money so as not to accidentally lose it.

- The child must know that there are some things that he should not buy under any circumstances, even if someone asked him to.

- It's better not to give schoolchildren a lot of pocket money, it's useless. Since children do not know how to properly handle money and can leave it in plain sight.

- Family budgeting is also very important. You can discuss with your child how to save money.

- It is a very big mistake for parents to reward their children for academic performance with money. Market relations should not be where love and trust reign.

Basic economic literacy helps us prepare for difficult life situations. By learning how to manage our funds, we increase income and create reserves to ensure personal safety in case of unforeseen circumstances. Therefore, it is so important to ensure financial stability in society.

When discussing a financial issue with a child, it is important to clarify what money is needed for and how to properly manage it. Each family's experience is unique, so it's best to start a discussion with loved ones. The sooner children understand the issue of finance, the easier it will be for them to manage their income.

At present, work on the introduction of economic efficiency as an academic subject continues in our state and, as a result, it will become an officially compulsory subject of the school curriculum for high schoolers (by order of the Ministry of Education of Russia). Students in social studies lessons will learn how the financial market and its regulatory system works, discuss the causes and consequences of inflation. The program will also include topics related to budget literacy [6; 7]. The features of budgetary regulation and tax structure, personal budget, current schemes of fraudsters, as well as ways to counter them will be considered. Economic literacy for schoolchildren and for children in general should become part of their knowledge, since learning financial concepts in adulthood is much more difficult.

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