

THE WORLD OF SCIENCE WITHOUT BORDERS

**PROCEEDINGS
OF THE 6th INTERNATIONAL SCIENTIFIC AND PRACTICAL
CONFERENCE FOR YOUNG RESEARCHERS**

**February 15, 2019
Tambov**

МИР НАУКИ БЕЗ ГРАНИЦ

**МАТЕРИАЛЫ
6-й МЕЖДУНАРОДНОЙ НАУЧНО-ПРАКТИЧЕСКОЙ
КОНФЕРЕНЦИИ МОЛОДЫХ УЧЁНЫХ**

**15 февраля 2019 года
Тамбов**



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FOREWORD

The traditional annual conference for graduates and post-graduate students “**The World of Science without Borders**” is gaining momentum. This year we are holding the sixth event in a row and are pleased to note that the number of participants is on the steady rise. The geographical frontiers of this forum are expanding. It is great honor for us to welcome all the contributors, who are willing to share their research findings with their peers and to exchange ideas.

The mission of the conference is to remove the barriers on the way of disseminating innovative projects among young scientists of the whole world. The vehicle of transporting the “new blood” is the English language serving the purpose of removing all hurdles in the academic communication and firmly positioning Russian science on the globe.

More than 100 papers have been included in this volume featuring the scope of research interests of students at Tambov State Technical University and partner institutions including young foreign scholars. This selection will be of interest for everybody who is keen on keeping in touch with the science of the young in Russia.

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УДК536.461
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STUDY OF ELECTRON FLAME ENERGY IN PULSED ELECTRIC FIELDS OF HIGH VOLTAGE

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Abstract

The effect of pulsed electric fields of high voltage on the flame ionization process is considered. The voltage was selected within the range from 100 000 to 1 000 000 V/m. To find the kinetic energy of electrons the formula was derived. It was used to calculate values, and a graph was plotted with time dependencies on kinetic energy for data analysis. The purpose of the study was to consider the processes of the impact of pulsed electric fields on the electron energy.

Keywords: electron energy; electric fields of high voltage; pulse action.

As it is known, in order to get the maximum benefit from the combustion of fuel, special conditions are necessary and one of the methods to increase the efficiency of fuel combustion is an impact of high voltage electric field on the flame. In this regard, the processes of the impact of pulsed electric fields on the electron energy were considered.

In the first approximation we will not take into account the interaction of electrons with atoms and ions as well as the interaction of electrons with each other.

Kinetic energy is determined by the formula:

$$E_k = \frac{m * v^2}{2} \quad (1)$$

where E_k is kinetic energy, m is particle mass, v^2 is particle velocity

If we find the speed, we can get the expression:

$$v = \sqrt{\frac{2E_k}{m}} \quad (2)$$

Since the velocity remains unknown we find the particle acceleration:

$$a = F * m \quad (3)$$

Through acceleration we express speed taking the value: $v_0 = 0$

$$a = \frac{v - v_0}{t} \rightarrow v = a * t \quad (4)$$

We get the inequality:

$$\frac{F}{m} = \frac{a}{t} \quad (5)$$

and then we make the replacement of a by v we get:

$$\frac{F}{m} = \frac{v}{t} \quad (6)$$

and express speed again:

$$v = \frac{F * t}{m} \quad (7)$$

If we insert this formula in the previously obtained expression 2, we get:

$$\sqrt{\frac{2E_k}{m}} = \frac{F * t}{m} \quad (8)$$

To get rid of the root, we use the following equation:

$$\frac{2E_k}{m} = \frac{F^2 * t^2}{m^2} \quad (9)$$

We shorten m and determine E_k from here:

$$E_k = \frac{F^2 * t^2}{2m} \quad (10)$$

It is known that the force with which the energy of the electric field acts is:

$$F = E_V * q \quad (11)$$

where E_V - voltage of the electric field, and q - electron charge

$$E_k = \frac{(E_V q)^2 * t^2}{2m} \quad (12)$$

So we can find the energy of the electric field acting on the electron.

Table 1. The energy of the electric field, calculated for a given voltage and time

$t=5 * 10^{-5}$				
$E_V, \text{V/m}$	100000	300000	700000	1 000000
E_k, J	$3.513 * 10^{-7}$	$3.162 * 10^{-6}$	$1.721 * 10^{-5}$	$3.513 * 10^{-5}$
$t=1 * 10^{-3}$				
$E_V, \text{V/m}$	100000	300000	700000	1 000000
E_k, J	0.00014	0.001	0.007	0.014

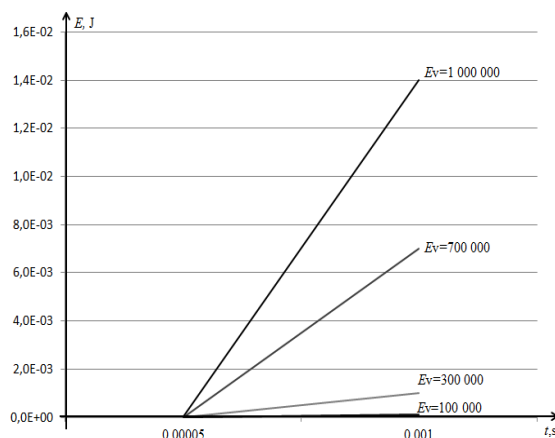


Figure 1 - Dependence of time on the kinetic energy for an electron under the action of different values of voltages of the electric field

The analysis of the data showed that to obtain the energy values of electrons capable of ionizing the neutral components of the flame, the exposure time of the field is sufficiently less than 10^{-6} s. A reduction in exposure time will allow getting the same performance indicators for fuel combustion at lower cost.

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ИССЛЕДОВАНИЕ ЭНЕРГИИ ЭЛЕКТРОНА ПЛАМЕНИ В ИМПУЛЬСНЫХ ЭЛЕКТРИЧЕСКИХ ПОЛЯХ ВЫСОКОЙ НАПРЯЖЕННОСТИ

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Аннотация

Рассмотрено воздействие импульсных электрических полей высокого напряжения на процесс ионизации пламени. Напряжение выбрано в пределах от 100 000 до 1 000 000 В/м. Для нахождения кинетической энергии электронов вывели формулу из которой получили рассчитанные значения и для анализа данных построен график зависимости времени от кинетической энергии. Цель исследования рассмотреть процессы воздействия импульсных электрических полей на энергию электронов.

Ключевые слова: энергия электрона; импульсное воздействие; электрические поля высокого напряжения.

A LOGISTICS APPROACH TO PROVIDING END CUSTOMERS WITH BIOFUEL

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Abstract

The main raw materials for the generation of thermal energy are gas, oil, coal, and wood. The main disadvantages of each of these types of raw materials are their cost and a negative impact on the environment. Electricity and heat producers in most countries of Western Europe are increasing the consumption of alternative fuels from biomaterials. The state encourages manufacturers to switch to the use of environmentally friendly biofuels. Russia has great potential in the form of large volumes and diversity of raw materials for the production of biofuels. But the production of biofuels in Russia has not gained high rates. One of the reasons for this is the high cost of delivery of the product to the final consumer. Consideration of the delivery from the point of view of the logistic approach and the development of the information and control delivery system will help to solve the problems that arise.

Keywords: biofuel, hygroscopicity, information management system, logistics, fuel pellets, transportation.

Introduction

The topic of my research is the application of a logistic approach in providing consumers with biofuel. Currently, the issue of ecology is very relevant. Many scientists are looking for alternative fuels for various fields of activity. Biofuels in the form of fuel pellets have become widespread. Fuel pellets are an alternative source of heat energy, which is obtained from the waste of timber industry, agricultural activities and household activities. Represent the dried pressed biomaterial. The raw materials for their production are waste of various fields of activity - sawdust of the timber industry, cake and straw from the processing of vegetable agricultural products, waste products of poultry houses and livestock farms, etc. This raw material is cheap and affordable. Pellets are an excellent alternative to classic types of fuel for space heating. Table 1 presents the comparative characteristics of various types of fuel.

Table 1 - Comparative characteristics of different types of fuel

Fuel type	Heat value, MJ / kg	Sulfur content,%	Ash content,%
Hard coal	20	2	20
Chicken litter pellets	18	0.1	8
Natural gas	36	0.0	0
Wood pellets	17,5	0.1	1
Straw granules	14.5	0.2	4

From the table we see that biofuels are only slightly inferior to traditional fuels and

can be used with the same efficiency.

The production process itself is also not costly. But for the end user biofuel is not cheaper than the traditional type of fuel. The bulk of the costs are the costs associated with logistics. Logistics: transporting biomass even in the form of pellets and briquettes is expensive. By applying the logistic approach and the possibilities of informatization, it will be possible to reduce the costs associated with transportation and storage.

Literature Review

The use of a logistics approach to the delivery of cargo has been considered by many scientists. For example, Zarudnev Dmitry Ivanovich considered the tasks of applying a logistics approach to managing the process of delivery of goods. Understand the advantages and disadvantages of various service options. G.E. Priorov and S.P. Karpachev were engaged in the issues of optimal planning for the delivery of biofuels using a different delivery method - transit and storage. They proposed costing methodologies for various modes of supply. A group of authors - Pshinko A.N., Gabrinets V.A., Kuznetsov V.G. – were engaged in the study of the use of regional renewable biological resources for the heating system. They addressed a number of issues:

- the possibility and cost of transition from the use of natural gas to the use of biofuels. As biofuel, it is proposed to use cereal straw;
- the region's capacity to provide raw materials for boiler houses;
- assessment of the cost of transporting biofuels in the region;
- assessment of the energy potential of this raw material and its use as an alternative fuel.

As a result, the main directions of state policy on stimulating enterprises to switch to biofuel were identified. The cost of one ton-kilometer of transportation of raw materials from the place of production to the place of consumption was calculated. The optimal delivery distance has been determined. It is proved that the energy efficiency of biofuels is not worse than traditional fuels.

Much attention is paid to the delivery of biofuels. A large number of scientific papers devoted to the effectiveness of the use of biofuels, as an energy source. But the question of preserving consumer characteristics of fuel pellets from waste poultry factories during transportation has not been studied enough.

Transport characteristics of fuel pellets

The key logistic functions are transportation and management of stocks, processes, information and material flows.

To solve the problem of transportation it is necessary to rely on the peculiarities of the transported cargo. Based on the characteristics of the goods, choose the delivery scheme.

Transport characteristics of fuel pellets include high bulk density, homogeneous consistency of the product, high degree of abrasion and high hygroscopicity.

These characteristics are both a positive point for the organization of transportation and negative. A positive point is the high bulk density and homogeneity of the product. Due to these characteristics, the capacity of the car body is used most efficiently. But

such characteristics as abrasion and hygroscopicity impose restrictions during transportation. Abrasion (strength) is the ability of pellets to maintain their shape and weight during physical exposure. The higher the abrasion is, the higher the quality of the pellets is. Hygroscopicity is the ability of pellets to absorb moisture from the environment. This property is also a limiting factor when transporting pellets.

The second side of the logistics approach is management. When managing the movement of material and information flows, producers and carriers face the following tasks: determining the optimal volumes and directions of material flows; forecasting demand and production volumes, forecasting the volume of traffic; organization of warehousing, packaging, etc.

Influence of fuel pellet properties on transportation

Compared with wood or coal, pellets are very convenient to use and have several advantages, including its reasonable price, high efficiency and environmental friendliness.

In particular, the production of pellets from the litter product of poultry farms contributes to the solution of several problems: the disposal of large quantities of poultry waste, the production of environmentally friendly biofuels, both for private use and for large CHP plants, and the production of organic fertilizer. Another positive aspect is the natural, constant renewability of raw materials.

Based on the above properties of the fuel pellets, we draw conclusions about the features of the organization of their transportation.

The high bulk density makes it possible to transport this bulk product relatively easily over long distances. The bulk density of pellets for transportation and storage is 650 kg / m³. Thanks to this indicator, the efficiency of using the carrying capacity of the vehicle will be high.

The uniformity of the consistency of the fuel pellets allows you to automate the processes of loading and unloading, as well as the processes of burning pellets.

Abrasion of granules ensures the ability to transfer pellets transport without losing their geometric properties. The abrasion of the product serves as a restriction when transporting through the terminal. This is due to the need to reload the goods. Any overload increases the number of small particles of pellets that are unsuitable for burning; one overload of a 25 kilogram bag (for example, a warehouse machine) increases the amount of waste by about 0.15-0.3% of the total weight of the bag. The best delivery method will be direct delivery from the warehouse of the manufacturer to the warehouse of the consumer.

European standards set stringent requirements for the production of pellets on the parameter of abrasion.

The high hygroscopicity of pellets makes it necessary to pay great attention to packaging materials. They must not pass moisture and preserve the integrity of the physical impact during loading and unloading and transportation of pellets. When saturated with moisture, fuel pellets lose their burning ability. And this is the main purpose of the fuel pellets. To avoid loss of consumer qualities will help the right choice of packaging and mode of transport. In Europe, it is widely used, especially in Germany and Austria, specialized transport for the delivery of pellet autos or auto-pneumatic unloading (in Germany it is called Silowagen, i.e. car-silo, or Pelletslander - pellet truck).

Most orders for the delivery of pellets to users of household boilers are performed directly by such transport. In Russia, there is no such transport.

Creating an information management system that controls the size of supplies, the timing, qualitative and quantitative characteristics of biofuels will simplify the logistics of supply. This system will include the development of a software-oriented complex that will work with both suppliers and consumers. That is, to predict and plan the supply of pellets, taking into account the effective level of the stock. It is important to control the process of transportation of pellets to the ultimate customer and to ensure the safety of qualitative and quantitative characteristics of the cargo. The logistic approach includes two aspects: transportation and management. For high-quality transportation, you must take into account the characteristics of the cargo, its transport characteristics. These features will dictate which method of delivery to choose (direct or via a staging post), which mode of transport to choose (indoor or outdoor) and so on. When managing, the tasks of optimizing stocks and supply volumes, forecasting supply and demand should be solved. The development and implementation of an information management system for the process of cargo transportation will allow solving these tasks.

Conclusion

Many countries are in search of alternative fuels. Special requirements are imposed on the environmental friendliness of raw materials. The solution to this problem can be the use of biofuels from various natural, environmentally friendly and safe raw materials. A large number of authors have been studying the logistic approach to managing the delivery of goods. The costs of delivering biofuels to end-users with different modes of supply have been studied. But the question of preserving consumer characteristics of fuel pellets from waste poultry factories during transportation has not been studied enough. Transportation is the main link in the logistics of the supply of goods. However, without targeted monitoring and control, it is not possible to achieve efficient supply. In this regard, it is necessary to develop an information management system for the pellet delivery process. Consolidation of the logistic approach and information management system will improve the energy efficiency of boiler houses (due to regular supply of pellets in the required quantity), increase the level of customer service, and reduce transport costs in the final cost of the product.

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ЛОГИСТИЧЕСКИЙ ПОДХОД К ОБЕСПЕЧЕНИЮ БИОТОПЛИВОМ КОНЕЧНЫХ ПОТРЕБИТЕЛЕЙ

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Аннотация

Основным сырьем для выработки тепловой энергии являются газ, нефть, уголь, лес. Основными недостатками каждого из этих видов сырья является их стоимость, а также негативное влияние на окружающую среду. Производители электрической и тепловой энергии в большинстве стран Западной Европы наращивают объемы потребления альтернативных видов топлива из биоматериалов. Государство стимулирует производителей на переход к использованию экологически чистого биотоплива. Россия имеет большой потенциал, в виде больших объемов и разнообразия видов сырья для производства биотоплива. Но производство биотоплива в России не набрало высоких темпов. Одной из причин тому является высокая стоимость доставки продукта до конечного потребителя. Рассмотрение доставки с точки зрения логистического подхода и разработка информационно-управляющей системы доставки поможет решить возникающие проблемы.

Ключевые слова: биотопливо, гигроскопичность, информационно-управляющая система, логистика, топливные пеллеты, транспортировка.

DETERMINATION OF THICKNESS OF THE EPOXY COATING ON A STEEL SAMPLE

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Abstract

Calculation expressions are obtained for determining the thickness of a polymer coating on a metal substrate by a nondestructive method. Values of an epoxy coating thickness on the steel samples are defined experimentally by means of the non-destructive thermal method.

Keywords: mathematical model, non-destructive testing, protective coating, the thermal conductivity, thermal method, thickness.

Introduction

Modernization of known methods and creation of new efficient methods and testing devices to determine the quality of the protective coating are demanded and relevant because of complexity of the known methods and large volumes of practical application [1].

The operability of the mathematical model of distribution of heat in two-layer objects which allows controlling temperature in case of local regularization of heat fluxes from superficial operation of the flat heater of constant power is investigated in this work [2, 3].

Experimental research

Values of thickness of an epoxy coating on the steel samples are experimentally determined by the developed method of nondestructive control.

Thermal influence of constant power is applied in a method of nondestructive control of thickness of two-layer polymeric and metal products. The flat round heater provides this thermal influence. The disk is built in a substrate of the measuring probe. Application of this system is proved and fully presented in works [2, 3].

The system consisting of limited and semi-limited bodies is considered for the purpose of increase in accuracy of determination of thickness of a polymeric coating in case of nondestructive control of two-layer materials.

The limited core is given to contact with a semi-limited core. Thermophysical properties of cores (thermal activity ε , heat conductivity λ , thermal diffusivity a , thermal capacity c) are various. The source of heat of constant power begins to act at initial timepoint on the free end of a limited core. The action continues throughout all process of heating. The problem of distribution of heat in the studied system can be written mathematically in the form of a direct problem of heat conductivity which solution for the first layer has an appearance [3]:

$$T_1(0, \tau) = \frac{2 \cdot q}{\sqrt{\pi}} \cdot \frac{\sqrt{\tau}}{\varepsilon_2} + \left(1 - \frac{\varepsilon_1^2}{\varepsilon_2^2}\right) \cdot \frac{q \cdot h_1}{\lambda_1} .$$

The expression represents a linear dependence of the following kind:

$$T(0, \tau) = b_1 \sqrt{\tau} + b_0,$$

where $b_1 = \frac{2q}{\sqrt{\pi \varepsilon_2}}$; $b_0 = \left(1 - \frac{\varepsilon_1^2}{\varepsilon_2^2}\right) \cdot \frac{qh_1}{\lambda_1}$.

The received solution in the form suitable for use on the working area of a thermogram (at a regularization of heat fluxes), was used for receiving mathematical expressions for calculation of thickness of the protective coating on the metal bases.

As the first coat of an object is low-diathermic, and the second is high-diathermic, i.e. $\lambda_1 \ll \lambda_2$, then $\varepsilon_1 \ll \varepsilon_2$. Therefore,

$$b_0 = \frac{qh_1}{\lambda_1}.$$

It follows from this expression that:

$$h_1 = \frac{\lambda_1 \cdot b_0}{q}.$$

Thus, it is possible to determine the coating thickness, if we know knowits heat conductivity in case of one-dimensional distribution of heat and the mode of regularization, carrying out calibration measurements.

Thickness of epoxy coating ($\lambda_1 = 0,13 \text{ W}/(\text{m}\cdot\text{K})$) on a steel sample was determined for experimental check of operability of the method. Three samples with various thickness of coatings were tested at the power of thermal influence on the heater – $3900 \text{ W}/\text{m}^2$ (heater radius – 0.004 m), a time step of measurement of temperature $\Delta\tau = 0.25 \text{ s}$.

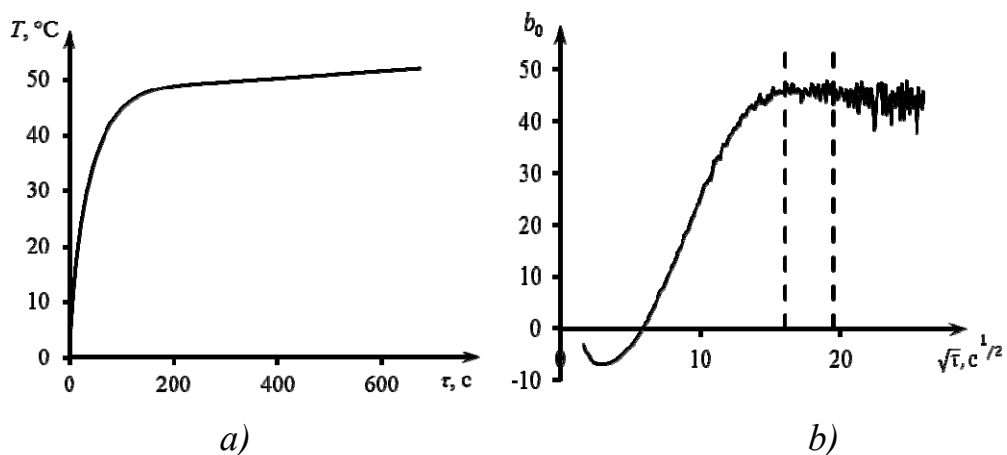


Figure 1 – Thermogram (a) $T_1 = f(\tau)$; Dependence $b_{0o} = f(\sqrt{\tau})$ (b).

The example of the thermogram (a) registered during the experiment and the schedule of dependence $b_0 = f(\sqrt{\tau})$ (b) which shows a change of the coefficient of the mathematical model b_0 describing the thermogram on the working site are presented in Fig.1.

Table 1 – Results of experiments

No of experiment	h_{1m} , mm	b_0	h_1 , mm	$\delta = \left \frac{h_{1m} - h_1}{h_{1m}} \right , \%$
1	0.14	39.66	0.132	5.7
2	0.16	44.28	0.158	1.3
3	0.20	46.38	0.193	3.5

Here: h_1 is the coating thickness determined as the difference of thickness of a product with a coating and the product thickness without coating measured by means of an electronic caliper.

Conclusion

The results of experiments are presented in table 1. They confirm operability of the method of nondestructive control of thickness of low-heat-conducting coatings on metal products. The relative error of determination of thickness of a coating does not exceed 6%.

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ОПРЕДЕЛЕНИЕ ТОЛЩИНЫ ЭПОКСИДНОГО ПОКРЫТИЯ НА ИЗДЕЛИИ ИЗ СТАЛИ

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Аннотация

Получены расчетные выражения для определения толщины полимерного покрытия на металлическом основании неразрушающим способом. Экспериментально определены значения толщины эпоксидного покрытия на стальных основаниях неразрушающим тепловым методом.

Ключевые слова: защитное покрытие, математическая модель, неразрушающий контроль, тепловой метод, теплопроводность, толщина.

УДК 621.396.676
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SYNTHESIS OF FRACTAL EMITTERS FOR DIGITAL ANTENNA SYSTEMS BROADBAND WIRELESS ACCESS

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Abstract

This article discusses the prospects of using fractal antennas in wireless broadband networks of IEEE 802.11 (Wi-Fi) and other antennas, which allow solving the problems of energy efficiency of the system, expanding the coverage area and providing high speed and stability of data transmission.

Key words: fractal antennas, Wi-Fi, wireless networks

Introduction

At present, to create compact antenna systems and improve the electrodynamic characteristics in wireless broadband networks of IEEE 802.11 (Wi-Fi) standard we need effective antenna systems that can solve this problem. One of these systems is the use of radiators based on fractal antennas.

Fractal antenna is an antenna, the active part of which has the form of a self-similar curve or any other similar figure consisting of similar segments.

First time, these principles were applied to antennas 1990 by an American engineer Nathan Cole, giving copper a form of self-similar broken curve known as the Koch curve [1]. During the study of antennas, it was found that by using fractals it is possible to significantly reduce the size of the antenna, and to extend the range of operating frequencies, therefore, to obtain a broadband antenna. This made it possible to put antenna data into practice in mobile devices, thanks to its compactness, as well as in wireless data networks such as Bluetooth and Wi-Fi.

Literature review

A unique feature of the fractal antenna is theoretically infinite compaction of a limited area of space by the antenna geometry, and as a result, additional resonant frequencies in the operating wavelength range, often exceeding the external geometric dimensions of the fractal compact structure. Also, due to this, small dimensions of the antenna are achieved.

Self-similarity of the structure and scaling effects of fractal structures allow providing unique characteristics of uniformity of the radiation pattern in a wide range of frequencies, in comparison with standard types of antennas, while minimizing the linear dimensions of the antennas, which is especially critical for the frequency ranges of long-range communication [2].

A striking example of this is the Sierpinski sieve, made as a car antenna, executed on a conductive film placed on the windshield of the cabin. This design allows, if necessary, to receive in all known frequency ranges of FM broadcasting, to carry out radio telephone communication, and provide wireless access to broadband networks.

The use of fractal sets contributes to the improvement of existing technologies. For example, making a frame antenna on fractal technology will significantly increase the

resistance of the frame antenna at frequencies below the resonance, increase aperture efficiency and simplify the task of its coordination for the needs of radio direction finding and frequency monitoring [3].

The Dipole formed by the law of the German Minkowski polyline is very close in its properties to the antenna based on the Koch fractal. When constructing this antenna instead of a system of triangles on a straight line, meanders decreasing in size are formed. Under first bend of a straight dipole, its gain increases. Subsequent iterations practically do not change the gain, but the range of operating frequencies of the dipole expands, and the antenna itself becomes much more compact [4]. As in the case of the Koch curve, only the first 5-6 steps are effective: to bend the wire further, you will have to reduce its diameter, and this will increase the antenna resistance and lead to loss of gain.

With the complex application of fractal technologies, it is possible to reduce the consumption of materials and the mass of antenna systems, especially if the emitters are combined in an antenna array [2]. This can significantly reduce their mutual influence by increasing the inter-element gap, as well as increase the density of the packaging elements in order to expand the scanning spectrum.

Conclusion

Thus, when the use of with fractal-type antennas in wireless broadband networks will provide high speed and stable data transmission, as well as provide system broadband, increase the coverage area of wireless networks.

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СИНТЕЗ ФРАКТАЛЬНЫХ ИЗЛУЧАТЕЛЕЙ ДЛЯ ЦИФРОВЫХ АНТЕННЫХ СИСТЕМ ШИРОКОПОЛОСНОГО БЕСПРОВОДНОГО ДОСТУПА

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Аннотация

Рассмотрены перспективы применения фрактальных антенн в беспроводных сетях широкополосного доступа стандарта IEEE 802.11 (Wi-Fi) и других, позволяющих решать задачи обеспечения энергоэффективности системы, расширения зоны покрытия, а так же обеспечить высокую скорость и стабильность передачи данных.

Ключевые слова: фрактальные антенны, Wi-Fi, беспроводные сети.

ORGANIZATION OF THE PROCESS OF COMPUTER MODELING IN MULTI-DIMENSIONAL THERMAL SYSTEMS

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Abstract

Computer or simulation modeling is a simulation in which a logical-mathematical model of an object under investigation is an algorithm for the functioning of an object, implemented as a software package for a computer.

Keywords: logical-mathematical model, algorithm for solving model equations, efficiency of operation of the facility, assessment of the adequacy, strategic planning, interpretation.

Introduction

In the process of computer simulation, the researcher interacts with three objects: a system - real, designed and imagined, a mathematical model, and a computer program. A computer program implements an algorithm for solving model equations.

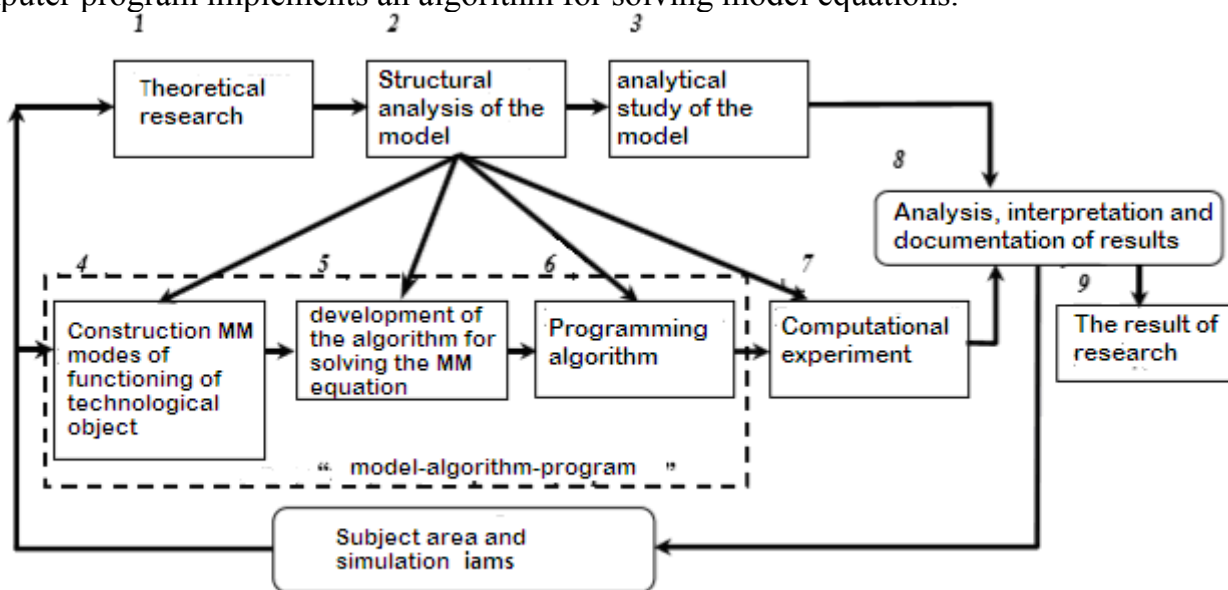


Figure 1 - Computer simulation scheme

Computer simulation process structure

The purpose of computer simulation is the optimization and design of real technological systems.

The whole process of computer simulation can be divided into the following stages:

- the definition of an object; the establishment of boundaries, restrictions, and measures of the efficiency of an object's functioning;
- formalization of the object, that is, the construction of the model - the transition

from a real subject to some logical scheme;

- data preparation - selection of data necessary for building a model, and presenting them in the appropriate form;

- development of a modeling algorithm and computer programs;

- assessment of adequacy - increase to an acceptable level of confidence level, with which one can judge about the correctness of the conclusions about the real object, obtained on the basis of reference to the model;

- strategic planning - planning a computational experiment that should provide the necessary information;

- tactical planning, determining the method of conducting each series of tests envisaged by the experiment plan;

- experimentation of the simulation process in order to obtain the desired data and sensitivity analysis;

- interpretation - drawing conclusions from data obtained by imitation;

- implementation - practical use of the model and simulation results;

- Documentation - recording the progress of the process and its results, as well as documenting the process of creating and using the model.

This model and the stages presented are characteristic of the outcome of events when the solution of the problem is best implied. In a situation where such an outcome is not possible, the search for the most optimal solution is necessary.

Conclusion

Thus, energy saving management in industrial projects is aimed at the choice of energy-saving measures and technologies with maximum efficiency to achieve the set targets with resource constraints. At the same time, the efficiency indicator of management processes should be calculated taking into account its technical, economic, social and environmental component in the conditions of uncertainty of the project processes and the external environment.

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ОРГАНИЗАЦИЯ ПРОЦЕССА КОМПЬЮТЕРНОГО МОДЕЛИРОВАНИЯ В МНОГОМЕРНЫХ ТЕПЛОВЫХ ОБЪЕКТАХ

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Аннотация

Компьютерное или имитационное моделирование – это моделирование, при котором логико-математическая модель исследуемого объекта представляет собой алгоритм функционирования объекта, реализованный в виде программного комплекса для компьютера

Ключевые слова: логико-математическая модель, алгоритм решения модельных уравнений, эффективность функционирования объекта, оценка адекватности, стратегическое планирование, интерпретация.

SYNTHESIS OF A DUAL-RIDGED HORN ANTENNA FOR SYSTEMS OF HYBRID BROADCAST BROADBAND TV

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Abstract

The main aspects of the analysis and synthesis of a dual-ridged horn antenna are considered, the results of the obtained antenna for Hybrid Broadcast Broadband TV.

Keywords: waveguide, radiation patterns, dual-ridged horn antenna, Hybrid Broadcast Broadband TV.

Introduction

The use of new broadcast standards has become possible with the rapid development of information technologies that have penetrated into all spheres of human life.

Hybrid Broadcast Broadband TV (HbbTV) has arisen in connection with the unification of the TV with the global Internet. The development of hybrid digital terrestrial television currently solves a number of problems and gains advantages over the analog one: a reduction in transmitter power, a significant increase in the number of television programs transmitted in the same frequency range, an improved image and sound quality of television programs, and the creation of high-definition television.

The main aspects of analysis and synthesis

To implement this technology, it is proposed to use high-performance antenna systems, which will expand the coverage area, increase throughput with a minimum amount of costs.

One can use a dual-ridged horn antenna as such antenna systems (Fig. 1).

A horn antenna is a metal structure, which consists of an expanding (variable cross-section) waveguide with a radiating open end.

A horn antenna is usually driven by a waveguide that is connected to the end of the horn.

Dual-ridged horn antennas are broadband and are perfectly consistent with the power line. The strip of a horn antenna is determined by the physical properties of its excitation waveguide.

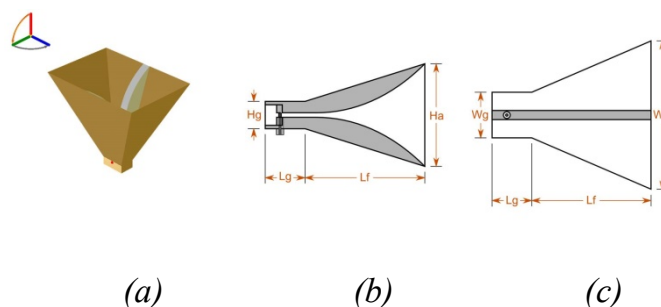


Fig.1 - View of dual-ridged horn antenna (a), comb structure type (b), horn type (c)

Table - Antenna Parameters

Name	Description	Value
H_g	Waveguide height	28.4 mm
L_g	Waveguide length	15.6 mm
L_f	Flare length	160 mm
H_a	Aperture height	140 mm
W_g	Waveguide width	44.85 mm
W_a	Aperture width	200 mm

Based on the geometrical dimensions given in the Table, we build a model in the Altair FEKO (Fig. 2).

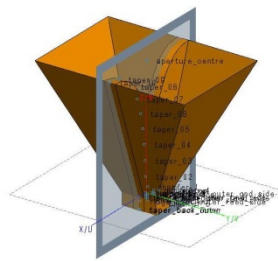


Figure 2 – 3D model of dual-ridged horn antenna

Analytical expressions of field-normalized radiation patterns in polar and Cartesian coordinate systems:

- *E plane*
$$F_E(\theta) = \sin\left(\frac{\pi a \sin\theta}{\lambda}\right) / \left(\frac{\pi b \sin\theta}{\lambda}\right) \quad (1)$$

- *H plane*
$$F_H(\theta) = \cos\left(\frac{\pi a \sin\theta}{\lambda}\right) / \left(1 - \left(\frac{\pi b \sin\theta}{\lambda}\right)^2\right) \quad (2)$$

To construct normalized radiation patterns for field strengths in the E and H planes in the polar coordinate system.

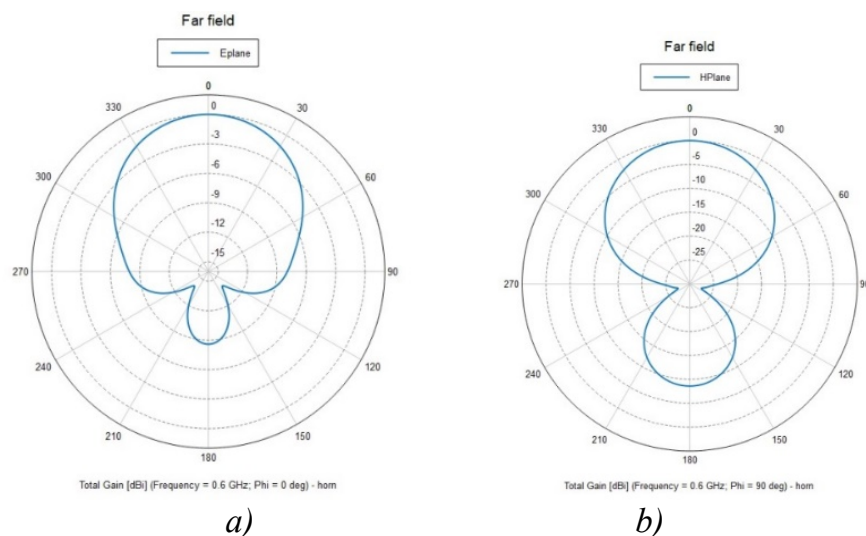


Figure 2 - Normalized radiation patterns in field strengths in the E (a) and H (b) planes in the polar coordinate system

Conclusion

The use of dual-ridged horn antennas for systems of Hybrid Broadcast Broadband TV makes it possible to reduce the transmitter power, improve the quality of the sound and television programs received, and create high-definition television, due to the extended frequency range, low VSWR, high input power.

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СИНТЕЗ ДВУХГРЕБНЕВОЙ РУПОРНОЙ АНТЕННЫ ДЛЯ СИСТЕМ ЦИФРОВОГО ГИБРИДНОГО ЭФИРНОГО ТЕЛЕВИДЕНИЯ

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Аннотация

Рассмотрены основные аспекты анализа и синтеза двухгребневой рупорной антенны, приведены результаты работы полученной антенны для цифрового гибридного эфирного телевидения.

Ключевые слова: волновод, диаграмма направленности, двухгребневая рупорная антенна, цифровое гибридное эфирное телевидение.

CALCULATION OF RELIABILITY OF ELECTRONIC AND MICROPROCESSOR SYSTEMS

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Abstract

The article discusses the problem of reliability of electronic equipment. Three stages of calculating the reliability index of electronic equipment are considered: an approximate calculation, a calculation taking into account operating conditions, and a revised calculation. The types of harmful external influences that lead to the failure of electronic equipment are identified.

Keywords: radio electronic equipment, approximate calculation; reliability of constructed object, operating conditions of the equipment, revised calculation.

Reliability is closely related to the various sides of the process of operating technical objects. At the same time, reliability means the property of an object to perform specified functions, keeping in time the values of the established operational indicators within the specified limits, corresponding to the specified modes and conditions of use, maintenance, repairs, storage and transportation.

The emergence of failures depends on a number of random reasons; therefore the theory of reliability applies probabilistic methods of research.

The reliability of electronic equipment (RE) is largely determined by the reliability of the elements of the electrical circuit (EC) and their number. For this reason, the accuracy of calculating the reliability indicators of the designed object with respect to failures caused by violations of the electrical circuits is of great importance.

We can distinguish three stages of the calculation of the reliability index: approximate calculation, calculation taking into account the operating conditions and the updated calculation.

An approximate calculation is carried out in order to verify the ability to fulfill the requirements of the technical specifications for reliability

Calculation of reliability of the constructed object takes into account the operating conditions of the equipment, the influence of mechanical effects, the altitude and climatic factors produced using correction factors for failure rates.

Refined calculation of reliability indicators is made if the construction of the object takes into account the deviation of the electrical load of the power system and the surrounding temperature from the nominal

Statistics show that 60% of all failures are due to violations of electrical radio electronic components of the concept, 30% due to construction errors and 10% due to violations of the manufacturing and assembly technology.

Technical facilities during operation experience various harmful external influences. These harmful effects may be subjective or objective. Subjective influences

are committed due to improper actions of people. Any, even a fully automated device requires periodic inspection and repair work, that is, exposed to people. At the same time, wrong actions of people due to lack of knowledge, skill, carelessness, as well as poor organization of work can lead to failures. For example, the failure of a technical object may occur due to improper adjustment, violation of the order, violation of the rules of switching on and off, methods and amount of maintenance work. Along with negative subjective factors, positive ones may also act, for example, the activities of inventors and rationalizers.

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РАСЧЕТ НАДЁЖНОСТИ РАДИОЭЛЕКТРОННЫХ И МИКРОПРОЦЕССОРНЫХ СИСТЕМ

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Аннотация

Рассмотрены три этапа расчета показателя надёжности радиоэлектронной аппаратуры - прикидочный расчет, расчет с учетом условий эксплуатации и уточненный расчет. Выделены типы вредоносных внешних воздействий, приводящих к отказу радиоэлектронной аппаратуры.

Ключевые слова: радиоэлектронная аппаратура, приблизительный расчет, расчет надёжности построенного объекта, уточненный расчет.

OCCUPATIONAL SAFETY AND ENVIRONMENTAL ENGINEERING

УДК 62-783

ББК 30H

ENSURING SAFETY WHEN WORKING AT HEIGHT

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Abstract

The purpose of this study is to analyze a set of measures to ensure the safety of working at heights. The study will consider the range of possible risks of working at heights, depending on the specifics of the work. The relevance of the study is that employees tend to set when working at heights. This as a result, it is necessary to develop a set of measures to ensure safety when working at heights by upgrading old technologies and the developing of new ones.

Keywords: personal protective equipment (PPE); working at height.

Introduction

According to the statistics for the period of January to October 2017, the Russian Labor Inspectorate recorded 876 industrial accidents. The number of victims who died in these incidents was 1025 people, and from January to October 2018, 920 workers were injured in 1180 industrial accidents.

In medical practice, a fall from a height is one of the most complicated diagnostics types of mechanical injury. This type of injury is rare and does not exceed 6% of the total number of cases of mechanical injury with a fatal outcome.

According to the analysis of injury statistics, the following groups of injuries can be distinguished in various combinations:

- 1) injuries received as a result of strikes on protruding parts of the object from which the fall occurs;
- 2) injuries caused by the impact of the body on the landing surface, which may be represented by external injuries and fractures of the skeleton bones;
- 3) injuries resulting from the displacement of the victim after the fall;
- 4) injuries caused at the time of impact on the landing surface.

The most obvious injuries when falling from a height are bone fractures and bruises.

According to the results of a three-year observation of the Russian Labor Inspectorate, the most frequent variant of the body position at the time of falling down was the lateral surfaces of the body - 31.1%. The next in terms of frequency of occurrence are the fall options on the lower limbs - 20%, on the head - 16.1%, on the back surface of the body - 13.9%, on the front surface of the body - 11.1%, on the buttocks - 1.7%. Indications of body position at the time of landing are absent in the conclusions in 6.1% of cases. [1]

The data summarized for 2015–2018 showed that the fractures arising from this type of injury were distributed as follows (Table 1):

Table 1 -Frequency of accidents when working at heights

Injured body part	Number of cases
body	74.4%
limbs	47.2%
head	43.3%
spine	23.3 %

Over the entire study period, the most frequent causes of death were traumatic shock and blood loss - 91 cases (50.5%); in 35 cases (19.6%) complications were represented by congestive pneumonia, brain edema.

Risk factors

About 30% of all accidents occur when a worker falls from a height - mainly due to the fact that employees forget to use mandatory personal protective equipment and safety equipment. Persons performing work at heights may be affected by such dangerous and harmful factors as weather conditions (wind speed, fog, etc.); electric shock; either too high or too low temperature; problems of mobility and access; hazards associated with work at heights.

These conditions must be taken into account before and during any work at heights. The order of work is subject to change, and the work should be suspended if these conditions create a risk for people performing work at height or other people who are near the place of work. The competent person issuing the work permit allows an assessment of the risks associated with any changes in weather conditions during work at heights and, if necessary, makes the appropriate changes to ensure the safety of personnel.

Causes

The main causes of falling from heights include insufficient training of staff and competent persons responsible for the safety of work at height; lack of personal protective equipment against falls from a height; use of improperly selected personal protective equipment; • use of obsolete or unusable fall protection; unsatisfactory periodic accounting, inspection and maintenance of personal protective equipment.

These hazards can affect a person both together and separately from each other. To ensure the safety of a worker it is necessary to prevent him from exposure to harmful factors. For all these factors, the best solution is to use personal protective equipment that can provide the necessary protection for personnel, as well as reduce the risk of injury.

Owing to the development of technology, new materials have appeared with improved properties, also changed the approaches to the manufacture of equipment for work at height. They have become stronger, more comfortable, and more reliable.

Safety measures

Personal protective equipment (PPE) for working at heights is combined into safety systems that have different functions. Thus, a restraint system is needed to limit the zone of movement of the worker so that he does not get into the danger zone. It consists of:

- full body harness, it is a component of the security system to clasp the human body to prevent falling;
- an opening device for connecting components so that the worker can attach to the support;
- points for attaching the body to the structure and lines for holding the worker.

The positioning system supports the worker, preventing the fall. Movement in it is limited, but the hands remain free. It consists of tethers; a sling that connects the waist belt with an anchor point or structural member; a sling with shock absorber; a safety leash (the employee must always be attached to it).

For cases of refusal provided for limiting the fall system. It includes an anchor line stretched between structural anchors, to which the PPE is attached; a sling; a shock absorber; and a safety harness.

Conclusion

In the course of the analytical work the statistical data were analyzed and the main types of injuries and the factors of their occurrence were identified. It was found that the equipment used to work at height does not provide sufficient safety. To improve the safety of personnel, it is necessary to purchase modern equipment and develop a procedure for working at height. The actions of the staff, the necessary equipment, will be covered by safety and procedures designed for working at heights.

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ОБЕСПЕЧЕНИЕ БЕЗОПАСНОСТИ ПРИ РАБОТЕ НА ВЫСОТЕ

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Аннотация

Цель данного исследования, заключается в том, чтобы проанализировать комплекс мер по обеспечению безопасности работ на высоте. В ходе исследования будет рассмотрен спектр возможных рисков при проводимых высотных работах, в зависимости от специфики проводимых работ. Актуальность исследования заключается в том, что ежедневно сотрудники получают травмы при проведении высотных работ, это обусловлено необходимостью разработки комплекса мер по обеспечению безопасности при проведении высотных работ путем усовершенствованием старых и появлением новых технологий.

Ключевые слова: средства индивидуальной защиты, работы на высоте.

ANALYSIS OF REGULATORY AND TECHNICAL INFORMATION USED IN THE ASSESSMENT OF WORKING CONDITIONS AT THE ENTERPRISE

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Abstract

Assessment of working conditions at the enterprise is carried out in accordance with the following regulatory documents: the Labor Code of the Russian Federation, the Occupational Safety Standards System (SSSC), and the Special Assessment of Working Conditions (SOUT).

Keywords: job safety, standard, safe conditions, employee labor.

Introduction

The purpose of the SSBT is to protect workers from the effects of hazardous and harmful production factors, to prevent accidents, including fatalities, and occupational diseases. At the national level, the standard serves to: (a) establish the national foundations of the labor protection management system, supported by national laws and other normative legal acts; (b) provide guidelines on the application of voluntary labor protection measures in organizations aimed at compliance with the norms and other regulatory legal acts leading to continuous improvement of labor protection activities; (c) to provide guidelines for the development of national and special corporate standards on labor protection management systems for the qualitative provision of the practical needs of organizations in accordance with their size and nature of activities.

Safety standard

At the organization level, the standard is intended to: (a) serve as guidelines for integrating elements of an occupational health and safety management system into an organization as part of an overall policy and management system; (b) contribute to the activation of all employees of the organization, including employers, owners, management personnel, employees and their representatives in order to apply modern principles and methods of labor protection management aimed at continuous improvement of labor protection activities.

Program to improve working conditions

A program to improve working conditions at an enterprise should aim to:

(1) prevent overcooling of the body of workers, which is one of the causes of colds, is important in production conditions. The main reason for the occurrence of colds is uncomfortable conditions of industrial premises and inappropriate clothing. The main means of preventing colds are the improvement of sanitary conditions in the premises.

(2) prevent fatigue under the action of the intensity of noise through the alternation of periods of work and rest under the action of noise. Rest only reduces the negative impact of noise on working capacity if the duration and amount of rest corresponds to the conditions under which the most effective restoration of irritated measures of noise to nerve centers occurs, therefore, when choosing the means of improving performance for a particular production, it is necessary to take into account the effect of rest on limiting the impact of intense noise on the human body;

(3) limit and eliminate the harmful effects of vibration in production, it is necessary: careful maintenance of equipment, timely replacement of wearing moving and rubbing parts, use of vibration-absorbing gaskets, use of various types of silencers, removal of the basement contacts of the unit with building foundations and, most importantly, the possibility of changing the technology - replacement of production operations associated with noise and vibration, silent production processes, rational alternation of periods of rest and work and the effects of vibration; the color of industrial premises and equipment also has a significant impact on the person;

(4) increase payments by employers for the consequences of industrial accidents and occupational diseases, because work performed in adverse working conditions should be evaluated significantly higher than work performed in normal working conditions; intensify the work of production control and technical supervision of the safe operation of lifting equipment;

(5) prevent the operation of facilities that have completed the normative period without the approval in accordance with the established procedure conclusions of industrial safety expertise and to ensure the strict implementation of the recommendations indicated in these conclusions;

(6) improve the system of financing measures to improve working conditions and labor protection, using economic mechanisms, such as partial funding of preventive measures to prevent industrial injuries and occupational diseases, and discounts on insurance rates for compulsory social insurance against industrial accidents and occupational diseases.

Conclusion

Ensuring safe working conditions for employees is one of the main duties of an employer under an employment contract, and it should become 212 of the Labor Code of the Russian Federation. Jobs based on special assessments. This amount will have to be paid to the employer.

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АНАЛИЗ НОРМАТИВНО-ТЕХНИЧЕСКОЙ ИНФОРМАЦИИ, ИСПОЛЬЗУЕМОЙ ПРИ ОЦЕНКЕ УСЛОВИЙ ТРУДА НА ПРЕДПРИЯТИИ

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Аннотация

Оценка условий труда на предприятии осуществляется в соответствии со следующими нормативными документами: Трудовой кодекс Российской Федерации, Система стандартов безопасности труда (ГССБ) и Специальная оценка условий труда (СОУТ).

Ключевые слова: охрана труда, нормативы, безопасные условия, труд работников.

ESTIMATION OF THE ATMOSPHERIC AIR POLLUTION WITH NITROGEN COMPOUNDS IN THE TAMBOV REGION

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Abstract

The article provides a list of observations on the state of environmental pollution in the Tambov regions over the last five years; supercritical values of pollution for different observation posts are shown; the influence of the seasons of the year, and the types of weather on the state of atmospheric pollution is described. These values are accompanied by diagrams and tables. The water pollution in the largest rivers of the region is described in detail by types of sections with various pollutants; the economic assessment of the state of reservoirs is given. The values of gamma-radiation doses and the acidity of precipitation are given. The ways of informing the management of the region and the population about the state of the atmosphere, water, soil in terms of their pollution are named.

Key words: atmosphere pollution; cleanliness of the river waters; scale radiation.

The monitoring system of environmental pollution Rosgidromet is one of the oldest in the country. In 1963, by the Decree of the Government of the USSR, the Hydrometeorological Service was entrusted with the organization of an atmospheric pollution monitoring service. In Tambov, the Integrated Pollution Monitoring Laboratory was established in 1979. Rosgidromet is engaged in the organization of monitoring of the state of the atmosphere, surface waters of the land, marine environment, soil, near-terrestrial space, the radiation situation on the Earth's surface and in near-Earth space, pollution of the environment, including radioactive waste. The existing observation network is used for the following:

- to monitor the level of air pollution, soil, water, physical, chemical and hydrobiological indicators in order to study the distribution of pollutants in time and space, assess and predict the state of the environment, determine the effectiveness of measures to protect it;

- to provide the government bodies, business organizations and the population with systematic and emergency information on changes in pollution levels (including radioactive), forecasts and warnings about possible changes in pollution levels;

The Tambov Regional Center for Hydrometeorology and Environmental Monitoring monitors air pollution in the city of Tambov, surface water pollution at 5 water bodies of the region, the gamma radiation exposure dose rate at 7 meteorological stations of the region, and the beta activity of atmospheric deposition in the city of Tambov, for acidity and chemical composition of precipitation, for soil pollution by pesticides and for pollution of snow cover.

The observation posts for air pollution in the city of Tambov are located:

- Post No 1: 29 Moscovskayaul., Tambov;
- Post No 2: 22 Naberezhnayaul., Tambov;

- Post No. 3:7Voronezhskayaul, Tambov.

Posts No.1 and No 2 are located in residential areas; Post No. 3 is located near the motorway with heavy traffic. The posts are equipped with laboratories Post No1 has manual sampling. Sampling is done at 7.00 am, 13.00 pm and 19.00 pm. The following ingredients are detected in the atmospheric air of Tambov: dust, sulfur dioxide, soluble sulfates, carbon monoxide, nitrogen dioxide and nitrous oxide, phenol, ammonia, benzo (a) pyrene and heavy metals [3].

As for average annual concentrations, there was an excess of maximal permissible concentrations for dust and benzo (a) pyrene. For 2017, the average dust was 0.23 mg/m³ and it was 1.5 maximal permissible concentrations. For benzo (a) pyrene, the average annual concentration in the whole city was 2.0 maximal permissible concentrations. The maximal permissible concentration for benzo (a) pyrene was exceeded in all months, but the maximum was observed in the winter months. The concentration of benzo (a) pyrene was well correlated with air temperature; the lower the temperature was, the higher the concentration was.

Carbon monoxide annual concentration was 2.6 mg / m³. This is slightly less than the maximal permissible concentration (3.0) but close to it.

Since 2013, it has increased from 3.41 to 5.40 (Tab. 1, Fig. 1). Supervision of land surface water was carried out on 5 water bodies (Tsna River, Forest Tambov, Vorona, Savala, Forest Voronezh) in 7 locations (Tambov, Morshansk, Rasskazovo, Kirsanov, Uvarovo, Zherdevka, Michurinsk) in 16 sections. To assess the impact of discharged water on water bodies, samples are taken above and below the city. Observations are carried out monthly. About 160 water samples are taken annually and 39 indicators are determined for each sample [2-3].

Table 1- Changes in the level of air pollution with various impurities, the API for 2013–2017

The name of the impurity	Characteristic	2013	2014	2015	2016	2017
Suspended substances	Qav	0.15	0.15	0.16	0.18	0.23
sulphur dioxide	Qav	0.007	0.007	0.008	0.009	0.009
Soluble sulphates	Qav	0.01	0.01	0.01	0.01	0.02
Carbon monoxide	Qav	1.4	1.5	1.8	2.3	2.5
Nitrogen dioxide	Qav	0.03	0.03	0.04	0.04	0.05
Nitrogen oxide	Qav	0.01	0.01	0.01	0.01	0.02
Phenol	Qav	0.002	0.002	0.002	0.002	0.003
Ammonia	Qav	0.02	0.02	0.02	0.02	0.03
Benz (a) pyrene	Qav	3.9	2.3	2.4	2.5	2.0
In the whole city	IZA	3.41	3.67	3.99	4.43	5.4

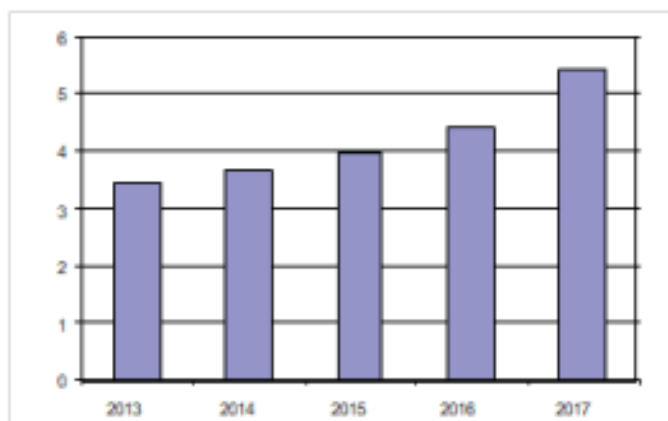


Figure 1 - Air pollution index

A list of observations on the state of environmental pollution in our region over the last five years showed supercritical pollution values for different observation posts and revealed the effect of the seasons of the year and weather types on the state of atmospheric pollution. The studies showed that membrane methods can purify wastewater to maximal permissible concentration values.

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ОЦЕНКА ЗАГРЯЗНЕННОСТИ АТМОСФЕРНОГО ВОЗДУХА АЗОТНЫМИ СОЕДИНЕНИЯМИ НА ТЕРРИТОРИИ ТАМБОВСКОЙ ОБЛАСТИ

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Аннотация

В статье дается перечень наблюдений за состоянием загрязнения природной среды в нашей области за последнее пятилетие; показываются сверхкритические величины загрязнения по разным постам наблюдения; влияние сезонов года и типов погоды на состояние атмосферного загрязнения. Эти величины сопровождаются диаграммами и таблицей. Подробно освещается загрязнение воды в крупнейших реках области по типам створов различными загрязнителями; дается хозяйственная оценка состояния водоемов. Приводятся величины доз гамма-излучения и кислотность атмосферных осадков. Названы способы информирования руководства области и населения о состоянии атмосферы, вод, почв с точки зрения их загрязненности.

Ключевые слова: загрязнение атмосферы; чистота вод рек; гамма-излучение.

REDUCTION OF DETERGENT POLLUTION FOR THE TAMBOV REGION WATER BODIES BY MEMBRANE METHODS

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Abstract

The data for the retention rate and the specific solvent flow in the ultrafiltration separation of industrial wastewater containing surfactants were obtained. A theoretical analysis of the kinetic curves for the retention coefficient and the specific solvent flow depending on the concentration, nature of the solute and the type of semipermeable membrane was performed. It has been established that with increasing pressure the retention factor and the specific solvent flow through surfactants behaves ambiguously.

Keywords: ultrafiltration, detergents, membrane, retention factor, specific solvent flow.

Introduction

Every year the production and consumption of detergents grows. This increases the amount of surfactants in wastewater and adversely affects the state of water bodies.

For MPC wastewater for surfactants are high requirements. For fisheries: anionic surfactants $\leq 0.1\text{--}0.5$ mg/l; nonionic surfactants $\leq 0.0005\text{--}0.1$ mg/l [1]. Purification of discharged water to such concentrations of surfactants is a complex task. Insufficient treatment of wastewater from surface-active substances leads to the eutrophication of water bodies.

There are many ways to purify wastewater from detergent contaminants, but membrane methods are one of the most promising [2-3].

Analysis of the research findings

Experimental studies were carried out on a flat-cell membrane installation using an ultrafiltration UPM-K membrane.

The main indicators of membranes include the kinetic coefficient of retention of the membrane and the specific flow of solvent.

The results of the study of the retention rate are presented in Fig. 1.

The graphs show that the retention factor decreases with increasing concentration of the solute. This is due to solvent transfer and retention of solutes.

The retention factor was calculated by the formula:

$$K = 1 - \frac{C_{per}}{C_{orig}}, \quad (1)$$

where C_{per} is the concentration of the solute in the permeate, mg/l; C_{orig} is concentration of substances in the initial solution, mg/l.

The retention factor depends on the concentration of the solute and pressure. The study observed an increase in the retention rate on the polyamide membrane. This is due to the distribution and nature of the membrane pores [3].

The specific solvent flow is the main quantitative indicator of the baromembrane separation process. Fig. 2 presents the results of the study of the specific solvent flow. The value of the specific solvent flow was calculated by the formula:

$$J^{+, -} = \frac{V}{F_m \cdot \tau}, \quad (2)$$

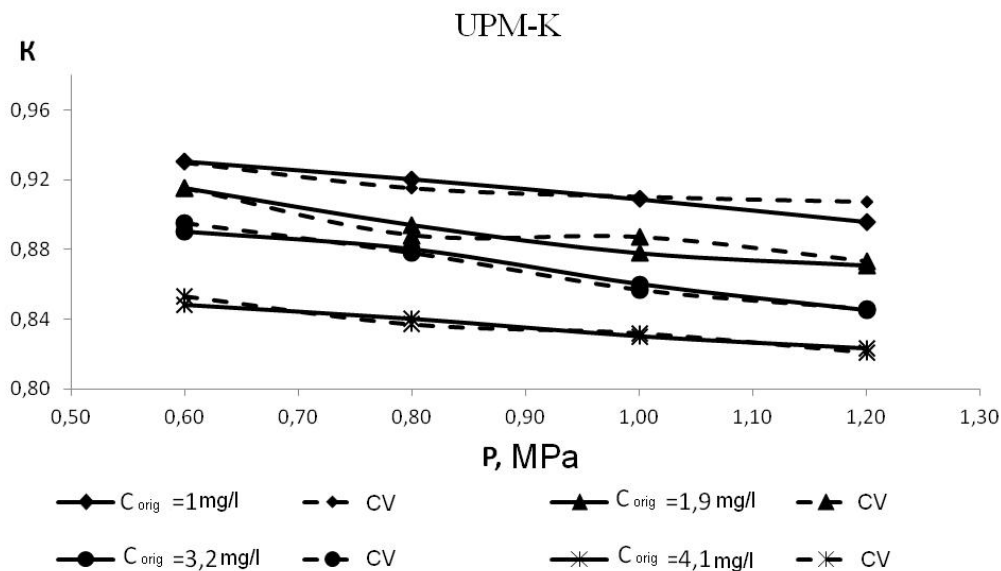


Figure 1 - Dependence of the retention coefficient on the pressure of the initial solution of anionic surfactants for the UPM-K membrane

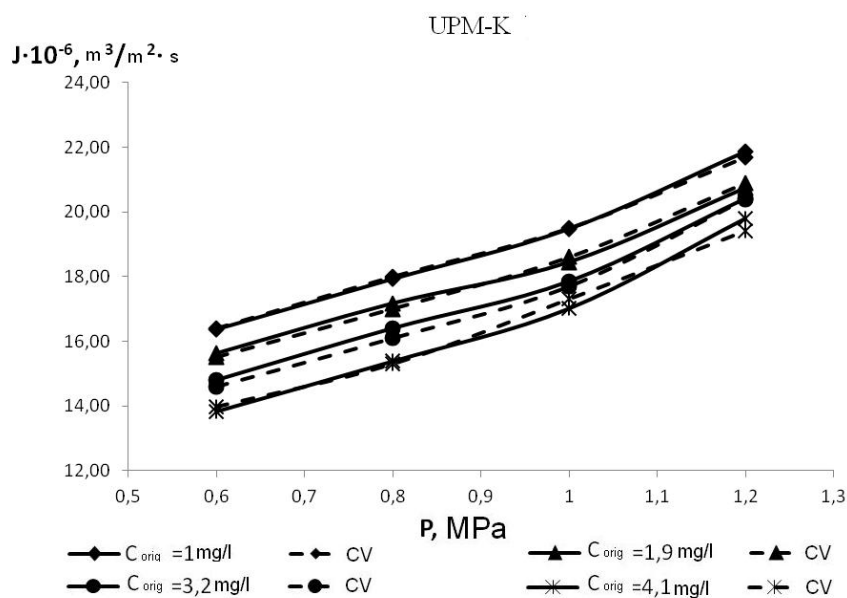


Figure 2 - Dependence of the specific solvent flow on the pressure of the initial solution of anionic surfactants for the UPM-K membrane

As can be seen from the above graphs, a decrease in the specific solvent flow is observed for the membrane under study with increasing concentration. This is due to the

formation of boundary concentration layers, also with the sorption process there is a blockage of the pores of the membrane. An increase in concentration also leads to an increase in the formation of spatial structures from ions and molecules of the solute, both in solution and on the surface of the membrane [3].

Conclusion

The sorption capacity and dependence on the concentration and temperature of the solution for the membrane UPM-K are studied. The researches show that membrane methods allow purifying waste water up to MPC values.

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СНИЖЕНИЕ ДЕТЕРГЕНТНЫХ ЗАГРЯЗНЕНИЙ ВОДОЕМОВ ТАМБОВСКОЙ ОБЛАСТИ МЕМБРАННЫМИ МЕТОДАМИ

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Аннотация

В работе получены данные по коэффициенту задержания и удельному потоку растворителя при ультрафильтрационном разделении промышленных сточных вод, содержащих поверхностно-активные вещества. Выполнен теоретический анализ кинетических кривых по коэффициенту задержания и удельному потоку растворителя в зависимости от концентрации, природы растворенного вещества и вида полупроницаемой мембраны. Установлено, что с повышением давления коэффициент задержания и удельный поток растворителя по поверхностно-активным веществам ведет себя неоднозначно.

Ключевые слова: ультрафильтрация, детергенты, мембрана, коэффициент задержания, удельный поток растворителя.

ENSURING SAFETY WHEN WORKING WITH ELECTRICITY

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Abstract

The purpose of this study is to analyze a set of measures to ensure the safety of working with electricity. The study considers a range of possible risks of working with electricity, depending on the specifics of the work. It is concluded that it is necessary to develop a set of measures to ensure safety when working with electricity by upgrading old technologies and the developing the new ones.

Keywords: personal protective equipment (PPE); working with electricity.

Introduction

Statistics show that when working with electrical installations with a voltage higher than 1000V, accidents occur about 3 times less often than in electrical installations with a voltage of up to 1000V. The reasons for this are the high prevalence of installations with voltage above 1000V, and access of a large number of people who are not authorized to work with electricity or are not qualified for this type of work. While for equipment with a voltage above 1000V, only highly qualified personnel can get admission. Currently, in the Russian Federation, lethal electric shock accounts for up to 3% of the total number of accidents.

Risks

Risk factors include:

- accidental contact with live parts;
- appearance of voltage on metal parts of electrical equipment, which during normal operation are not energized (due to insulation failure, violation of grounding rules, the falling of a live wire on them);
- occurrence of step voltage on the plot of land where a person is located;
- in networks with voltages above 1000 V, damage is possible by means of an electric arc arising between the current-carrying part and a person when being close to the current-carrying parts;
- human factor, i.e. inconsistent and erroneous actions of staff; admission to work with electricity without checking the absence of voltage at the installation where people work;
- leaving the installation under voltage without supervision.

Causes

The main causes of electric shock are:

- inadequate training for staff and safety officials;
- lack of personal protective equipment;
- use of improperly selected personal protective equipment;
- use of outdated or unsuitable protection;

- unsatisfactory periodic accounting, verification and maintenance of personal protective equipment.

These hazards can affect a person both together and separately from each other. To ensure the safety of the employee, it is necessary to prevent his exposure to harmful factors. For all these factors, the best solution is to use personal protective equipment that can provide the necessary protection for personnel, as well as reduce the risk of injury.

Safety measures

To reduce the risk of accidents when working with electricity, one must follow the basic safety guidelines:

- eliminate the possibility of accidental contact with live parts under voltage;
- provide electrical installations with reliable insulation;
- to create a protective earth, automatic disconnection;
- to work with electricity only with the use of special protective equipment.

Conclusion

In the course of the analytical work the statistical data were analyzed and the main types of injuries and the factors of their occurrence were identified. It was found that the equipment used does not provide sufficient safety. To improve the safety of personnel, it is necessary to purchase modern equipment and develop a procedure. The actions of the staff, the necessary equipment will be covered by safety and procedures designed.

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ОБЕСПЕЧЕНИЕ БЕЗОПАСНОСТИ ПРИ РАБОТЕ С ЭЛЕКТРИЧЕСТВОМ

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Аннотация

Цель данного исследования, заключается в том, чтобы проанализировать комплекс мер по обеспечению безопасности при работе с электричеством. В ходе исследования будет рассмотрен спектр возможных рисков при работе с электричеством, в зависимости от специфики проводимых работ. Актуальность исследования обусловлена необходимостью разработки комплекса мер по обеспечению безопасности при работе с электричеством путем усовершенствованием старых и появлением новых технологий.

Ключевые слова: средства индивидуальной защиты, работы с электричеством.

SYSTEM OF COLLECTION, STORAGE AND TRANSPORTATION OF MERCURY-CONTAINING LAMPS AND OTHER DEVICES WITH MERCURY FILLING IN THE TAMBOV REGION

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Abstract

Modern economy should be based on recycling of waste materials, low-calorie energy, etc. The study proposes the creation of a subsystem of environmental management at the regional level aimed at the collection and treatment of waste containing hazardous substances such as mercury. The idea of building a technological site for the decontamination of mercury-containing lamps and other devices with mercury filling using Russian equipment is described.

Keywords: waste management, mercury-containing waste, technology, utilization, environmental management.

The Tambov region is a constituent entity of the Russian Federation and a part of the Central Federal district. The area is 34,462 km². The region was formed on September 27, 1937. According to Rosstat, the population of the region is 1,033,352 people (as of 2018). The population density is 29.99 people per sq.km. The urban population is 60.89%.

According to the Charter of the region and the Law “On administrative-territorial structure of the Tambov region”, the subject of the Russian Federation includes the following administrative-territorial entities: 7 cities of regional significance; 23 districts, including: 1 city of district importance, 12 town councils, and 234 village councils [1].



Figure 1 – Administrative-territorial division of the Tambov region

Table 1- Cities of regional importance (urban districts) and districts

No	Name	Administrative center	Area, km ²	Population	Density populations, persons / km ²
VI	Tambov	Tambov	96.6	≈293,661	3.3
VII	Uvarovo	Uvarovo	23	≈23,987	9.6
1	Bondaridistrict	C. Bondari	1.254	≈10,819	9.5
7	Michurinsky district	Michurinsk	1.655	≈32,512	20.4
20	Tambov region	Tambov	2.632	≈103,147	40.0

Table 1 presents some cities and districts of the Tambov region, carrying out the delivery of mercury-containing waste to specialized enterprises [2]. Despite the huge area of the Tambov region, only a few specialized organizations are engaged in activities for the collection, storage, transportation, reception and further transfer to the disposal of mercury-containing lamps and other devices with mercury filling, such as OOO“TECHNOECOS” and OOO “Tambov Ecological Plant” located in Tambov.

One of the most serious problems of waste recycling is the problem of disposal of mercury-containing waste (lamps, thermometers and other devices with mercury filling) due to the fact that mercury belongs to the I class of danger. The solution to this problem is possible provided the organization of the system of collection, storage and processing of mercury-containing materials on the basis of developed innovative technologies.

The purpose of this research is to create a subsystem of environmental management at the regional level, able to solve the problem of disposal of mercury-containing lamps and other devices with mercury filling.

Let us consider in more detail the activities of organizations for the treatment of mercury-containing waste. OOO “Tambov Ecological Factory” was created on December 27, 2007. The company’s field of business includes wholesale trade of waste and scrap of non-ferrous and ferrous metals; waste collection; treatment and disposal of wastes; processing of secondary non-metal raw materials; processing of waste rubber; processing other non-metal secondary raw materials; waste removal and recycling office equipment, electronics and equipment, etc.

Environmental policy of OOO“Tambov Ecological Plant” is aimed at the creation of uniform system on the organization and control of the address of waste at the enterprises of Customers. As part of the comprehensive service, the company provides services for the development of environmental projects and passports for waste of I-IV hazard classes.

Fluorescent lamps are the most common and one of the most dangerous waste products and consumption. Unlike other types of waste, spent fluorescent lamps are produced in the vast majority of organizations, regardless of their activities; in addition, these lamps are widely used in everyday life. The danger of fluorescent lamps, as well as other mercury-containing waste, is the toxic effects of mercury vapor on the human body in case of accidental combat, so the disposal of lamps is mandatory and should be carried out at specialized enterprises. The essence of the process lies in the recycling of mercury-

containing waste, comprising the processes of separating the flow of air with the vibration of mercury-containing phosphor, glass, aluminum and steel bases with a view to their use as secondary raw materials. After separation, the phosphor is placed in a sealed container, filled with cement, filled with a demercurizing substance, partially binding mercury, and in this form is transported for further processing. The danger of mercury-containing waste fighting imposes strict requirements for the collection and temporary storage of these wastes on the territory of the organization by the regulatory authorities.

ООО “ТЕХНОЕКС” accept for disposal mercury-containing lamps, regardless of size, design, purpose and producing countries, produces a collection of energy-saving lamps of different shapes, ignitron, and mercury thermometers and their marriage. It also offers the removal of mercury-containing waste in compliance with their safety and isolation from the environment. Besides, the de-mercurization set allowing neutralizing the broken lamp independently, and specialized transport containers for collecting mercury and energy saving lamps is offered [3].

At the enterprises described above, there is no shop for processing mercury-containing lamps and other devices with mercury filling of Tambov and the Tambov region because these enterprises do not have the appropriate equipment, technologies and specialists able to solve this problem. Meanwhile, foreign production technologies could be applied at enterprises, and the development of technology and the choice of equipment are a serious scientific task.

Based on the above, it would be more profitable and economically feasible to develop a technology for the storage and disposal of mercury-containing waste, with its further introduction to the enterprises of the region, since at the moment mercury-containing waste is transported to other regions for processing and disposal.

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СИСТЕМА СБОРА, ХРАНЕНИЯ И ТРАНСПОРТИРОВАНИЯ РТУТЬСОДЕРЖАЩИХ ЛАМП И ИНЫХ ПРИБОРОВ С РТУТНЫМ ЗАПОЛНЕНИЕМ В ТАМБОВСКОЙ ОБЛАСТИ

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Аннотация

Современная экономика должна строиться на основе повторного использования отработанных материалов, отходов, низкокалорийной энергии и т.п. Такое направление в экономике названо циркуляционной экономикой, построенной на рециклинге. В докладе предложено создание подсистемы экологического менеджмента регионального уровня нацеленного на сбор и переработку отходов, содержащих такие опасные вещества как ртуть. Высказана идея построения технологического участка по дезактивации ртутьсодержащих ламп и иных приборов с ртутным заполнением с использованием российского оборудования. В настоящее время эти лампы выбрасываются в общий контейнер, отравляя окружающую среду.

Ключевые слова: обращение с отходами, ртутьсодержащие отходы, технология, утилизация, экологический менеджмент.

METHODS OF PREVENTING AND EXTINGUISHING FIRES IN CHEMICAL LABORATORIES

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Abstract

In this paper, the analysis of fire extinguishing systems was carried out, and the options for placing automatic fire detectors in chemical laboratories were selected. The main sources of fire danger in chemical laboratories are considered

Keywords: chemical laboratories, fire safety, danger

The purpose of the work is to develop measures to prevent and eliminate fires in chemical laboratories.

Ensuring fire safety in the enterprise is a very important aspect of the activity of any economic entity and it involves, first of all, the exclusion of fire conditions.

Production facilities are characterized by an increased fire hazard, as they are characterized by the complexity of production processes, the presence of significant quantities of liquefied combustible gases, solid combustible materials, large equipment of electrical installations and more.

The main causes of fires are often:

- (1) Violation of the technological regime - 33%.
- (2) Malfunction of electrical equipment - 16%.
- (3) Poor preparation for the repair of equipment - 13%.
- (4) Spontaneous combustion of oily rags and other materials - 10% [1]

Sources of ignition can also be open fire of technological installations, red-hot or heated walls of equipment, sparks of electrical equipment, static electricity, sparks of impact and friction of machine parts and equipment. In addition, sources of ignition can be violations of the norms and rules for storing fire-hazardous materials, careless handling of fire, use of open fire, blowtorches, smoking in prohibited places, failure to carry out fire-fighting measures for equipping fire water supply, fire alarm systems, and provision of primary firefighting equipment.

For all industrial and warehouse premises, categories of explosion and fire hazard should be defined, as well as the class of the zone according to the Electrical Installation Rules, which should be marked on the doors of the premises.[2]

Standard equipment (notices, signs) of safety should be posted near the equipment having an increased fire hazard.

One of the conditions for ensuring the fire and explosion safety of any production process is the elimination of possible sources of ignition.

In the chemical laboratory where the research is carried out, employees must constantly maintain cleanliness in the rooms and workplaces; monitor the health of electrical appliances and outlets.

It is forbidden to smoke in unequipped and non-designated places, as well as directly at workplaces, in laboratories and other places. Collect waste paper, rags and other flammable materials.

It is also forbidden to use electrical wiring with broken insulation, use “bugs” instead of standard fuses, to prevent overloading of the power grid. Use electrical equipment for other purposes. To block up fire exits, corridors, staircases, passages between equipment to the places of storage of firefighting equipment.

Defective electric heaters are a major fire hazard. Using them is prohibited. Do not leave lighted burners and electric heaters on unattended. Before leaving, even for a short time, the heat source must be turned off.

A fire in a chemical laboratory sometimes arises due to improper storage of incompatible substances (nitric acid with glycerol, alcohol, sulfuric acid with turpentine, gasoline and alcohol).

Laboratory staff has to follow the following rules:

(1) Upon completion of work, de-energize the power grid and close the room to the lock;

(2) To keep in good condition and constant readiness primary fire extinguishing agents (fire extinguishers, sand, fire hydrants, etc.) and be able to use them.

To prevent possible cases of fire or explosion, workers must comply with the following basic requirements:

- do not use open fire in fire hazard areas;
- smoke only in designated areas;
- keep the workplace clean, clean the workplace in a timely manner, prevent dust accumulation.

Every employee of the chemical laboratory should know:

- fire safety rules and comply with them;
- the location of the electrical warning fire alarm, fire extinguishers and personal protective equipment, to monitor their presence, serviceability and know how to use them;
- numbers of the fire department, gas rescue station, emergency service, institute medical service;

In the event of a fire (ignition), the employees who discovered it must:

- immediately notify the fire brigade by calling 9-01;
- de-energize the laboratory (remove the voltage from the switchboard);
- prior to the arrival of the fire brigade, start extinguishing the fire with the available means and liquidate people and property in accordance with the fire brigade duties;
- upon arrival of the fire department, follow the instructions of the fire extinguisher.

Laboratory staff must know the rules of first aid to victims of accidents.

The work has developed ways to prevent and eliminate fires in chemical laboratories, as well as a set of precautions when working in chemical laboratories.

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МЕТОДЫ ПРЕДОТВРАЩЕНИЯ И ТУШЕНИЯ ПОЖАРОВ В ХИМИЧЕСКИХ ЛАБОРАТОРИЯХ

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Аннотация

в данной работе проведен анализ систем пожаротушения, подобраны варианты размещения автоматических пожарных извещателей в химических лабораториях. Рассмотрены основные источники пожарной опасности в химических лабораториях

Ключевые слова: химические лаборатории, пожарная безопасность, опасность

УДК 631.331
ББК П07

MORE EFFICIENT USE OF DRILLS FOR SOWING CEREALS

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Abstract

This article describes the reasons for reducing the performance of the agricultural units, affecting the yield. The technological maintenance of agricultural machinery, its structure and its phased implementation in production and training process are discussed.

Keywords: agrotechnical requirements, combine harvesters, crop, technology services.

Introduction

In the production of cereals, one of the important processes is the crop. The main task of sowing is the optimal placement of the seeds in the soil in order to improve productivity and maximize the gross grain harvest. Agronomic requirements of the process of sowing established tolerance values in mm are as follows: seeding depth $\pm 10\%$ of the set 40 ... 80; abnormality seeding drill $\pm 5\%$, sowing machines $\pm 3\%$; deviation between the butt between rows connected by a machine drills ± 20 ; deviation between the butt passes ± 5 ; the distance between the discs ± 10 .

Technology services

The basis for achieving high levels of productivity and quality of the mechanized fieldwork is in good technical condition, completeness and timely adjustments and agricultural machinery to the preset mode.

To fulfill the requirements of farming, it is necessary to prepare drills, hold technological treatment, performing operations comprising checking the technical state of the working units, mechanisms and nodes completeness drills conduct adjustment and setting, in accordance with known sowing the crop.

In literature and GOST 24055-88 it found that technology services include: processes at harvest-shipment of grain from hopper of a combine harvester and shipping it to the storage location processing place, sugar beet, potato, sugar beet and from bunkers potato harvesters and transport to the place of storage or processing; Shuttle crop seeds, potatoes, fertilizers to meet the relevant sowing processes, and planting application. In this case the service order process, unlike the technical is at harvest determining the required number of machines for unloading and delivery of grain and root crops from the field to the processing item or storage; shuttle service to units carrying out the sowing, planting or fertilizing seeds, respectively, root crops or fertilizers

without breaking the rhythm of the implementation process, in addition proposed to replace the term maintenance – operational.

Check tillage, sowing machines, combine harvesters and other agricultural machines showed that the low quality of production processes is due to the mismatch setting adjustment parameters working conditions.

Execution of processes with low quality results in loss of crops cultivated crops to 30%, reducing shift productivity by 10-20%, but the increase in fuel consumption of 5-6%, downtime for technical reasons to 20%.

In the last 15-20 years in connection with the reform in the Russian Federation with position of agricultural machinery has deteriorated significantly.

The reasons for this are: a technique used by 70% obsolete, operation period exceeds the scheduled more than 1.2 ... 1.5.

Therefore, the load on the piece of equipment has increased dramatically; agricultural machines produce poor quality metal-that leads to a simple increase in terms of equipment and technological operations; excessive soil compaction as a result - a reduction of yield and gross harvest of agricultural crops; difficulty with providing machine operators with qualified personnel; not developed and mastered new methods of operation of equipment.

Due to the unsteadiness of agricultural processes an average value of technological and energy parameters changeable in time and space (length fields, soil moisture and plants, slope, etc.). Therefore, the operating parameters of units is necessary not only to periodically check, change and automatically (if possible), but and continuously adjust and customize on the operating modes specified by agronomic requirements.

The list of operations carried out during daily maintenance (ETO) TS-1 and TS-2 are listed correct adjustment of working machines and other mechanisms, assemblies. However, this is not a list of regulations, their periodicity, the complexity used by instrumentation and equipment execution sequence. But the main thing is not specified, i.e. what crop to plant (and that the seed rate and depth), soil moisture (drilling depth), field size and slope (the need for refueling drills seeds and fertilizers and the end time of sowing given crop, in the case of sowing other culture) where and when to carry out the adjustments. This leads to the fact that they are carried out by machine approximately, and for that no one is responsible. The tension of chains, belts, gaps in gears gearboxes, couplings connections, pressure in the tires of the wheels, but in no cases do not seeding rate, depth, uniform distribution of seeds in a row. After all, in the spring, in the period of sowing, often changing weather conditions, the rainfall begins. During the entrance to the field, it may take a little rain (change seeding depth) on the way to reduce the pressure in one of the wheel tires (vary seeding depth)

Conclusion

Thus, the timely and proper conduct of technological services sowing machines and units, their inspection and adjustment, and the adjustment to the operating mode specified by agrotechnical requirements, is the basis of increase of efficiency of their use, which is expressed in the improvement of the quality of crop, yield and gross harvest of grain is not less than 10 ... 15% and the service life of sowing machines.

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ПОВЫШЕНИЕ ЭФФЕКТИВНОСТИ ИСПОЛЬЗОВАНИЯ СЕЯЛОК ДЛЯ ПОСЕВА ЗЕРНОВЫХ КУЛЬТУР

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Аннотация

Проанализированы причины, снижающие показатели работы сельскохозяйственных агрегатов, влияющих на урожайность. Рассмотрены особенности технологического обслуживания сельскохозяйственной техники, его структура, и поэтапное внедрение в производство и учебный процесс.

Ключевые слова: агротехнические требования, зерноуборочный комбайн, посев, технологическое обслуживание.

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WAYS OF DEVELOPMENT OF TECHNICAL SERVICE IN AGRICULTURE

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Abstract

The agro-industrial complex is one of important sectors of national economy. Its accelerated development is necessary for high-quality improvement of food resources of the country and decrease in public costs for ensuring good nutrition of the population. One of the main levers of implementation of modern agrarian policy is timely and high-quality technical and technological service, repair and diagnostics of the and the equipment used in agriculture.

Keywords: agriculture, repair, technical operation, technical service.

Introduction

In conditions of market economy, shortage of agricultural machinery, economic and technological crisis in production of agricultural products, the development of methods of highly effective use of the available park of cars and the equipment in the village, technical service and modernization of cars is becoming of paramount importance.

Lack of competitive domestic technologies and equipment forces the major and effective enterprises to buy the foreign equipment – more expensive and reliable. In agrarian and industrial complex of our country a large amount of agricultural machinery is imported (the import from Republic of Belarus makes up to 38.7%, from other countries – 32.9%) [1]. However, the problem of technical maintenance is particularly acute for imported cars. To increase the efficiency of technologies of technical maintenance of imported farm vehicles and to lower operational expenses it is necessary to repair and restore parts. Calculation of the cost of parts restoration for the existing technologies has shown that their restoration can bring from 120 to 150 thousand rubles that makes 33% of the total cost of repairs.

Economic output

The most economic and fast way of a solving the problem of imported spare parts is the creation the specialized centers for collection, restoration and production of parts in a number of regions with the highest concentration of the imported equipment. Such experience of restoration of parts to the import equipment is used in Russia (the Republic of Bashkortostan – JSC Zirgansky MTS, CJSC Bashdizelpretsizion, Kazan – NPP Motor, the Yaroslavl region – CJSC PK Yaroslavich, the Komi Republic – JSC Severtransekskavation, Moscow – LLC Mekhanika and others), and the repaired parts are not of a lower quality than the original ones, while the price is much lower than of the imported spare parts. This allows cutting down expenses on repair and maintenance of cars. Therefore in these conditions the organization of production and restoration of parts to imported vehicles should be considered as an alternative to buying expensive original spare parts [1].

In modern conditions up to 95% of the equipment being under repair cannot be restored due to the absence of complex, high-precision equipment necessary for

qualitative repair of equipment. The share of repair of equipment in the specialized enterprises makes no more than 7%. Costs of repair of equipment make about 60 billion rubles, or 10% of all revenue of the made agricultural production [2, 3]. According to experts, the problem of repair and maintenance of the imported equipment will become aggravated in the process of increase in term of operation of vehicles [4]. As shows the operating experience of the machine and tractor park accumulated in recent years, the system of technical and technological maintenance, diagnostics and repair of vehicles in agriculture needs improvement [1,3,4].

Conclusion

Considering the above, it is necessary to develop and carry out effective measures on the termination of recession of technical maintenance and search of ways of stage-by-stage development of the technical sphere of agrarian and industrial facilities. In this regard it is necessary to strengthen the regulating role of the state in organizational, technical and technological transformation of agrarian and industrial complex at all levels, in development of high technologies, in creation and production of the new equipment and in the solution of other questions of production activity of the technical sphere, legal, financial, information and staffing of agricultural production.

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ПУТИ РАЗВИТИЯ ТЕХНИЧЕСКОГО СЕРВИСА В СЕЛЬСКОМ ХОЗЯЙСТВЕ

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Аннотация

Агропромышленный комплекс является одной из важных отраслей национальной экономики, ускоренное развитие которой является решающим условием строительства и качественного улучшения продовольственных ресурсов страны и снижения государственных затрат на обеспечение полноценного питания населения. Одним из основных рычагов реализации современной аграрной политики является своевременное и качественное техническое и технологическое обслуживание, ремонт и диагностика автомобилей и оборудования, используемых в сельском хозяйстве.

Ключевые слова: сельское хозяйство, ремонт, Техническая эксплуатация, техническое обслуживание.

FEED DISPENSER FOR MILKING MACHINES

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Abstract

As part of the feed distribution lines on automated milking machines are widely used dispensers, including bulk materials. The article describes the drum dispenser with movable elements in the cells.

Keywords: bulk materials, dispenser, drive, drum, feed.

Installations for milking cows in special milking parlors (UDE-8, UDA-16, UDS-3B, etc.), as a rule, are equipped with a line of dosed delivery of dry feed in feeders installed in each machine. As dosing devices in these lines augers and vibrating trays are used, which have a large dosing error (deviation from a given dose reached 10%).

We propose to use for the issuance of feed drum dispenser with varying length of working cells (Fig. 1). The dispenser consists of a cylindrical body 1 with loading and unloading Windows, inside which a drum 3 with cells [1] is placed on the horizontal shaft 2. The latter is formed by fixed radial blades, the end wall of the body and movable elements 7. The movable elements are moved by means of a drive, which is made in the form of pneumatic cylinders 8 located between the disks 9 and 22, the rods 10 and 23 are attached to the piston of each of them on both sides. The rods 23 are rigidly connected to the movable elements, and the rollers interacting with the adjustable stop 11 along the rods are fixed on the rods 10, which is located at the level of the cell located under the loading window of the dispenser body. To stop the stop in the desired position, corresponding to a given dose, there is a lock 12 with a dose indicator.

Pneumatic cylinders are equipped with a distribution unit, made in the disk 21 is rigidly connected to the shaft 2 and the disk 9 and has holes communicating with the cavities of the pneumatic cylinders, and the disk 20 is connected to the glass 18 and pressed to the disk 21 by means of a spring 19 located on the glass 18 inserted into the sleeve 13, the inner cavity of which in the cross section has a square shape. In the disk 20, two pairs of figured puzzles are cut out, which are pair wise communicated with the vacuum conduit 14 and with the atmosphere through the nozzles. To close off the feed serve as shelves attached to the exterior of the mobile elements.

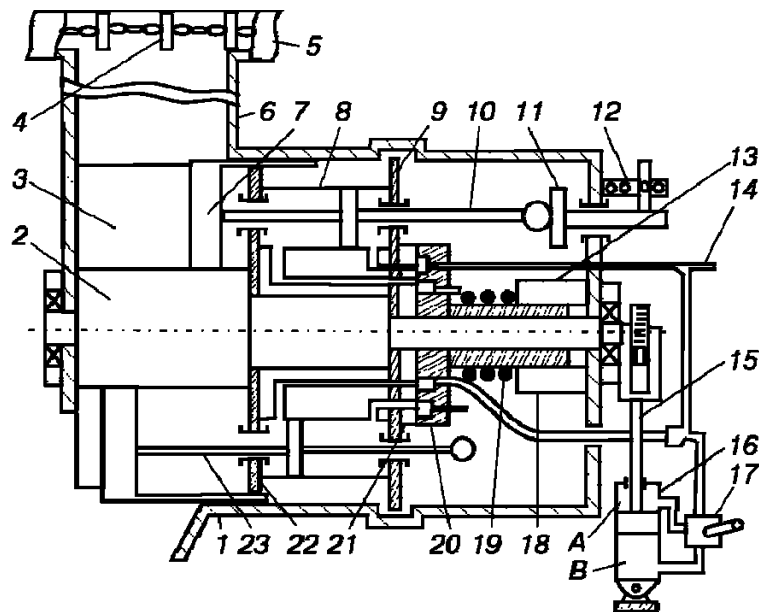


Figure 1 - Diagram of the dispenser

The drive of the drum shaft consists of a pneumatic cylinder 16, the rod of which is connected with a ratchet mechanism 15 fixed to the shaft 2. Control of the pneumatic cylinder is carried out by a pneumatic crane 17, which has three positions (“on”, “off”, “pause”).

Distribution of compound feed is carried out as follows. At the beginning of the feed from the feed line 5 under the action of chain-washer conveyor 4 enters the drive 6, under which the dispenser is fixed.

The milkmaid installs a pneumatic crane 17 in the “on” mode, as a result of which air is sucked out of the chamber of the pneumatic cylinder 16, and the chamber b is connected to the atmosphere. Under the influence of the pressure difference in the chambers A and B, the stem of the pneumatic cylinder 16 extends, turning the dispenser shaft through the ratchet mechanism 15 at an angle limited to one cell of the drum.

When the shaft rotates, the drum cells are alternately filled with feed in the loading area and emptied at the unloading Windows. When the next cell approaches the loading window, the left cavity of the corresponding pneumatic cylinder 8 is connected to the atmosphere through the distribution unit, and the right one is connected to the vacuum pipe 14, as a result of which the piston of this pneumatic cylinder, together with the rod 23 and the movable element 7, moves to the disk 22 and the cell is filled with feed from the accumulator 6 both under the action of gravity and due to the suction of the movable element. The movement of the rod (the length of the working part of the cell) is limited to the stop 11 when contacting the latter with the rod roller 10. At the exit of the cell from the area of the boot window roller get away with focusing without the access of air and vacuum in the cavity of the pneumatic cylinder is terminated and the moving element remains in the set position. At the entrance of the cell in the area of the discharge window is now the right cavity of the air cylinder 8 through the distribution unit is connected to the atmosphere, and the left – to the vacuum pipe, whereby the moving element is moved to the discharge window and the feed is pushed out of the cell into the feeder. During the rotation of the drum, the disk 20 remains stationary relative to the rotating disk 21, which

its holes are alternately combined with the shaped grooves of the disk 20, alternately informing the cavities of the pneumatic cylinders with the vacuum line and atmosphere.

When switching the air valve 17 to the “pause” position, air is sucked from the chamber to the air cylinder 16, and the chamber A is connected to the atmosphere. The pneumatic cylinder rod retracts and returns the ratchet mechanism to its original position.

In the study the laboratory sample of the dispenser was found, that inaccuracy results when the dry feed does not exceed 5%

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ДОЗАТОР КОМБИКОРМОВ ДЛЯ ДОИЛЬНЫХ УСТАНОВОК

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Аннотация

В составе линий раздачи кормов на автоматизированных доильных установках широкое применение находят дозаторы, в том числе сыпучих материалов. В статье приведено описание барабанного дозатора с подвижными элементами в ячейках.

Ключевые слова: барабан, дозатор, комбикорма, привод, сыпучие материалы.

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ADEQUACY OF MATHEMATICAL MODELS FOR ERYTHROCYTE SEDIMENTATION RATE DETERMINATION PROCESS

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Abstract

The modeling comparison of the method for determining the erythrocyte sedimentation rate in algebraic and integral, algebraic and differential forms is made. The evaluation of efficiency from the metrological point of view and coordination of information processes with technology schemes and addressing programs was carried out.

Keywords: adequacy of innovation, informative parameter, method for determining erythrocyte sedimentation rate (ECR), metrological efficiency.

Introduction

Adequacy of innovations to the processes of physics is determined by the correspondence of physical phenomena, the identity of the operators of mathematics and metrological correspondence. Adequacy is a measure of the effectiveness of innovation in terms of novelty and essence, efficiency and suitability. Therefore, adequacy reflects scientific novelty and practical value of the technology solutions from the comparative analysis of the science achievements [1].

Adequacy of mathematical models allows us to determine the physics of the phenomenon with the help of a variety of mathematical images. Adequacy of mathematical models allows evaluating the effectiveness from the metrological point of view and coordinating information processes with the technology of schemes and addressing programs [2].

In this paper, a method for determining the rate of erythrocyte sedimentation (ESR) is considered. In this method, one informative parameter is known – the time constant T and the second informative parameter is unknown – the maximum value of erythrocyte sedimentation H [3].

Modeling of the ESR method

Simulation confirms adequacy of mathematical models of the process of determining the erythrocyte sedimentation rate in algebraic and integral, algebraic and differential form.

The identity of the ESR models in algebraic and differential form is proved as:

$$\begin{cases} h = H \left(1 - e^{-\frac{t}{T}}\right), \\ h = \frac{1}{T} \int_0^t (H - h) dt, \end{cases} \quad (1)$$

where variables are the time and height of the plasma layer with limiting parameters (time constant T and the maximum value of erythrocyte sedimentation H).

The right parts of the equations of the system are equated as (1):

$$H \left(1 - e^{-\frac{t}{T}}\right) = \frac{1}{T} \int_0^t (H - h) dt, \quad (2)$$

and the height of the plasma layer in the left part of equation is replaced (2) with the first equation of the system (1):

$$H \left(1 - e^{-\frac{t}{T}}\right) = \frac{1}{T} \int_0^t \left(H - H \left(1 - e^{-\frac{t}{T}}\right) \right) dt = \frac{1}{T} \int_0^t H e^{-\frac{t}{T}} dt. \quad (3)$$

If in the integral from the right side of the equation (3):

$$H \left(1 - e^{-\frac{t}{T}}\right) = -H e^{-\frac{t}{T}} \Big|_0^t \quad (4)$$

we substitute the limits of integration, we obtain a result in the algebraic form of an exponential form:

$$H \left(1 - e^{-\frac{t}{T}}\right) = H \left(1 - e^{-\frac{t}{T}}\right). \quad (5)$$

Solution (5) shows the identity between the algebraic equivalent of system (1) and the resulting solution. This solution proves the adequacy of the integral models for determining the erythrocyte sedimentation rate.

On the basis of the method of primitive substitution and their derivatives of integral models and algebraic models, adequacy of mathematical models in algebraic and integral form is proved (1).

The derivatives of the primitive system are calculated as (1):

$$\begin{cases} \frac{dh}{dt} = \frac{H}{T} e^{-\frac{t}{T}}, \\ \frac{dh}{dt} = \frac{1}{T} (H - h). \end{cases} \quad (6)$$

The right parts of the equations of the system are equated as (6):

$$\frac{H}{T} e^{-\frac{t}{T}} = \frac{1}{T} (H - h). \quad (7)$$

After easy transformations we get the expression:

$$h = H \left(1 - e^{-\frac{t}{T}}\right), \quad (8)$$

which is identical to the algebraic model. This proves adequacy of mathematical models for determining the rate of erythrocyte sedimentation again.

Conclusion

Consequently, the identity of the operators of calculation and transformation for expressing the height of the plasma layer proves adequacy of mathematical models for

determining the rate of erythrocyte sedimentation in differential, algebraic and integral form.

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АДЕКВАТНОСТЬ МАТЕМАТИЧЕСКИХ МОДЕЛЕЙ ПРОЦЕССА ОПРЕДЕЛЕНИЯ СКОРОСТИ ОСЕДАНИЯ ЭРИТРОЦИТОВ

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Аннотация

Проведено сравнение моделирования способа определения скорости оседания эритроцитов в алгебраической и интегральной, алгебраической и дифференциальной формах. Проведена оценка эффективности с метрологической точки зрения и координация информационных процессов с технологией схем и адресацией программ.

Ключевые слова: адекватность инноваций, информативный параметр, метрологическая эффективность, способ определения скорости оседания эритроцитов.

METHOD OF INCREASING OCCLUSION TESTS INFORMATION

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Abstract

The problem of increasing occlusion tests information is focused on in the paper. An occlusive test is performed to diagnose the functional state of peripheral vessels. The study was limited to a selected area of the distal phalanges of fingers. Using a thermal imager, the average temperature in the distal phalanges of fingers of the hand is continuously measured during the pre-occlusal, occlusal and post-occlusal periods, and the result is a temporal dependence of the temperature on the test time according to which normal or pathological changes in the blood flow regulation of the peripheral vessels are evaluated. Additionally, the type of microcirculation (hyperemic, normotonic, or spastic) is determined by the time dependence of temperature. As a result, a method was obtained that improves the information content of occlusal tests by recording and analyzing the temporal dependence of the temperature of the distal phalanges of the hand. The method makes it possible to determine the reaction of the vessels to the hypoxia conditions created by continuous temperature measurements in the region of the distal phalanges of the hand during an occlusive test.

Keywords: blood flow, imager, occlusal test, occlusion, phalanges of the hand, temperature measurement.

Introduction

The method relates to medicine, in particular to methods of functional diagnostics of the state of peripheral vessels. Currently, methods based on indirect recording of pulsation in arteries are widely used for the non-invasive diagnosis of the state of vessels. The most common observations of changes are in the volume of a limb and measurements of fluctuations in the electrical impedance of limbs. However, when creating an occlusion of the cuff pressure, the pulsating movements of the arteries distal to the cuff are stopped, and the sphygmography and rheography methods only state the absence of blood flow and do not carry other information about the reaction of the extremities to the occlusion. Under such conditions, measurements during the occlusion of such a level as temperature would allow non-invasive studies of the response characteristics to the stress test [1].

Method description

Using a thermal imager, the average temperature in the distal phalanges of fingers of the hand is continuously measured during the pre-occlusal, occlusal and post-occlusal periods, and the result is a temporal dependence of the temperature on the test time, which is used to judge normal or pathological changes in blood flow regulation - the blood filling of peripheral vessels. The duration of the pre-occlusal period of the test is at least 30 seconds, the occlusal period is 90-120 seconds, the post-occlusal time period is at least 90 seconds. Temperature measurements can be carried out simultaneously on multiple fingers.

During the test, the patient's blood pressure is measured in order to determine the

cuff pressure needed to create the limb occlusion. The occlusal test with registration of temperature is carried out in pre-occlusal, occlusal and post-occlusal periods. On the resulting sequence of thermograms, areas of the distal phalanges of fingers are highlighted, and the dependence of the average temperature of these areas on the test time is set.

Prior to occlusion, the temperature of the pre-occlusal period is recorded for at least 30 seconds. During the occlusal period, there is the cuff pressure on the shoulder, exceeding the systolic pressure by 50 mm Hg, and a decrease in temperature is recorded. In the postocclusal period, there is sharp depressurization of the cuff on the shoulder, accompanied by an increase in temperature due to the development of postocclusal hyperemia.

The time of artificially created occlusion is chosen in order to provoke vascular reactions, without disturbing the patient [2].

During this period, the diameter of the brachial artery increases, reaching the maximum in approximately 90 seconds of hyperemia, then the diameter of the artery begins to decrease to values characteristic of the pre-occlusal period. Consequently, the maximum temperature should also be reached in approximately 90 seconds.

If the temperature of each of the fingers does not reach the average level of the pre-occlusal period, during the post-occlusal period then the violation of the endothelium-dependent regulation of the local blood flow is registered.

If the temperature of only one or several fingers does not reach the average temperature level of the pre-occlusal period, during the post-occlusal period then the presence of a spasm of the blood vessels of these fingers is registered.

With the help of an occlusive test with continuous temperature measurement, we can conclude about the type of microcirculation in the limbs.

If the temperature of several fingers reaches the level not exceeding the average temperature level of the pre-occlusal period, during the post-occlusal period then the hyperemic type of microcirculation is registered, if the temperature of several fingers rises above the average temperature of the preocclusion period by no more than 2 ° C during the post-occlusal period, then the normotonic type of microcirculation is registered, if the temperature of several fingers reaches the level exceeding the average temperature of the pre-occlusal period by more than 2 ° C during the post-occlusal period, then the spastic type of is registered.

If the temperature did not drop by more than 1 ° C below the average temperature of the pre-occlusal period during the period of occlusion, then the blood supply to the limb is limited [3].

Conclusion

Thus, based on the obtained temporal dependence of temperature, conclusions can be drawn about the local endothelium-dependent regulation of vascular tone, as well as the hemodynamics of the microvasculature based on the comparison of the temperature before and at the end of the occlusion period.

From the standpoint of diagnosis, the results of an occlusive test in studies of the cardiovascular system prove the high information content of tests of this type.

The method allows determining the response of the vessels to the created conditions of hypoxia, by continuous temperature measurements in the region of the distal phalanges of the hand during an occlusive test. Temperature measurement during the test allows

monitoring of the reaction of the extremities. Monitoring and comparing of the dynamics of temperature simultaneously on several fingers makes it possible to detect the presence of vasospasms.

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МЕТОД ПОВЫШЕНИЯ ИНФОРМАТИВНОСТИ ОККЛЮЗИОННЫХ ТЕСТОВ

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Аннотация

Для диагностики функционального состояния периферических сосудов проводят окклюзионный тест. Исследование ограничивалось выделенной областью дистальных фаланг пальцев. С помощью тепловизора непрерывно измеряют среднюю температуру в области дистальных фаланг пальцев кисти в предокклюзионный, окклюзионный и постокклюзионный периоды, в результате получают временную зависимость температуры от времени теста, по которой судят о нормальном или патологическом изменении регуляции кровотока - кровенаполнения периферических сосудов. Дополнительно по временной зависимости температуры определяют тип микроциркуляции - гиперемический, нормотонический или спастический. В результате был получен метод, который повышает информативность окклюзионных тестов за счет регистрации и анализа временной зависимости температуры дистальных фаланг кисти. Метод позволяет по непрерывным измерениям температуры в области дистальных фаланг кисти во время проведения окклюзионной пробы определить реакцию сосудов на созданные условия гипоксии.

Ключевые слова: измерение температуры, кровоток, окклюзионный тест, окклюзия, тепловизор, фаланги кисти.

DEVICE FOR THE ANALYSIS OF THE PSYCHO-EMOTIONAL STATE OF MAN'S BRAIN ACTIVITY

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Abstract

This paper discusses the method, the purpose of which is to create a data base of forms of emotional excitation. The method of recognition of the psycho-emotional state of a person in the field of psychiatry and psychology can be realized by a special device of restricted aim, which is based on the principle take off biopotentials of brain activity in determined areas of the neocortex. In other words, it is intended to develop a device that is a miniature analogue of an electroencephalograph, the main task of which is to determine the connection between an external stimulus of different origin and the emotional state of a person.

Keywords: electroencephalograph, psycho-emotional state.

Introduction

The subject of the research was the neocortex, in particular the areas of the brain responsible for changes in the emotional state. The study's aimed at developing a device that can determine the emotional spline of a person, using the developed method. The method recorded the difference in time and amplitude between the first half of the emotional surge on the stimulus and the second half. This analysis process allows you to determine the cause of the excitation and the person's attempt to hide it. Paul Ekman, an expert in the field of the psychology of emotions raised the question in his book "The Psychology of Lie" about the expression of pure emotions. The development of this device can solve this problem by recognizing emotions and into various categories. Six main emotions are distinguished: joy, fear, sadness, surprise, disgust and anger, other emotions are only different degrees of expression of the six basic ones [1]. The quick determination of the psycho-emotional state will allow to get more correct results in such areas as: psychiatry, criminal examination. We need to get data about all six types of human emotions as a result of psycho-emotional state research, i.e. emotional excitement of a person under the action of various different stimuli. And create database of types of splines of emotional excitations developed by the device.

Emotional state tracking

The use of electroencephalogram (EEG) has a number of advantages over other instrumental methods in the course of neurobiological research. First, electroencephalography is a non-invasive way to research an object. Secondly, there is no need to remain stationary, as it happens in case of functional magnetic resonance imaging (MRI). Thirdly, during the EEG spontaneous brain activity is recorded, therefore, the subject does not need to interact with the researcher. In addition, EEG has a high resolution in time compared with such methods as functional MRI, and can be used to identify millisecond oscillations of the brain's electrical activity.

Event-related potentials are used in cognitive studies using EEG. Most models of this type of research are based on the following: when it influence on a subject, it reacts openly or covertly. During the study, the patient receives any stimuli, and an EEG is recorded. The potentials associated with the events emit an averaging value of the EEG signal for all tests in different states.

We focus on the limbic system of the brain (the part that Macklin called the brain of a mammal), because it plays the most important role in the expressive non-verbal behavior [2].

Emotional disturbance can be detected by confining itself to the area that is responsible for this — the temporal region of the brain. Therefore, it is not necessary to record the full complex of EEG signals (further, this will affect the processing speed). The medial part of the temporal lobe belongs to the limbic system, which is involved in the emotional behavior and control of the autonomic nervous system.

It is necessary to take into account the existence of theta waves in the signal. Theta waves are associated with a change in the state of consciousness. Theta rhythm is associated with the searching behavior, which increases in case of the emotional stress. It is often observed in case of psychotic disorders, states of confusion.

The analysis of the obtained data is performed in the Matlab software environment; in the future, the program will be converted into the working environment of the Arduino board. A mathematical function is a wavelet function that is used to analyze experimental data.

The wavelet function is a band-pass filter tuned to any frequency of transmission. The combination of wavelets forms a bank of filters, therefore convolving with the coefficients of such filters results in filtering in the band occupied by wavelets.

Since wavelets have good time-frequency adaptation, they are a convenient tool for studying the frequency characteristics of a signal. Wavelet transform (WT) is divided into discrete (DWT) and continuous (CWT). Discrete wavelet transform (DWT) provides enough information for signal analysis, being at the same time economical in the number of operations and memory. Discrete wavelet transform is used to quickly process data and reduce memory footprint (Formula 1) [3].

$$\left(f(t), \psi_{\sigma_0^j, k\tau_0\sigma_0^j}(t) \right) = \sum_{-\infty}^{+\infty} f(t) \frac{1}{\sqrt{|\sigma_0^j|}} \psi \left(\frac{t - k\tau_0\sigma_0^j}{\sigma_0^j} \right) \quad (1)$$

Formula (1) is a variant of a discrete wavelet transform with a decrease in the number of samples in the transition from one scale (j) to another (j + 1).

Where ψ is the discretization of the basic functions (Formula 2):

$$\psi_{\sigma_0^j, \tau}(t) = \frac{1}{\sqrt{|\sigma_0^j|}} \psi \left(\frac{t - \tau}{\sigma_0^j} \right) \quad (2)$$

To implement the device it is necessary to complete the following steps. The first stage is the assembly and configuration of the scheme. At the moment, an electrode has been manufactured with an operational amplifier, connected via negative feedback and a power supply unit for the circuit (Figure 1). The second stage is to conduct a series of

experiments in order to obtain samples of emotional leaps in response to stimuli. It is known that emotions take place in the range from a few microseconds to 3-5 seconds. In this time range the signal will be analyzed.

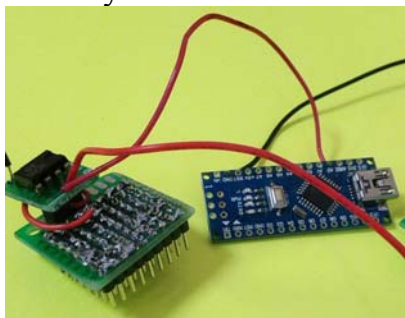


Figure 1 - Electrode and amplifier connected to the circuit

The hardware in the project consists of the Arduino board, which is a trademark of hardware and software for building simple automation systems and robotics. The software part consists of a software shell (IDE) for writing programs, compiling them, and programming hardware. The hardware is a set of mounted printed circuit boards. Fully open system architecture allows you to freely copy or supplement the Arduino product line.

The third stage is the receipt of characteristic signs of each of the emotions. The signal comes from the electrode and the amplifier to the board, in which programmatically passes frequency filtering, which saves time and board memory. In the final stage, signs of an emotional outburst stand out.

Conclusion

All this allows creating a database of filtered bursts of each of the main 6 emotions, so that in the future the program will independently determine the emotional outburst and its nature. At the moment there is a small database of emotions of joy, for great achievements it is necessary to expand the sample.

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УСТРОЙСТВО ДЛЯ АНАЛИЗА ПСИХОЭМОЦИОНАЛЬНОГО СОСТОЯНИЯ МОЗГОВОЙ АКТИВНОСТИ ЧЕЛОВЕКА

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Аннотация

Развитие метода распознавания психоэмоционального состояния человека в области психиатрии и психологии может быть реализовано специальным устройством узкого назначения, в основу которого положен принцип снятия биопотенциалов мозговой активности в определенных областях головного мозга. Другими словами, предполагается разработка устройства, которое представляет собой миниатюрный аналог электроэнцефалографа, главной задачей которого является определение связи между внешним стимулом различного происхождения и эмоциональным состоянием человека.

Ключевые слова: электроэнцефалограф, психоэмоциональное состояние.

DEVELOPMENT OF A METHOD FOR DETECTING LOCAL INHOMOGENEITIES IN A THERMAL IMAGE

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Abstract

The paper is devoted to the development and research of the method of increasing the efficiency of local inhomogeneities detection on the thermal image with adaptive frequency filtering. The aim of the work is to improve the detection of local inhomogeneities in the thermal imaging image with adaptive frequency filtering. This method allows a method has been developed to increase the efficiency of detecting local inhomogeneities in a thermal imaging image with adaptive frequency filtering, it is characterized by the fact that the signal filtering occurs in a wide and narrow frequency range, which results in the a more effective suppression of interfering temperature signals.

Keywords: adaptive frequency filtering, occlusion, peripheral geodynamics, post-occlusal period, time delay.

Introduction

Man's hands and fingers are characterized by pronounced temperature dynamics, the analysis of which, both at rest and during stress tests, can be used to detect skin blood flow disorders during burns, mechanical injuries, Raynaud's disease, carpal tunnel syndrome, and peripheral nerve damage.

Establishing the relationship between fluctuations in temperature and blood flow has many difficulties, for example, with the difference in the shape of the two types of coexisting fluctuations and the presence of a time delay of temperature values. At the same time, the values of time delays determined by different groups of researchers do not agree with each other [3].

In connection with the above, an urgent task is to establish the relationship between temperature fluctuations and the blood flow of human fingers, which will expand the capabilities of thermal imaging methods in diagnosing disorders of peripheral hemodynamics, and in the case of thermal measurements, visualize the spatial distribution of skin blood flow oscillations.

Literature review

The closest solution adopted for the prototype is a way to visualize oscillations of the skin blood flow in the limbs. The objective of this solution is to visualize the oscillations of the skin blood flow in the extremities by recording the dynamics of the skin temperature distribution (dynamic thermogram) with a thermal imaging camera, mathematical processing of temperature data and converting thermograms into blood flow oscillation distribution maps. [1]

The technical result is to increase the investigated surface area of the object and increase the accuracy of determining the parameters of peripheral blood flow by

temperature methods through the use of a new model of temperature signal propagation in biological tissue and visualization of spatial changes in blood flow oscillations.

In accordance with the model used, fluctuations in the blood flow generate a heat wave propagating from a certain depth to the surface of the skin. The wave is characterized by attenuation and final propagation velocity. Therefore, a relationship can be established between signals of temperature and blood flow fluctuations by analyzing the oscillations at individual frequencies. At the same time, the frequency dependences of the delay and attenuation of the temperature signal relative to the blood flow signal will characterize the properties of the skin [2].

The main disadvantages of the selected prototype are:

- fluctuations in the point of observation due to involuntary movements of the fingers;
- distortion of information on temperature values due to automatic normalization of frame brightness with a sharp increase in the temperature of the distal phalanx of fingers;
- the absence of a system for suppressing non-informative fluctuations of the temperature of the distal phalanx of fingers.

The second drawback arises due to an increase in the hand temperature when it is heated in a warmer room, in this case the hand temperature (t_p) becomes higher than the background temperature (t_ϕ), after the normalization of the highest hand temperature to the maximum, the effect of decreasing background temperature occurs. For example, at time t_1 , t_ϕ was 25° , maximum $t_p = 27^\circ$ at time t_2 maximum $t_p = 30^\circ$.

Research Method

To increase the detection efficiency, it is necessary to reduce the level of temperature noise due to fluctuations in the skin temperature. To do this it is proposed to measure the pulse rate and highlight the blood flow signal only with the pulse rate.

Thus, adaptive frequency filtering of the thermal flow signal will be implemented.

We propose a method for detecting local inhomogeneities based on occlusal dough consisting in preprocessing images in accordance with the prototype, in selecting areas in the thermal image in which the temperature increment after occlusion and in the post-occlusal period is more than 1 degree. After that, for each frame of the image, starting from the moment when the occlusion is completed, the contrast of inhomogeneities with the surrounding tissue is continuously calculated, the moment of time with the highest contrast is selected.

The skin temperature fluctuations in the hand area and the subsequent mathematical spectral analysis of temperature fluctuations, during which the spectral coefficients of temperature fluctuations are set against time. Then each spectral component of frequency f_i is shifted to the previous time point by the interval Δt , the amplitude of each spectral component is multiplied by the coefficient determined by the formula $C_{AMP}(f_i, z) = \exp\left(z \cdot \sqrt{\frac{\pi \cdot c \cdot \rho}{\lambda} \cdot f_i}\right)$ where z – is the thickness of the biological tissue layer, λ – thermal conductivity coefficient of the skin, c – specific heat capacity of the skin, ρ – density of the skin, f_i – frequency of the i -th spectral component.

Conclusion

During the study, a method was developed to improve the detection of local inhomogeneities in a television image with adaptive frequency filtering, characterized by the fact that the signal is filtered in a wide and narrow frequency range, which results in the more effective suppression of interfering temperature signals

The practical significance of our results is that the demonstrated electrothermal analogy allows you to use the time derivative of temperature to convert the temperature signal of the extremities into oscillations of the skin blood flow and vice versa.

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РАЗРАБОТКА МЕТОДА ОБНАРУЖЕНИЯ ЛОКАЛЬНЫХ НЕОДНОРОДНОСТЕЙ НА ТЕПЛОВИЗИОННОМ ИЗОБРАЖЕНИИ

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Аннотация

Статья посвящена разработке и исследованию метода повышения эффективности обнаружения локальных неоднородностей на тепловизионном изображении с адаптивной частотной фильтрацией. Цель работы заключается в повышении эффективности обнаружения локальных неоднородностей на тепловизионном изображении с адаптивной частотной фильтрацией. Разработан метод повышения эффективности обнаружения локальных неоднородностей на тепловизионном изображении с адаптивной частотной фильтрацией, отличающийся тем, что фильтрация сигнала происходит в широком и в узком диапазоне частот, что обеспечивает более эффективное подавление мешающих температурных сигналов.

Ключевые слова: адаптивная частотная фильтрация, временная задержка, окклюзия, периферическая геодинамика, постокклюзионный период.

METHODS OF HARDWARE AND SOFTWARE CORRECTION OF X-RAY IMAGES

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Abstract

The most well-known methods of digital x-ray image correction are considered, their advantages and disadvantages are described, and the most effective method - correction using Laplacian pyramids - is presented.

Keywords: digital x-ray image, Laplacian pyramids, image processing, noise reduction, contrast enhancement

Introduction

Software and hardware correction of digital x-ray images is useful in real clinical practice. It provides a higher quality of the obtained images and, thus, simplifies the process of the correct diagnosis and reduces the need for re-diagnosis (an extra dose of radiation). The task of choosing a correction method is often faced by engineers. It is often difficult to choose a suitable method due to the wide variety of methods. Therefore, it is necessary to consider the main methods of X-ray image correction and choose the most effective method. Let us consider the well-known methods of correcting X-ray images.

Analysis of methods

At the moment reduction of the influence of scattered radiation is most often achieved through technical solutions, so-called anti-scattering devices. This may be the use of anti-scatter grids, slit or multi-slit scanning, air gap. These devices have significant drawbacks. Artifacts in the form of a small streaked structure, the Moire effect (a pattern that occurs when two periodic mesh patterns are superimposed) are introduced into the image into the process of its reduce, radiation anti-scatter grids also weaken the primary component along with a decrease in the scattered [1].

Another method for improving the image quality is the use of cone beam radiology. The image is obtained by rotating the frame to which the X-ray source and detector are attached around the patient. The main disadvantage of this method is the sensitivity to the movement, which affects the appearance of artifacts that are not associated with the object of study during the procedure [2].

In addition to the above mentioned hardware correction methods, filters are used that transmit predominantly high-energy part of the X-ray tube emission spectrum, which is installed in front of the object under study using sensors to obtain the final image. The disadvantage of this method is that the resulting image is summarized, i.e. it is a set of superimposed images (projections) of the internal structures of the object under study. This complicates the image analysis, forcing the use of tomography with increased radiation exposure to the patient [2].

The main disadvantage of all hardware methods is the high cost and complexity of implementation, which is why software methods for correcting digital X-ray images are widely used [3].

One of the most common quality improvement methods is homomorphic filtering. It allows normalizing the brightness of the image and enhancing its contrast. The main purpose of homomorphic filtering is the separation of reflection coefficient and illuminating intensity (image brightness). To do this, the logarithm of the product of the illuminating intensity function and the reflectivity function is taken, which results in the sum of the logarithms of the factors. The received signal is processed by a linear high-frequency filter, and then potentiation is applied, which allows obtaining the desired processed enhanced image. However, there is a possibility of introducing noise into the processed image or distortion of useful information [3].

Correction of digital X-ray images using the wavelet transform result in for noise suppression and the contrast increase of digital x-ray images. The input image is subjected to gamma correction: square root extraction for approximation of Poisson noise by the model of additive noise, distributed according to the normal law. Then, for a multiplicative noise model, a logarithmic transformation is performed, and a one-level wavelet transform of the input image is performed. On the basis of the data obtained, a block-wise splitting of the wavelet coefficients and an estimate of the standard deviation of the noise for each block are performed. Block noise estimates are smoothed and interpolated to the size of the original image. After that, the image is subjected to batch stationary wavelet transform for a specified number of splitting levels. The next step is to perform threshold noise reduction and the selection of image details using the previously calculated estimate of the noise level. The transform coefficients are processed by an adaptive nonlinear operator. At the end, the inverse stationary wavelet transform is performed, and the resulting image with a reduced noise level and underlined details is subjected to inverse gamma transform.

The above mentioned method allows toimplementing noise reduction and contrast increase of digital X-ray images, but is rather labour-consuming due to the presence of an adaptive non-linear operator and a large number of operations.

One of the most modern methods of software processing of X-ray images is a method for correcting digital X-ray images using Laplacian pyramids [4].

The original image with the help of pyramidal splitting is laid out on the detailing and approximating images. At the next stage, the scattered radiation in the approximating part of the images is removed and the process of increasing the contrast for the detailing images is carried out. The final step is the reconstruction and the formation of the final image.

The main advantages of this method:

1. The possibility of correcting the amplitude and frequency characteristics of the image.
2. Noise reduction.
3. The ability to remove the influence of scattered radiation.
4. Correction of the dynamic range of the image in accordance with the dynamic range of the intended output device.
5. The redundancy of the pyramid makes it resistant to motion compensation errors.

6. The Laplacian pyramid allows you to efficiently transmit an image over a channel with limited bandwidth.

Conclusion

Thus, hardware and software methods for correcting digital X-ray images were analyzed, the advantages and disadvantages of the presented methods were found, and the most effective method was identified, namely, the image correction using Laplacian pyramids.

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МЕТОДЫ АППАРАТНОЙ И ПРОГРАММНОЙ КОРРЕКЦИИ РЕНТГЕНОВСКИХ ИЗОБРАЖЕНИЙ

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Аннотация

Рассмотрены наиболее известные методы коррекции цифровых рентгеновских изображений, описаны их преимущества и недостатки, выявлен наиболее эффективный метод – коррекции при помощи пирамид Лапласа.

Ключевые слова: цифровое рентгеновское изображение, пирамиды Лапласа, обработка изображений, подавление шума, усиление контраста

WAVELET ANALYSIS TO EXPLORE THE POTENTIALS OF THE PRESTRIATE AREA

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Abstract

This paper discusses the method, the purpose of which is the creation of biomedical engineering control systems. The method of recognition of the psycho-emotional state of a person in the field of psychiatry and psychology can be realized with a special device of restricted aim, which is based on the principle of taking off biopotentials of brain activity in determined areas of the neocortex. In other words, it is proposed to develop a method that can be effectively used for the study of visual information on the electroencephalogram.

Keywords: electroencephalograph, visual cortex, wavelet analysis.

Introduction

Neurons that send visual signals from the eyes are directly connected to the visual area of the cerebral cortex. By analyzing the potentials, it is possible to obtain information that can be successfully used to create control systems for biomedical techniques, or to diagnose diseases of the eyeball. In other words, it is planned to develop a method that can be effectively used for the study of visual information on the electroencephalogram.

Electroencephalography (EEG) is a method for studying the electrical activity of nerve cells in the brain. Since the EEG signal is transient the frequency characteristics vary greatly with time (different eye positions at different time intervals). Therefore, for detailed spectral (and more precisely spectral-time) signal analysis, it is necessary to have basic functions that would have localization in both the frequency and time domains. Wavelet functions have such properties [1].

Detection of visual cortex signals

The EEG signal was removed from the visual cortex, which is a part of the cerebral cortex, which is responsible for processing visual information. Basically, it is concentrated in the occipital lobe of each of the hemispheres of the brain.

As a rule, the wavelet transform produces a large number of small coefficients and a small number of large ones. The discrete wavelet transform of the signal is calculated by passing it through two filters (high and low frequencies) in each iteration [2].

Since the filters pass only half of all the frequency components of the signal, components that are not in the transparency band can be removed. Decimation is performed, i.e. thinning twice. This is reflected in Fig. 1.

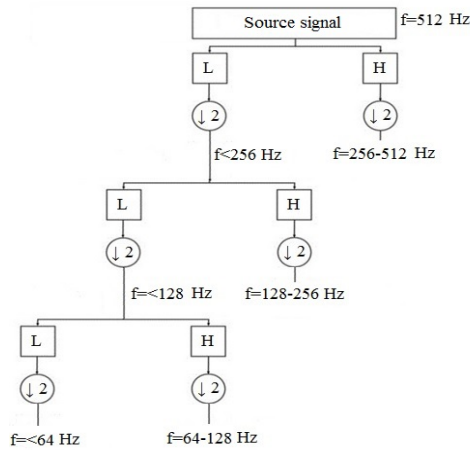


Fig. 1 - Signal decomposition scheme

As a result, the original signal will be represented as two new sequences of the coefficients L and H. The sequences L and H are half the length of the original signal. Further, the decomposition process can be continued on L.

After analyzing the signal at different frequencies, the frequency was chosen at which the signal has the most information, with the lowest noise level (Fig. 2).

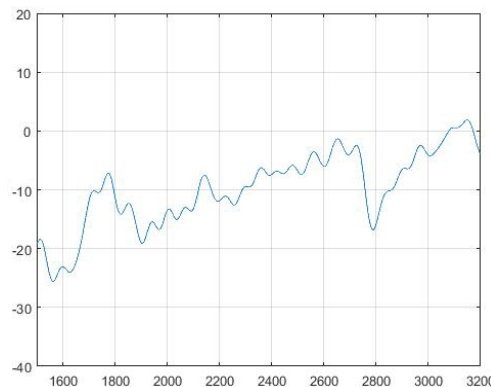


Fig. 2 - Signal after processing

Having found the intervals at which the eyeball moves upwards by the number “1” and the downward movement by the number 2, we find the average values of the amplitudes before, during, and after the movement of the eyeball. The resulting values are presented in Table 1.

Table 1 - moments eye movement

Time	Average amplitude
Before moving 1	-11.0307
While driving 1	2.6611
After movement 1	-5.1135
Before moving 2	8.2176
While driving 2	-2.0633
After movement 2	9.0264

The movements of the eyeball correspond to sharp amplitude jumps. A sharp increase for upward movement and a sharp decrease for downward movement.

The neural network is built on the perceptron principle. Perceptron is a network consisting of elements with a variable interaction matrix), determined by a sequence of past states of network activity. Perceptron training is implemented by the method of error correction - it is a training method in which the weight of the connection does not change as long as the current reaction of the perceptron remains correct. If an incorrect reaction appears, the weight changes by one, and the sign (+/-) is determined opposite to the error sign.

The values of these intervals will be used to train an artificial neural network that will automatically recognize the predetermined movements of the eyeball [3].

Conclusion

All this allows creating a database of filtered bursts of each of the main eyeball movements, so that in the future the program will independently determine the movement and its nature. At the moment there is a small database of movements up and down, for great achievements it is necessary to expand the sample.

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ИССЛЕДОВАНИЕ ПОТЕНЦИАЛОВ ЗРИТЕЛЬНОЙ КОРЫ ГОЛОВНОГО МОЗГА С ПОМОЩЬЮ ВЕЙВЛЕТ-АНАЛИЗА

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Аннотация

Нейроны, посылающие зрительные сигналы от глаз непосредственно соединены со зрительной зоной коры большого мозга. Анализируя потенциалы, возможно получить информацию, которая с успехом может использоваться для создания систем управления биомедицинской техникой или диагностики заболеваний глазного яблока. Другими словами, предполагается разработать метод, который можно будет эффективно использовать для исследования зрительной информации на электроэнцефалограмме.

Ключевые слова: Вейвлет-анализ, зрительная кора, электроэнцефалограф.

THE IMPACT OF SUDDEN UNEXPECTED DEATH SYNDROME TO EPILEPSY MONITORING REQUIREMENTS

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Abstract

The syndrome of sudden unexpected death of a patient with epilepsy is considered. It has been established that existing monitoring methods are ineffective in detecting mechanisms in epilepsy development of this syndrome. The key features of the proposed new monitoring method of epilepsy are considered, that can add significantly the clinical picture of disease produced by traditional methods of monitoring.

Key words: epilepsy, electroencephalography, monitoring, sudden death, SUDEP.

Introduction

According to the World Health Organization, more than 50 million people worldwide were diagnosed with epilepsy. This disease is one of the most common neurological diseases in the world [1]. Epilepsy is called as a chronic disruption of the brain, which is accompanied by specific symptoms and frequent paroxysms of various types. Forms of epilepsy are divided due to the reasons of its origin: congenital and acquired epilepsy. Classification of seizures of epilepsy varies every year and is becoming wider, that is connected with the discovery of new principle of the emergence of epilepsy, as well as with the opening of the first unknown factors conducive to disease development. In addition, it was revealed that 8-17% of deaths the patients with epilepsy occur suddenly, without apparent reason. A condition called as a sudden death of the epilepsy patients (SUDEP), was formulated only in the 1995. Thus, there is about 500 epilepsy patients died in UK with SUDEP syndrome, most often the syndrome occurs among men, aged 20 to 40 years.

Thus, there is a need to modernize the existing and development of new methods for monitoring of epilepsy.

Methods and materials

Conducted by D. Fiker research has demonstrated the exact relationship between the existence of generalized seizures and an increase in the likelihood of sudden death. The risk of SUDEP Syndrome was 14 times higher with patients, who have generalized seizures epilepsy with a frequency of manifestations at least once a month [2].

According to Fergus Rugg-Gunn and coauthors, the great number of patients detected the increase in heart rate (HR) during an attack of epilepsy. In addition, paroxysmal tachycardia can occur: sinus tachycardia and bradycardia, atrial fibrillation, stopping sinus unit, change of ST segment and T wave inversion, the blockade through atrioventricular connection, during an attack of epilepsy [3]. Paul Schraeder considered the development of arrhythmia as a result breathing stops during or after generalized attacks, but the exact sequence of symptoms till the end is unknown.

In case of the likelihood of SUDEP syndrome of patients with epilepsy, it is advisable to monitor cardiac activity and blood oxygen saturation that is currently not taking place.

Now electroencephalography (EEG) techniques and video-EEG (VEEG) are widely used in the diagnosis and monitoring, the essence of these methods to register the

difference of electric potentials of the brain projected the skin of the head. The main difference between VEEG from the EEG is the use of video cameras to monitor the condition of the patient. The monitoring of epilepsy can be applied in the outpatient and inpatient settings. Using these methods allows establishing the diagnosis "epilepsy", when analyzing EEG can detect the location of the epicenter of the disease, to monitor the spread of the hearth.

Results and discussion

A modern approach to epilepsy monitoring does not take into account the existence of SUDEP syndrome that leads to reduced effectiveness monitoring. In addition, to ensure the full monitoring of epilepsy there is a need to provide ongoing analysis of cardiac and respiratory activities of the patient, this requirement cannot be met using traditional monitoring methods, which have a need to use expensive equipment and qualified professionals to regulate the monitoring process.

Therefore, there is a need to develop a fundamentally new method of monitoring epilepsy, available for use by the patient yourself at home.

The key points in the proposed method should be: defining occurrence of epilepsy attack, analysis of informative parameters of epileptic attack, analysis of cardiac and respiratory activity of the patient, the preservation and transmission of the accumulated information by trained professionals.

Conclusion

The SUDEP syndrome, which leads to the death of a patient with epilepsy as a result of a breach of cardiac or respiratory activities during an attack of epilepsy, is considered. There is a need to amend existing methods and to develop new ones for epilepsy monitoring techniques to improve their effectiveness. It is proposed to develop a fundamentally new method of monitoring epilepsy, which can significantly improve the effectiveness of monitoring of epilepsy.

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ВЛИЯНИЕ СИНДРОМА ВНЕЗАПНОЙ НЕОЖИДАННОЙ СМЕРТИ НА ТРЕБОВАНИЯ К МОНИТОРИНГУ ЭПИЛЕПСИИ.

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Аннотация

Рассмотрен синдром внезапной неожиданной смерти больного эпилепсией. Установлено, что существующие методы мониторинга эпилепсии малоэффективны в обнаружении механизмов развития данного синдрома. Предложены ключевые особенности нового метода мониторинга эпилепсии, который способен существенно дополнить клиническую картину заболевания, получаемую традиционными методами мониторинга.

Ключевые слова: эпилепсия, электроэнцефалография, мониторинг, внезапная смерть, SUDEP.

УДК678
ББК24.7

UTILIZATION OF POLYOLEFIN WASTES

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Abstract

The problem of waste disposal of polyolefins is considered. Various methods of disposal of these wastes are analyzed. It is proposed to process them into secondary raw materials, the final stage of which is granulation followed by the production of various products.

Keywords: plastics, polymers, polyolefins, recycling, utilization, waste.

Introduction

One of the most tangible results of human activity is the generation of waste, among which plastic waste occupies a special place due to its unique properties. Plastics are organic materials consisting of natural or synthetic high molecular compounds [1].

One of the fastest growing uses of plastics is packaging. Of all the plastics produced, 41 % is used for packaging; of this amount, 47 % is spent on food packaging. Convenience and safety, low price and high aesthetics are the determining conditions for the accelerated growth of the use of plastics in the manufacture of packaging material [1].

The problem of recycling plastics is primarily of an ecological nature, since plastics does not rot and corrode, which is characteristic of plastics. The total volume of solid waste disposal in Moscow alone is about 4 million tons per year [1].

However, at present, the problem of recycling plastics waste becomes relevant not only from the standpoint of environmental protection, but also due to the fact that in the context of a shortage of polymeric raw materials, plastic waste becomes a powerful raw material and energy resource [1].

The technology of polyolefin wasteprocessing

The most effective way to recycle polyolefin wastes is to reuse them. Polyolefins are the most versatile type of thermoplastics. These include high and low density polyethylene and polypropylene. Polyolefins are widely used in various industries, transport and agriculture [1].

Methods for wasteprocessing of polyolefins depend on the brand of polymer and their origin. Technological waste is simply processed, that is, production waste that has not been exposed to intense light exposure during operation [2].

For the transformation of waste thermoplastics into raw materials suitable for subsequent processing into products, it is necessary to pretreat it. The choice of the pretreatment method depends mainly on the source of waste and the degree of contamination [1].

Waste in the form of obsolete products requires more thorough preparation.

Pretreatment of agricultural foil waste from polyethylene, bags of fertilizer and waste from other compact sources, as well as mixed waste consists of the following steps: sorting and identification (for mixed waste); grinding; separation of mixed waste; washing; drying [1].

Pre-sorting provides for a rough separation of waste by color, size, shape, and, if necessary and possible, by type of plastics. Pre-sorting is done manually on tables or conveyor belts. Various foreign objects and inclusions are simultaneously removed from the wastewhen sorting. The waste is sorted, and then it is crushed with knife crushers of wet or dry grinding to obtain a loose mass with a particle size of 2...9 millimeters [3].

Next, the crushed waste is washed in the washing machine. Washing is carried out in several stages with special detergent mixtures. The mass is squeezed in a centrifuge with the moisture content of 10...15 %, then it is put to a drying unit, and then to a granulator [1].

Granulation is the final stage of the preparation of secondary raw materials for subsequent processing into products. This stage is especially important for recycled low density polyethylene due to its low bulk density and difficulty of transportation. In the process of granulation, the material is compacted, its further processing is facilitated, the characteristics of secondary raw materials are averaged, as a result of which the material is obtained that can be processed using standard equipment [1].

For the plasticization of crushed and cleaned polyolefin wastes, single-screw granulators with the length of $L=(25...30)\times D$ (where D is the screw diameter), equipped with a continuous filter and having a degassing zone, are most widely used. However, for processing contaminated and mixed waste, screw presses of special designs are needed, with short multiple-use augers of length $L=(3.5...5)\times D$, having a cylindrical nozzle in the extrusion zone [1].

Secondary granular materials are obtained depending on the sequence of cutting and cooling processes in two ways: head granulation and underwater granulation. The choice of granulation method depends on the properties of the processed thermoplastic and especially on the melt viscosity and adhesion to the metal. The diameter of the obtained granules is generally 2...5 millimeters [1].

Studies of granulated secondary polyethylene indicate that its viscous properties do not differ from the properties of primary polyethylene, that is, it can be processed under the same modes of extrusion and injection molding as the primary polyethylene. However, the resulting products are characterized by low quality and durability [1].

A promising direction for the processing of polyolefin wastes is to combine rolling and extrusion processes in one unit. This reduces the energy consumption of the process of obtaining secondary granules from polyolefins [4].

As a result, the obtained granules can be used for packaging household chemicals, construction parts, agricultural equipment, pallets for the transportation of goods, chimneys and other products. However, it is more promising to add secondary raw materials to the primary ones in the amount of 20...30 %. When plasticizers, stabilizers, and fillers are introduced into the polymer composition, this figure can be increased up to 40...50 %. This increases the physical and mechanical characteristics of the products, however, their durability (when operating in harsh climatic conditions) is only 0.6...0.75 of the durability of products from the primary polymer. A more efficient way is to modify the secondary polymers, as well as to obtain composite materials based on them [1].

Conclusion

The paper analyzes the problem of polyolefins waste recycling. It is proposed to recycle polyolefin wastes by combining the process of rolling and extrusion in one unit followed by the use of the resulting granulate of composite materials.

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УТИЛИЗАЦИЯ ОТХОДОВ ПОЛИОЛЕФИНОВ

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Аннотация

Рассмотрена проблема утилизации отходов полиолефинов. Проанализированы различные способы утилизации данных отходов. Предлагается их переработка во вторичное сырье, окончательным этапом которого является грануляция с последующим получением различных изделий.

Ключевые слова: отходы, переработка, пластмассы, полимеры, полиолефины, утилизация.

FUNCTIONAL PROPERTIES OF STYRENE-ACRYLIC COATINGS MODIFIED WITH CARBON NANOMATERIALS

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Abstract

Three-layer polymer films with improved reflection and absorption of electromagnetic radiation (EMR) were obtained by modifying a mixture of multi-layer carbon nanotubes (MWCNT) and graphene doped with nitrogen. The reflection of radiation is about 60% in the entire frequency range. The absorption varies from 98.5 to 99.7% depending on the frequency of the radiation and reaches a maximum at 18-25 GHz.

Keywords: Graphene, carbon nanotubes, radio absorption, radio reflection.

Introduction

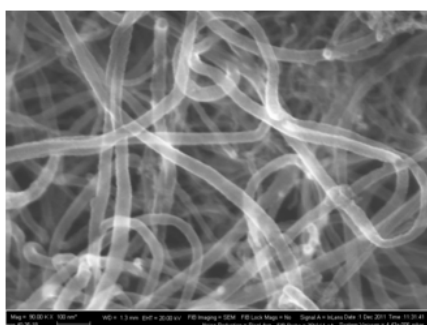
Electronic devices used in appliances and households pose a danger to the environment and human health due to the emitted electromagnetic radiation. In this regard, materials that can efficiently absorb and repel EMR are becoming very popular, especially in the communications, electronic, military, and aerospace industries. An urgent task is the development of composites with a tunable microwave transmittance and thermal stability.

Graphene and multilayer carbon nanotubes are fillers of polymer matrices that provide the ability to selectively control the reflection coefficient of EMR. Especially effectively carbon nanostructures work in the composition of layered materials [1-2].

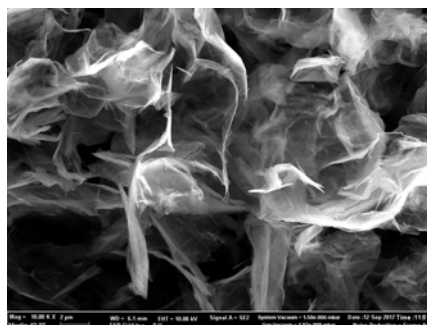
The purpose of this work was to obtain multilayer functional coatings with a variable reflection coefficient of electromagnetic radiation.

Methods of research

The MUNT Taunit-M (Fig. 1 (a)) and graphene doped with nitrogen (Fig. 1 (b)) produced by LLC Nanotehtsentr, Tambov were used in the work. As a matrix we used styrene-acrylic dispersion (TU 2257-001-71432335-17).



a)



b)

Figure 1 - SAM-images of CNT Taunit-M (a) and graphene doped with nitrogen (b)

Based on these materials, three-layer radio-absorbing films were obtained. The preparation was carried out as follows: CNT in the amount of 10 wt.% was introduced into the styrene-acrylic matrix, and mechanical mixing was carried out for 5 min. The resulting material was deposited on a fluoroplastic substrate in a uniform layer and dried at room temperature. In a similar way, a composition based on graphene doped with nitrogen was obtained and applied with a second layer. The third layer had the same composition as the first.. The film thickness after drying was 300 μm .

Data presentation

The study of the ability of the composite to absorb and reflect EMR was carried out using rectangular waveguides. The frequency range of measurements was regulated by the dimensions of the waveguide channel. The amplitude of the reflected and transmitted electromagnetic waves was recorded in 4 frequency bands: 26–40 GHz, 17–26 GHz, 12–17 GHz, 8–12 GHz, with channel sizes: 7.2x3.5, 11x5.5, 16x8 and 23x10 mm respectively. The image of the composite structure is shown in Scheme 1.

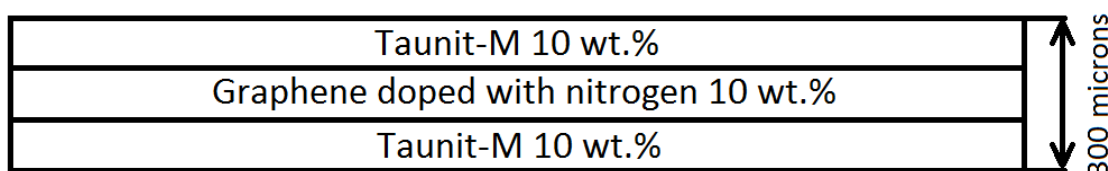


Figure 2 - Schematic representation of a three-layer composite film

Discussion

Fig. 3 shows the dependence of the reflection coefficient of electromagnetic radiation on the radiation frequency. In the entire investigated range, about 60% of the incident radiation is reflected, which is due to the high concentration of MCNTs in the outer layers.

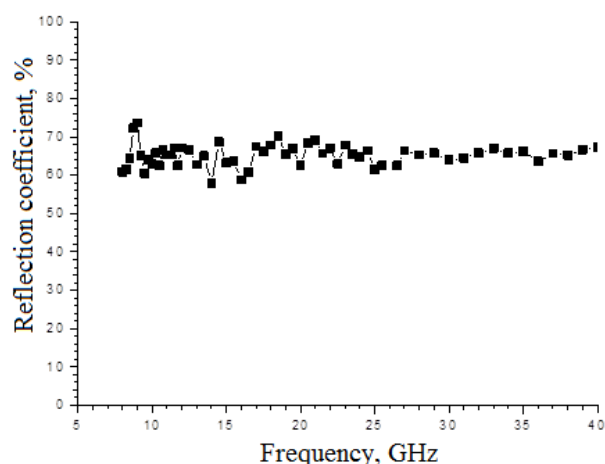


Figure 3 - The dependence of the reflection coefficient of the radiation frequency

The analysis of the dependence of the transmission coefficient on the frequency of the EMR (Fig. 4) shows the high efficiency of the applied nano-modifiers. The resulting composite film transmits only 0.3-1.5% of the radiation.

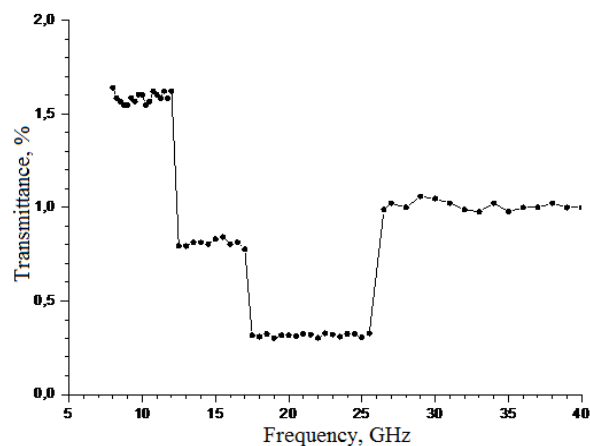


Figure 4 - The dependence of the transmittance on the radiation frequency

The minimum transmittance (0.3%) is observed in the frequency range 18-25 GHz.

Conclusion

A composite film was obtained on the basis of alternating layers modified with MWCNTs and graphene doped with nitrogen. Its thickness was 300 microns. The composite is characterized by the ability to reflect (up to 60%) and absorption (up to 99.7%) of EMI. The maximum absorption of microwave radiation is achieved at a frequency of 18-25 GHz.

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ФУНКЦИОНАЛЬНЫЕ СВОЙСТВА СТИРОЛ-АКРИЛОВЫХ ПОКРЫТИЙ, МОДИФИЦИРОВАННЫХ УГЛЕРОДНЫМИ НАНОМАТЕРИАЛАМИ

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Аннотация

Получены трехслойные полимерные пленки с улучшенными показателями отражения и поглощения электромагнитного излучения (ЭМИ) за счет модифицирования смесью многослойных углеродных нанотрубок (МУНТ) и графена, допированного азотом. В качестве матрицы использована стирол-акриловая суспензия. Отражение излучения составило около 60% во всем частотном диапазоне. Поглощение при этом изменилось на 98,5-99,7% в зависимости от частоты излучения и достигло максимума при 18-25 ГГц.

Ключевые слова: графен, углеродные нанотрубки, радио поглощение, радио отражение.

DISPOSAL OF POLYPROPYLENE WASTE

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Abstract

The paper deals with the problem of recycling waste from polypropylene. Various methods of disposal of these wastes are presented, one of which is their processing into secondary raw materials, followed by granulation and the manufacture of various products from them. A promising direction of processing waste polymers is to combine the processes of rolling and extrusion in one unit, which allows obtaining a more effective technical solution to the problem.

Keywords: plastics, polymers, polypropylene, recycling, secondary, utilization, waste.

Introduction

Plastic has long been in demand in human life. It serves for the packaging of food and non-food products and various products of everyday life. Polypropylene is a polymer that externally represents a white solid that is created by polymerization. The material is used for the manufacture of films, bags, parts for car seats, inhalers, disposable syringes, and caps for polyethyleneterephthalate bottles.

When the service life of plastic products is over, they are thrown away. Waste plastics can be thrown away, but after falling into incinerators, the material disintegrates into components that are harmful to nature and humans [1].

But you can recycle the waste products from polypropylene for recycling. This will prevent pollution, and allow obtaining composite materials that can be used in various industries. Reception of polypropylene waste is carried out by private companies that process them.

Technology of processing polypropylene waste

One of the most tangible results of human activities is the generation of waste, among which plastics waste has a special place due to its unique properties. Considering the specific properties of polymeric materials - they are not exposed to rotting, corrosion - the problem of their utilization is, first of all, ecological in nature. The main way of using waste plastics is their disposal, i.e. reuse. The positive side of recycling is also the fact that an additional amount of useful products is obtained for various sectors of the national economy and there is no pollution of the environment. For these reasons, recycling is not only economically feasible, but also an environmentally preferable solution to the problem of using plastic waste [2].

For the conversion of waste thermoplastics into raw materials suitable for subsequent processing into products, it is necessary to pretreat it. Pre-sorting provides for a rough separation of waste according to various criteria: color, size, shape, and, if necessary and possible, due to types of plastics. As a rule, preliminary sorting is carried out manually on tables or assembly lines; in case of sorting, various extra objects and inclusions are simultaneously removed from the waste. The separation of plastics is done by adding surfactants to water, which selectively change their hydrophilic properties. In some cases,

an effective way to separate polymers may be to dissolve them in a common solvent or in a mixture of solvents. By treating the solution with steam, polyvinyl chloride, polystyrene and a mixture of polyolefins are isolated; purity of products is not less than 96%. Flotation and separation methods in heavy environments are the most efficient and economically viable of all listed above.

It is estimated that only a small part of the annually generated polymeric wastes is disposed of. The reasons for this are the difficulties associated with the preliminary preparation (collection, sorting, separation, cleaning, etc.) of waste, the lack of special equipment for processing, etc. Gaseous products of thermal decomposition of plastics can be used as fuel to produce working steam. Liquid products are used to obtain coolants.

Currently, the most acceptable method for Russia is the recycling of polymeric waste materials by mechanical recycling, since this method of processing does not require expensive special equipment and can be implemented in any place of waste accumulation [3].

It is advisable to make pellets from polypropylene waste, which can then be reused in enterprises for the manufacture of plastic items. Secondary polypropylene is cheaper than the “primary”, but almost as good as the most important properties. This makes it advantageous for production, and as a result, in modern industry, products are rarely found that are entirely made of primary or only secondary raw materials. A promising direction of polypropylene processing is the combination of rolling and extrusion processes in one unit. This reduces the energy consumption of the process of obtaining secondary granules from polypropylene [4].

As a result, the obtained granules receive packaging for household chemicals, it is used as a hydro and thermal insulation material in the form of finished products (panels, plates, cassettes, blocks), and in the form of semi-finished products (filling the basis of hollow structural elements of buildings). These products are obtained from “pure” secondary raw materials. However, it is more promising to add secondary raw materials to the primary in the amount of 20 ... 30%.

Conclusion

The paper analyzes the problem of recycling polypropylene. It is proposed to carry out recycling of polypropylene by combining the process of rolling and extrusion in a single unit.

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УТИЛИЗАЦИЯ ОТХОДОВ ПОЛИПРОПИЛЕНА

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Аннотация

В работе рассматривается проблема утилизации отходов из полипропилена. Представлены различные способы утилизации данных отходов, одним из которых является их переработка во вторичное сырье, с последующей грануляцией и изготовлением из них различных изделий. Перспективным направлением переработки отходов полимеров является совмещение процессов вальцевания и экструзии в одном агрегате, что позволяет получить более эффективное техническое решение проблемы.

Ключевые слова: вторичная переработка, отходы, пластмассы, полимеры, полипропилены, утилизация.

STRUCTURAL CHANGES OF THE CONICAL CARBON NANOTUBES AFTER MECHANICAL TREATMENT AND OXIDATION

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Abstract

This paper studies the influence of mechanical and chemical treatment to surface structure of the conical carbon nanotubes (CNTs). Short conic fragments of nanotubes have a great potential in solar cells elements and electrochemical current sources. Conical multiwalled CNTs "Taunit" was chosen as an initial material. It was treated by milling in the planetary mill ("Pulverizette 5"), oxidation in nitric acid during 5 hours with 100 C and combining of these two methods. Graphene layers structure was investigated using Raman spectroscopy and effective particle size analysis in the water dispersions by the dynamic light scattering method. After milling we don't observe significant changes in surface structure in contrast of oxidation. After this kind of treatment, defective parameter based on intensities of peaks D (~1350 cm⁻¹) and G (~1550 cm⁻¹) grows. It shows destructive changes in the structure of outer graphene layers. Analysis of the average effective particle size in water suspensions shows that oxidation actually contributes to desagglomeration and getting more stable mixture of CNTs unlike mechanical treatment. After oxidation we can get individual short nanocones with many defects.

Keywords: dynamic light scattering, nanotubes, nanocones, oxidation, Raman spectroscopy

One of the characteristics of the carbon nanotubes (CNTs) is the shape of graphene layers and their position in the structure. Conical nanotubes are more known as "stack of cups" or "fish-bone". They have a lot of sp³-hybridized outer carbon atoms, which associate with structural defects. This is the reason of their high reactivity and destructive changes by oxidation, e.g., treatment in the boiling nitric acid. As a result it crushes into shorter particles with more defective external graphene layers. So we can get carbon nanocones with an extremely high specific surface area. Such type of material has perspectives of application in solar cells and electrochemical current sources.

Raman spectroscopy was used for evaluation of the graphene layers structure by Thermo Scientific DXR Raman Microscope. with laser wavelength 532 nm. Efficiency of the fragmentation of CNT surface was analyzed as an effective particle size in their water suspension by dynamic light scattering on Nicomp 308 ZLS.

There are some special peaks on the Raman spectras (Fig.1): D (~1350 cm⁻¹ – "Defects" shows presence of sp³-hybridized carbon) and G (~1550 cm⁻¹ – "Graphite" shows presence of sp²-hybridized carbon) (Dresselhaus et al, 2005; Hoa, 2018; Szybowicz, Nowicka & Dychalska, 2018). Ratio of their relative intensities I_D/I_G is the indirect defectiveness parameter.

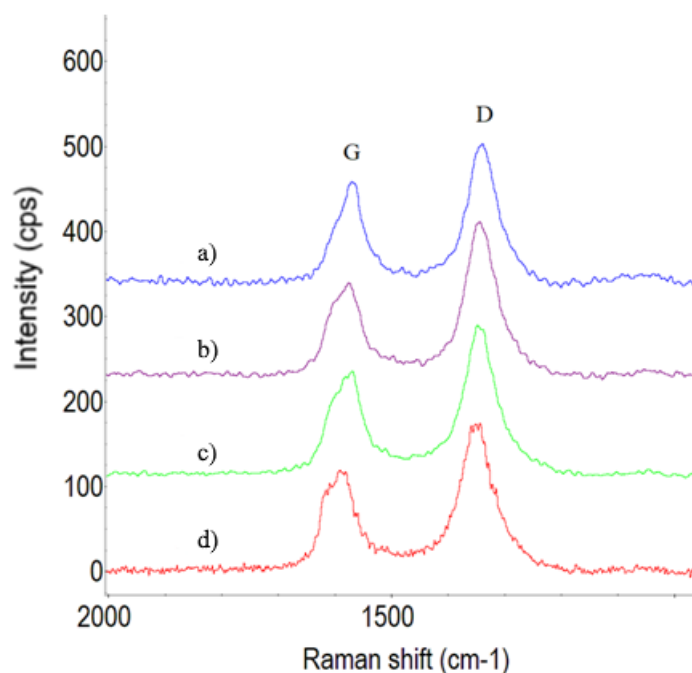


Fig. 1 - CNT "Taunit" Raman spectras: a) initial; b) milling in the planetary mill; c) oxidation in nitric acid; d) milling and oxidation

Raman spectroscopy results are presented in Table 1.

Table 1. Results of Raman spectroscopy for I_D/I_G ratio after treatment using different methods

Sample	I_D/I_G	Sample	I_D/I_G
Initial CNTs	1.38	CNTs (oxidation)	1,45
CNTs (milling)	1.32	CNTs (milling + oxidation)	1,48

Effective particle size analysis is presented in Tab.2.

Table 2. CNT's effective particle size (D) of the dispersion phase majority of fractions in the water mixtures

Sample	D, nm (%)	Sample	D, nm (%)
Initial CNTs	66 (97)	CNTs (oxidation)	57 (97)
CNTs (milling)	165 (92)	CNTs (milling + oxidation)	55 (97)

It is important to emphasize that initial nanotubes have already had a high defective parameter. After milling we don't observe significant changes in I_D/I_G ratio. The defective parameter increases after oxidation in nitric acid. The use of mechanical treatment before oxidation provokes stronger changes in the structure, but the difference is not significant. It equals just 0.03. Therefore, oxidation is a more effective kind of treatment for creating additional defects and vacancies on the surface of CNTs. Milling doesn't make an impact on the graphene layers.

Results of the visual observation show that milling doesn't have any advantages for CNTs as a hydrophilic material. Initial and machined CNTs are hardly dispersed in the water. The most of material forms sediment. On the other hand, CNTs make sedimentary stable water dispersion after oxidation in nitric acid.

Analysis of the average effective particle size in water suspensions shows that

oxidation actually contributes to desagglomeration of CNTs unlike mechanical treatment.

The real particle size of initial CNTs and CNTs after milling is much higher because the data in the tab.2 shows only distributed material in the water.

Oxidized material makes the stable water dispersion with almost no residue. Therefore, the particle size is 55-57 nm without any bigger agglomerates. This fact allows us to make an assumption that CNTs are crushed into short fragments during oxidation. The diameter of these CNTs is 20-50 nm. Thus we can suggest that individual particles can be presented as short nanocones with several graphene layers and a lot of defects and vacancies.

Obtained material is planned to be studied with scanning electron microscopy and transmission electron microscopy. It can also be used in the solar cells elements and electrode materials.

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ИЗМЕНЕНИЯ В СТРУКТУРЕ КОНИЧЕСКИХ УГЛЕРОДНЫХ НАНОТРУБОК ПОСЛЕ МЕХАНИЧЕСКОЙ ОБРАБОТКИ И ОКИСЛЕНИЯ

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Аннотация

В статье рассматривается влияние механической и химической обработки на структуру поверхности конических углеродных нанотрубок (УНТ). Короткие конические фрагменты нанотрубок обладают большим потенциалом для реализации в электрохимических источниках тока и элементах солнечных батарей. В качестве исходного материала выбраны УНТ «Таунит», которые были подвержены обработке в планетарной мельнице («Pulverizette 5»), окислению в азотной кислоте в течение 5 часов при температуре 100 °С и последовательной обработке данными методами. При помощи КР-спектроскопии и методом динамического рассеяния света изучены структура графеновых слоев и эффективный размер частиц. Механическая обработка не оказывает значительных изменений на структуру поверхности, в отличие от окисления, отражающего рост показателя дефектности, основанного на интенсивностях пиков D (~1350 см⁻¹) и G (~1550 см⁻¹). Этот показатель косвенно показывает деструктивные изменения внешних графеновых слоев. Также обработка в азотной кислоте приводит к образованию более стабильных водных суспензий с частицами меньшего размера, которые могут быть представлены индивидуальными короткими наноконусами с большим количеством дефектов.

Ключевые слова: динамическое рассеяние света, КР-спектроскопия, нанотрубки, наноконусы, окисление.

IMPROVING SAFETY FOR PERSONNEL AND THE ENVIRONMENT OF PRODUCTION OF N, N'-DITHIODIMORPHOLINE (DTDM) USING THE EXAMPLE OF JSC "NIIKHIMPOLIMER"

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Abstract

The research focuses on to the improvement of the technological process of production DTDM at one of the enterprises of the city of Tambov, as well as reducing emissions into the atmosphere during the production of DTDM. The paper considers the implementation of three packed absorbers and the replacement of a belt dryer with an infrared dryer.

Keywords: air pollutants, infrared dryer, N, N'-dithiodimorpholine (DTDM), packed absorbers.

Introduction

At the enterprise "NIIKHIMPOLYMER" (Tambov, Russia) production line of N, N'-dithiodimorpholine (DTDM) does not meet the requirements of environmentally friendly production, as the substances released in the manufacture of this product are dangerous.

It is proposed to make changes to the existing cleaning line: to install three packing absorbers for air purification from pollutants and to replace the belt dryer with an infrared dryer.

This paper presents the results of technological and economic calculations of the proposed equipment.

Information about the dangers of production

The technological process of obtaining N, N'-dithiodimorpholine (DTDM) includes four stages: preparation of a solution of sulfur chloride in gasoline, condensation, filtration of the reaction mixture and rinsing the paste, pelletizing and drying of the finished product (DTDM).

The finished product is dried in a belt dryer, which can lead to dangerous situations. Malfunction or improper handling of the dryer can lead to an increase in temperature in it, which in turn can cause emergency situations. They may arise as a result of technical problems or violation of technological regulations and work instructions. Cleaning of gas emissions is not provided.

The company is characterized by an increased level of risk, due to the heating of products up to 120-130°C in a belt dryer, which does not provide a sufficient level of safety at these temperatures. Also, the environmental safety of production can be improved by introducing a gas emission treatment line.

In the process of preparation and drying DTDM, the following flammable and harmful substances: gasoline, morpholine, sulphur chloride, sodium chloride and hydrochloric acid are used. Pairs of substances such as morpholine and sulphur chloride act with environmental components, including human, causing irreversible consequences. For example, emissions of sulphur chloride in large amounts into the atmosphere can lead to

acid precipitation, and in contact with humans it causes upper respiratory irritation, degenerative and necrotic changes in the liver and kidneys. Aerosol of sodium hydroxide also has a disastrous impact on nature and on humans. In contact with the atmosphere and water alkali inhibits biochemical processes and has a toxic effect, in contact with human skin causes serious burns and blisters, when inhaled, a person has a burning sensation and pain in the throat, and in contact with the eyes causes pain and severe deep burns.

Therefore, this article proposes the replacement of the belt dryer and the introduction of packed absorbers.

Brief results of calculation of packed absorbers

The purpose of the calculation is to reduce the concentration of vapor of morpholine with 0.50 (mol.%), vapor of sulfur chloride with 0.30 (mol.%) and aerosols of sodium hydroxide with 0,50 (mol.%) to 0.01 (mol.%) with water. The main apparatus of this process is a packed absorber with ordered ceramic Raschig rings.

As a result of the calculations, the following parameters were determined, which are presented in Table 1.

Table 1 - Results of calculation of packed absorbers

Item	Absorber for morpholine vapors	Absorber for sulfur chloride vapors	Absorber for aerosols of sodium hydroxide
Packing height	1	1	1
The outer diameter of the column, m	0.616	0.616	0.616
The inner diameter of the column, m	0.6	0.6	0.6
Height of the cylindrical part of the column, m	3	3	3
Approximate weight of the device, kg	750	750	750

Brief results of calculation of infrared dryer

Let's calculate the heat calculation and get $Q = 44641.47$ kJ. Then we find the irradiation density for the case of the lamps in the usual order and get $E = 1688.28$ W/m². When the radiation density is determined, it is possible to calculate how many infrared emitters are needed. We get $n = 22$. We will correlate the calculated amount of heat required for drying (44641.47 kJ) with the heat power of the emitters (22*100 W) bring everything to one unit of measurement and compare. From the formula for determining the thermal power, we find the time for which the amount of heat transfers to the heat system. Thus, the operating time of the infrared dryer is 6 hours. The Table 2 presents detailed characteristics of the equipment.

Table 2 - Characteristics of infrared dryer

No	Type of dryer	SK-1IK-600
1	Type of conveyor belt	Teflon
2	Thermal converter	THK
3	Installed capacity, kW	12
4	Power consumption, kW	5-8
5	Number of emitters	22
6	Number of phases	3
7	Supply voltage, V	380
8	Alternating current frequency, Hz	50
9	Temperature in the working area, °C	0-250
10	Working chamber size (LxWxH), mm	4000x700x240
11	Width of conveyor belt, mm	625
12	Speed of conveyor belt movement, m/min	0-5
13	Load per 1 m. linear conveyor belt, kg, not more	50
14	Dimensional specifications (LxWxH), mm	5300x1050x1500
15	Weight, kg, not more	800

Having calculated equipments, it is possible to construct the process diagram.

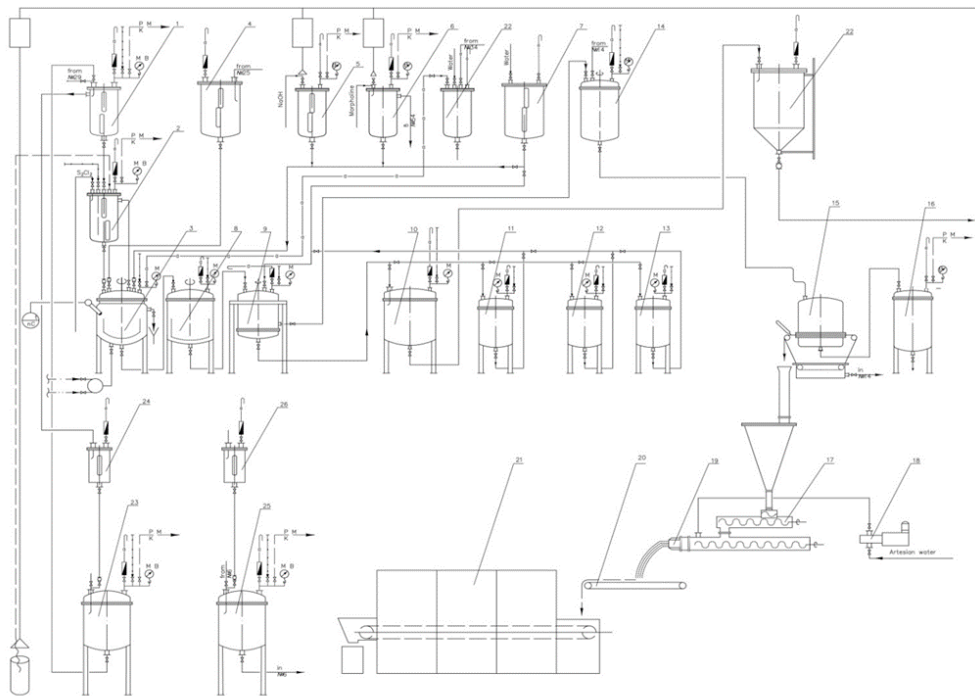


Figure 1- Process diagram

Economic assessment of replacement and implementation of new equipment

Table 3 presents the results of economic calculation. The calculation was made using the maximum approximation to the real prices.

Table 3 -Results of economic calculation of the project

No	Name	Unit	Economic difference, UB
1	2	3	4
1	Profit from sales	RUB	19300000
2	Total annual profit	RUB	19300000
3	Profitability index	for 5 years	16.34
4	NPV (Net Present Value)	RUB	17157629
5	Paybackperiod	years	3
6	Capital intensity ratio	ton/RUB	0.00095
7	Capital coefficient	RUB/ton	1050
8	Capital-labor ratio	RUB/person	9650000
9	Efficiency of labor	ton/person	500

Conclusion

Proposals for improving the level of safety of the DTDM production line for personnel and for the environment were made and justified. The economic rationale of modernization of methods of purification of air from polluting substances and drying of the finished product in the production of N, N'-dithiodimorpholine (DTDM) was considered in this work. The profitability of the project is calculated. The project is cost-effective.

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ПОВЫШЕНИЕ БЕЗОПАСНОСТИ ДЛЯ ПЕРСОНАЛА И ОКРУЖАЮЩЕЙ СРЕДЫ ПРОИЗВОДСТВА N, N'-ДИТИОДИМОРФОЛИНА (ДТДМ) НА ПРИМЕРЕ ОАО «НИИХИМПОЛИМЕР»

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Аннотация

Работа посвящена усовершенствованию технологического процесса производства ДТДМ на одном из предприятий г. Тамбова, а также сокращению выбросов в атмосферу при производстве ДТДМ. В статье рассмотрено внедрение трех насадочных абсорберов и замена ленточной сушилки на инфракрасную сушилку.

Ключевые слова: загрязнение воздуха, инфракрасная сушилка, N, N'-дителидиморфоллин (ДТДМ), насадочные абсорберы.

IDENTIFICATION OF FAT COMPOSITION OF BABY FOOD “MALUTKA”

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Abstract

The paper focuses on the problem of fat composition of baby food “Malutka”. The research of the fat composition of baby food is in demand due to the large volume of counterfeit products associated with the replacement of milk fat with cheap vegetable substitutes like palm oil. The development of the express method of NDT and the means of its implementation for the identification of bulk baby foods is relevant. An experimental realization of a non-destructive method for the express analysis of the fat composition of baby food “Malutka” is presented.

Keywords: baby food, experimental realization, express method, fat composition, non-destructive testing.

Introduction

This method of non-destructive testing (NDT) is based on the registration of the first derivative according to the time from the main value – the temperature in several points of control of the polymer body under investigation in dynamic thermal modes during heating and cooling. To calculate the values of the velocity V^* , the temperature change of the thermogram was divided into intervals: 1 ... k ; 2 ... $k + 1$; $u - k + 1$... u , where k is the number of points in the interval, an integer positive odd number ($k \geq 3$); u is the number of points in the thermogram; i is the interval number. The definition of the regression line for each interval during heating (1) and cooling (2) was performed by the method of least squares [1]:

$$T'_i = b_{1i} \tau + b_{0i}, \quad (1)$$

$$T''_i = b_{3i} \tau + b_{2i} \quad (2)$$

where:

$$b_{1i} = \frac{k \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} \tau_j T_j \right) - \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} \tau_j \right) \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} T_j \right)}{k \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} (\tau_j)^2 \right) - \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} \tau_j \right)^2} = V^*, \quad (3)$$

$$b_{0i} = \frac{\left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} T_j \right) \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} (\tau_j)^2 \right) - \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} \tau_j \right) \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} \tau_j T_j \right)}{k \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} (\tau_j)^2 \right) - \left(\sum_{j=i-(k-1)/2}^{i+(k-1)/2} \tau_j \right)^2} \quad (4)$$

The values b_{3i} and b_{2i} of equation (2) are found similarly to b_{1i} and b_{0i} by formulas (3), (4). The values b_{1i} , b_{3i} correspond to the rates of change of temperature V^* at the points where the thermal receiver is located during heating and cooling. By the method of least squares, straight lines were built over k points of the thermogram, the rates of temperature change were determined which were attributed to the temperature of the middle of each interval T_s . Thus, it was possible to increase the sensitivity of measurements and obtain an entry in the "spectral form" in those temperature-time regions where differences in the values of properties are found. Registration of the first derivative of temperature expressing the rate of change of this quantity on the temperature dependence curve, is implemented by measuring system with probes equipped with:

- a) around flat heater of constant power in the form of a thin disk;
- b) around flat heater which provides programmatically with a constant heating rate in the local area of the product under study [1].

The melting point has practical importance in technological processes for controlling the process of hydrogenation of fats, quality control of raw materials and consumer properties of finished food products. Its value is a constant that is very sensitive to impurities, so the fat can be identified by its melting point and its purity can be determined [2].

The research of the fat composition of the baby food “Malutka”

Fig. 1 illustrates the thermograms (dependences of heating temperature on time during heating and cooling) obtained at the object of study – infant formula “Malutka” using a measuring system [1, 3].

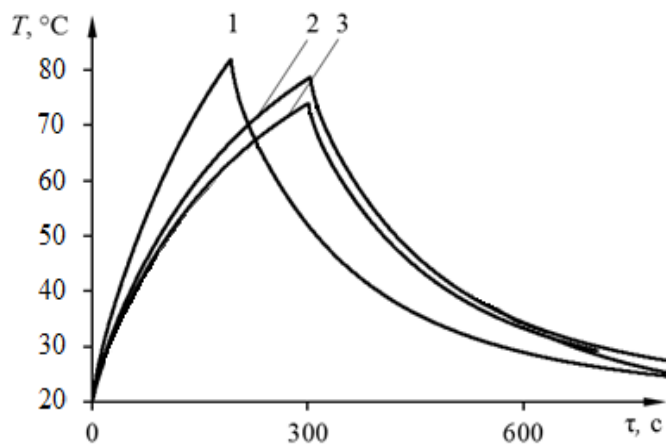


Figure 1 - Thermograms (1) - (3) obtained when the voltage on the heater U_s^I (V): $U = 5.0$ (1); $U = 4.2$ (2); $U = 4.0$ (3)

On the abscissa axis is the time of heating and cooling of the object (τ , s), on the ordinate axis is temperature (T , °C) at the control point on the surface. Table 1 presents the performance characteristics of the experiments.

Table 1. Operational characteristics of the experiments

Voltage U , V	Amperage I , A	Temperature of the beginning of the experiment T_b , °C	Temperature of the end of heating T_e , °C	Object density ρ , g/cm ³	Weight of pattern m , g
5.0	0.20	20	82	1.266	265
4.2	0.17	20	79	1.266	285
4.0	0.16	20	74	1.266	285

Heating was carried out at the temperature (T_e , °C) (Table 1), then the heater was turned off and the temperature values were recorded $T = f(\tau)$ during the cooling of the system

Figure 2 illustrates the dependences $b_1 = f(T)$ for the heating stages. The temperature of the surface of the test object (T , °C) is indicated on the abscissa axis, and the heating rate b_1 is on the ordinate axis.

At the temperature of 23–25 °C a sharp change in the heating rate is observed, due to the endothermic effect of heat absorption during the melting of milk fat.

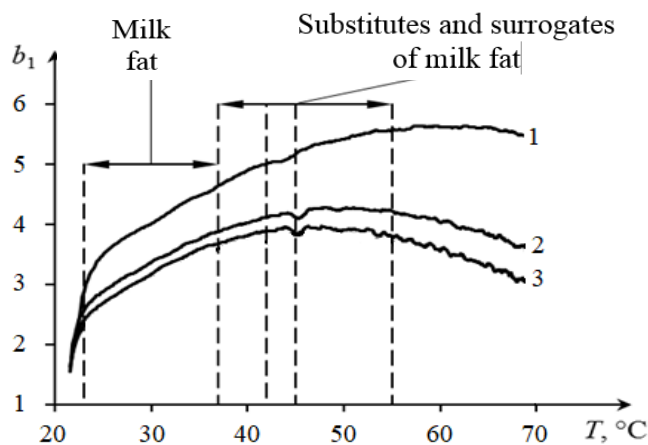


Fig. 2 - Dependences $b_1 = f(T)$ obtained at the heating stage with the voltage on the heater U (V): $U = 5.0$ (1); $U = 4.2$ (2); $U = 4.0$ (3)

Conclusion

The research of baby food “Malutka” shows that in its structure fats are identified the values of melting temperature of which are fixed in the range from 37°C to 57 °C. These results indicate the presence of milk fat substitutes and surrogates in the product (for example, at 45 °C there is a peak in heat absorption during the melting of palm oil).

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ИДЕНТИФИКАЦИЯ ЖИРОВОГО СОСТАВА МОЛОЧНОЙ СМЕСИ «МАЛЮТКА»

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Аннотация

Статья посвящена проблеме жирового состава детского питания «Малютка». Исследование жирового состава детского питания востребовано в связи с большим объемом фальсифицированной продукции, связанной с заменой молочных жиров на дешевые растительные заменители типа пальмового масла. Разработка экспресс-метода неразрушающего контроля средства его реализации для идентификации сыпучих продуктов детского питания – актуальна. Представлена экспериментальная реализация неразрушающего метода экспресс-анализа жирового состава детского питания «Малютка».

Ключевые слова: детское питание, жировой состав, неразрушающий контроль, экспериментальная реализация, экспресс-метод.

UTILIZATION OF SEWAGE SLUDGE OF MUNICIPAL TREATMENT FACILITIES

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Abstract

The purpose of this study is to analyze the process of wastewater sludge treatment. The study considers methods of treatment and disposal of sewage sludge. The process and methods of composting sewage sludge will also be considered.

Keywords: sewage, sludge, treatment, utilization.

Introduction

During the process of wastewater treatment is the formation of various sediments. They contain a large number of elements and substances that with proper use, can be of significant benefit. But before productive use, precipitation should be brought to a suitable quality state. To solve this problem, various preparation and processing activities are used.

Sewage systems accumulate liquid effluents containing solid pollutants and neutral substances. Their concentration can reach 10% of the total. All waste water regardless of the source (water supply system, production, etc.) and the degree of pollution must undergo the procedure of removal of pollution. Before being released into the environment, they must be cleaned by 95-98%. During the various processes of removing contaminants precipitation is formed.

Wastewater sludge (WWS) is a solid chemical substance that occurs during settling and cleaning in storage, sedimentation tanks, aeration tanks, digesters and other tanks for removal of contaminants of waste fluids.

The composition of precipitation

(1) Deposits with a solid structure (up to 2/3 or 4/5 of the total) are mainly organic elements (fats, proteins and carbohydrates). About 15-20% are the nutritional components of soil.

(2) Liquid deposits. Such sediments contain bacteria, viruses, fungi, eggs of parasitic worms.

WWS is divided into six groups, depending on the source of income:

- large solid precipitation, selected lattices;
- elements, settled in a sand trap, and the heavy waste from the tanks primary sedimentation;
- sediments from tanks with flocculants (substances which under the action of the liquids formed a loose flocculent aggregates) and coagulants (substances that cause the thickening of liquids, sticking in the large structure of solids)
- waste activated sludge from the aeration tanks; waste film biofilters.

WWS from grids, sand traps and primary sedimentation tanks have the unmodified structure. The sediments from the remaining treatment units have changed structure and composition as a result of exposure and treatment with biological and chemical reagents.

Two main uses of runoff precipitation:

- Application as organic mineral fertilizers.
- As a raw material element for heat generation during combustion.

WWS contains a large number of nutrients necessary for cultivated vegetation. In addition, the mixture includes trace elements, which makes their value comparable to organic fertilizers, which are traditionally used to improve the parameters and characteristics of the land layer for growing agricultural crops.

The main disadvantage of precipitation is that they include heavy metals. Such sediments are effectively used in the production of several types of bricks and cement mortars. The addition of sedimentary rocks with metals increases strength and hardenability. WWS with heavy metals is effectively used as fertilizer in the areas of afforestation and greening of cities. Such plants are not used in food, so the metal content is not a threat. But rare elements affect the improvement of soil properties. In case of contact cleaning systems, a large part of the settling particles is formed in the primary settling tanks. Sedimentary elements are also formed in blocks of biological (air and airless) removal of polluting elements.

Liquidation

Liquidation is performed in cases when it is impossible or unprofitable, from the financial point of view, to make utilization or other procedures of their effective application. Different methods are used for liquidation. The choice of method depends on the composition of sludge, the characteristics of the processing plant or treatment plant.

Method of destruction:

- (1) Combustion-the most effective way, fast and low-cost reduction of WWS with effective disinfection.
- (2) Regeneration (isolation and restoration of certain elements) of WWS at the enterprises of mechanical engineering.
- (3) The dumping of liquids in storage and injection into a special soil voids.
- (4) These methods are secondary methods of liquidation.

Disposal

Before disposal, sewage sludge undergoes the composting process. This term refers to the processes of natural biological and temperature process of organic precipitation splitting under the influence of aerobic microorganisms.

The purpose of composting is stabilization, disinfection and preparation of substances for use as fertilizers on agricultural land. This process is accompanied by the release of heat, which with the right approach can also be used effectively. Composting copes with the tasks of minimizing fuel consumption for disinfection and improving sanitation and hygiene.

After composting and decontamination, the WWS, are used in agriculture as a nutrient nitrogen-phosphate orientation. When placed in the ground, they are mineralized, and organic matter is converted into compounds suitable for absorption by plants. The usefulness of certain fertilizers from wastewater is determined by the parameters of the concentration of nutrients. The most valuable is the activated sludge. Application of the prepared compost allows reducing soil acidity, increasing the content of nutrients.

Fertilizers from WWS contain a large number of mineral trace elements. Each element is essential for the growth and development of crops under different conditions of cultivation. The necessary concentration of these substances helps to accelerate the processes of plant development, increase the stability of many species. Deficiency leads to disruption of metabolic processes. Thus, copper increases the degree of maturation of grain plants grown in marshy and sandy areas. Manganese is needed for the active growth of beet, corn. Fruit plants and grapes react painfully to the lack of iron and zinc. Clover, beans, peas, vegetables need access boron fertilizers.

Precipitation is excellent for restoring the surface layers of the earth depleted as a result of agricultural activities. WWS fertilizers are actively used in the preparation of soils that have been transferred from industrial to agricultural use. The composition of the compost is actively restores the upper fertile layer of soil. Fertilizers from WWS contain a large number of mineral trace elements. Each element is essential for the growth and development of crops under different conditions of cultivation. The necessary concentration of these substances helps to accelerate the processes of plant development, increase the stability of many species. Deficiency leads to disruption of metabolic processes. Thus, copper increases the degree of maturation of grain plants grown in marshy and sandy areas. Manganese is needed for the active growth of beet, corn. Fruit plants and grapes react painfully to the lack of iron and zinc.

Conclusion

The use of compost as a fertilizer provides significant environmental benefits by returning nutrients to the soil and reducing the use of chemical fertilizers. Hygienic studies of precipitation of household and close to the composition of urban and industrial waste water, as well as the resulting compost confirmed their sanitary and epidemiological safety, high fertilizer value and allowed to recommend these products for fertilizing the soil for planting, planting ornamental shrubs, industrial crops, subject to appropriate agrotechnical measures.

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УТИЛИЗАЦИЯ ОСАДКОВ СТОЧНЫХ ВОД ГОРОДСКИХ ОЧИСТНЫХ СООРУЖЕНИЙ

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Аннотация

Цель данного исследования заключается в том, чтобы проанализировать способы переработки осадка сточных вод и их дальнейшей утилизации. В ходе исследования будет рассмотрен спектр возможных способов утилизации ОСВ. Актуальность исследования заключается в том, что ухудшение экологической обстановки и проблемы, связанные с выделением все новых территорий под иловые карты, ведут к необходимости поиска безопасных и экономически оправданных технологий утилизации осадков.

Ключевые слова: осадок сточных вод, обработка, утилизация.

INFLUENCE OF FLUORINATION AND PARTICLE SIZE ON THE STRENGTH CHARACTERISTICS OF THE EPOXY BINDER BFE-170

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Abstract

In this work we determined the effect of fluorination and dispersion of carbon nanotubes on the strength characteristics of an epoxy polymer based on BFE-170 and hardener UP-606/2. Based on the experiments, it turned out that the use of carbon nanotubes leads to a significant increase in the mechanical characteristics of epoxy composites.

Keywords: carbon nanotubes, composite materials, epoxy resin, fluoridation.

Introduction

A modern trend in the industry was the replacement of metal products with products made of polymeric and composite materials. Polymers due to their unique characteristics are able to benefit in various fields of production. Therefore, this direction is very promising.

Due to the high specific surface area and excellent mechanical characteristics, carbon nanomaterials have prospects for the wide application in the composition of lightweight polymer composites [1]. The use of unmodified and functionalized carbon nanotubes as fillers of polymer composites based on epoxy resin leads to a significant increase in tensile and bending strength in comparison with unfilled composites [2].

Sample making of epoxy resin

In this paper, the influence of fluoridation and dispersion of CNTs on the strength characteristics of epoxy polymer based on BFE-170 and hardener UP-606/2 was determined. For that samples were made for strength according to on the following technology:

Preparation of casting molds (cleaning, lubrication with wax separator, twisting). Further weighing of epoxy resin and hardener was done on laboratory scales. After being weighed the mixture is stirred for samples in the proportions of 1 gr. hardener for 50g of epoxy resin. Mixing takes place in such a way that the mixture has a minimum number of air bubbles. In order to remove the sample from the mold, a thin layer of wax separator is lubricated. After that the form is lubricated with a small amount of mixture. To remove the air cavities, the primary vacuuming of the mold and the resin container was carried out in a vacuum drying oven. Next, the mixture of resin and hardener is poured into molds. Later the secondary vacuuming of the mold with resin takes place in the vacuum drying oven (after the complete removal of air bubbles, we complete the vacuuming). The samples are maintained at the temperature $t=80$ °C for 3 hours. At the end of the manufacturing process, after the complete polymerization, samples are extracted from the mold. Before the test, the samples are sanded with sandpaper to the required geometry [3].

The measurement of the strength characteristics was carried out on a universal testing machine Testometric M350-5AT. Based on the capabilities of this equipment, our samples can be examined for bending and breaking.

After the experiments, it was found that the use of carbon nanotubes leads to a significant increase in the mechanical characteristics of epoxy composites, but the initial CNTs are inferior to fluorinated ones. The greatest effect is achieved at the content of 0.1 mass. % fluorinated CNTs in the composition of the composite: tensile strength is increased by 50%, the Young's modulus in tension is increased by 74%, bending strength increases by 60%, Young's modulus in bending increases by 66%.

Conclusion

Fluorinated CNTs are noticeably more effective than the original ones, from the standpoint of the hardening effect, it is more likely that when introduced into the polymer matrix, the modified tubes are better integrated into the structure of the polymer matrix and more fully realize their potential. There is also a tendency of positive influence of dispersion on the mechanical properties of the material.

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ВЛИЯНИЕ ФТОРИРОВАНИЯ И ДИСПЕРСНОСТИ НА РОЧНОСТНЫЕ ХАРАКТЕРИСТИКИ ЭПОКСИДНОГО СВЯЗУЮЩЕГО ВФЕ-170

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Аннотация

В данной работе определялось влияние фторирования и дисперсности углеродных нанотрубок на прочностные характеристики эпоксидного полимера на основе ВФЕ-170 и отвердителя УП-606/2. На основании проведенных экспериментов выяснилось, что использование углеродных нанотрубок приводит к существенному возрастанию механических характеристик эпоксидных композитов.

Ключевые слова: композиционные материалы, углеродные нанотрубки, фторирование, эпоксидная смола.

FEATURES OF RESEARCH OF MORPHOLOGY SURFACE OF NANO-FILTRATION MEMBRANES OPMN-P AND OFAM-K

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Abstract

The aim of the work was the development and study of an automated method for calculating the morphology of microstructural inhomogeneities of the selectively permeable surface of OPMN-P and OFAM-K nanofiltration membranes.

Keywords: automated calculation method, clogging factor, distribution histogram, nanofiltration membranes.

The membrane method for separating solutions is one of the cost-effective and technologically simple and involves the systems for cleaning water from pollutants for the technological needs of enterprises. This technology was first used at the enterprise of Minatom of Russia more than 20 years ago. They learned how to manufacture a new type of microfiltration material, which is the best for cleaning liquids and gases from additional elements (such as dust, suspensions, bacteria, etc.)

The object of the study was OFAM-K and OPMN-P nanofiltration membranes, the characteristics of which are presented in Table 1. Table 1 shows the performance characteristics of OFAM-K and OPMN-P membranes [1, 2].

Table 1 - Working characteristics of OPMN-P and OFAM-K membranes

Performance	Membranetype	
	OFAM-K	OPMN-P
Operating pressure, MPa	3,0	1,6
Minimum performance by water, at T = 298 K, $\text{m}^3/\text{m}^2 \cdot \text{c}$	$2.22 \cdot 10^{-5}$	$2.77 \cdot 10^{-5}$
Delay coefficient, notless	0.15% NaCl	
	0.95	0.55
Working range, pH	2–12	
Maximum temperature, K	323	

The OFAM-K membrane is a semi-permeable medium-pressure nanofiltration composite membrane consisting of a surface (selectively permeable) layer and a porous substrate. OPMN-P membrane is a semi-permeable nanofiltration composite polymer film consisting of a surface (selectively permeable) layer and a porous substrate.

The calculation was made using a program that studies the description of the basic functions of the imaging processing toolbox. To do this, the software tools Matlab 2017 was used the task, as well as the software Development and experimental approbation of a software package for determining the fraction of ion-conducting membrane surface using scanning electron microscopy data [3]. The obtained images of nanofiltration OPMN-P and OFAM-K were subjected to optical examination (surface visualization using an Axio Observer Z1 optical microscope (Produced by Carl Zeiss)) with the required magnification. The procedure of image fixing was carried out using the Axiovision image analysis program.

The selected areas of the OPMN-P and OFAM-K nanofiltration membranes with an area of 100 X 100 μm were processed using Matlab 2017, so that the main parameters, such as the average contamination diameter (microstructural heterogeneity and membrane contamination coefficient), were obtained. We present an example of image processing of OPMN-P and OFAM-K membranes (Fig. 1).

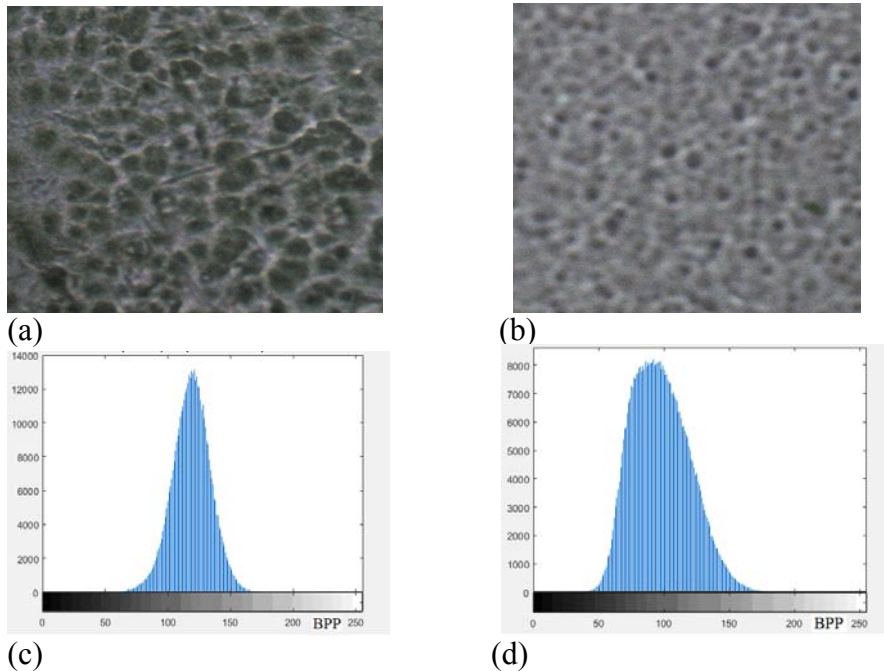
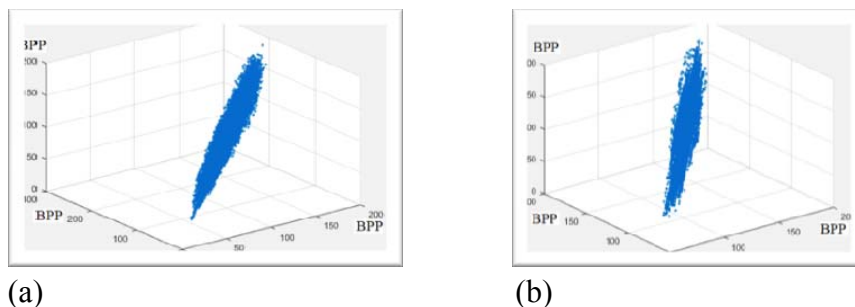


Figure 1 - Selected areas and histograms of the color distribution of the image of the OPMN-P nanofiltration membranes (a, c) and OFAM-K (b, d) with an area of 100 x 100 microns

Conducting a visual analysis of the selected areas of the OPMN-P and OFAM-K nanofiltration membranes, it is noted that the image is not very contrast (Fig. 1a,b). To eliminate this drawback and to create a contrast image, color distribution histograms were made: from 0 - (black background) to 256 (white background) (Fig. 1c,d).

The analysis of the distribution histograms (Fig. 1c,d) showed that the greatest concentration of color distribution is shown for the OPMN-P membrane in the region of 90 and OFAM-K in the region of 120. To analyze the microstructural inhomogeneities of the surface of materials, membrane clogging factor and for better understanding characteristics of the image, the construction of three-dimensional dot plots of three visible colors - RGB channels (Fig. 2a,b) was carried out.

The three-dimensional point plots of the visible channels of OPMN-P and OFAM-K membranes in different colors (Fig. 2a,b) are needed to determine the use tools for obtaining a contrast image.



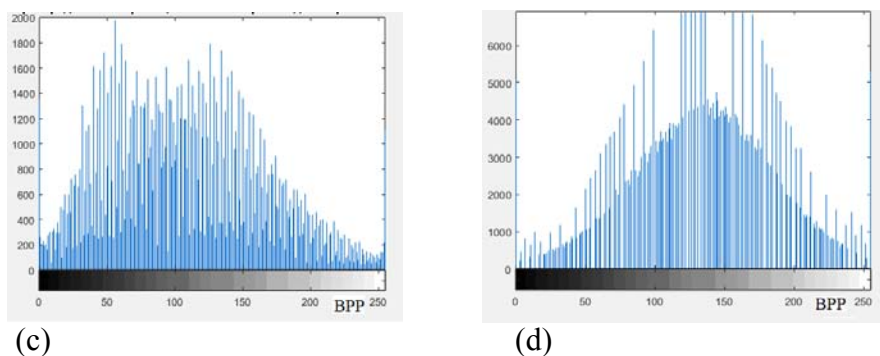


Figure 2 - Three-dimensional dot plots of visible colors and a histogram of brightness distribution after correction of OPMN-P (a, c) and OFAM-K membranes (b, d)

It can be noted that all points are mainly located approximately in the same plane, which indicates the reliability of the experimental data obtained. In the Matlab 2017 package, the function of obtaining a more contrast image of the selected areas in the form of histograms is used (Fig. 2, c, d).

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ИССЛЕДОВАНИЕ МОРФОЛОГИИ ПОВЕРХНОСТИ НАНОФИЛЬТРАЦИОННЫХ МЕМБРАН ОПМН-ПИОФАМ-К

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Аннотация

Целью работы явилась разработка и исследование автоматизированного метода расчета морфологии микроструктурных неоднородностей селективно-проницаемой поверхности нанофильтрационных мембран ОПМН-П и ОФАМ-К.

Ключевые слова: автоматизированный метод расчёта, гистограмма распределения, коэффициент засоренности, нанофильтрационные мембраны.

SUPER CONCENTRATE CARBON NANOTUBES

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Abstract

The technological process for obtaining a superconcentrate of multi-layered carbon nanotubes in epoxy resins for industrial volumes is considered in the paper. As a result of the experiments samples were obtained from the concentrate with a given concentration which showed strong strength characteristics.

Keywords: carbon nanotubes, nano-modification, superconcentrate.

Introduction

Carbon nanotubes (CNTs) are a unique product that can change the properties of materials in which it is used. The practical importance and significance of these materials used in thermo- and thermo-plastics have been shown in many publications. One of the main areas of CNT application has been the improvement of the properties of epoxy and phenol formaldehyde resins. Nanomodified epoxy resins show improved strength properties (from 0.01% to 5% wt.), the coefficient of heat and electrical conductivity (from 1% to 6%), as well as dimensional stability during the curing process. In order to achieve these improvements, a number of problems have to be solved, the most important of which are: the uniform distribution of the dispersed filler in the epoxy matrix; stabilization of the particulate filler for a long time; ensuring the affinity of CNT to the epoxy matrix, with the aim of efficiently distributing the stresses inside the matrix. At the same time, researchers should focus on the possibility of scaling up the developed campaigns and their industrial reproduction, while not forgetting about the price of the final product. The use of complex and expensive technologies for the introduction, distribution and stabilization of CNT in the target matrix can increase the cost of the product by several times, thereby putting it in a noncompetitive position on the target market [1].

The description of an experiment

In Tambov State Technical University, together with the Tambov plant “Zavkom” a technological process is being developed for producing superconcentrate multilayer carbon nanotubes in epoxy and phenol formaldehyde resins in industrial volumes, designed to produce superconcentrates of multilayer carbon nanotubes used to improve performance (adhesion, strength, frost resistance, UV resistance, heat resistance, fire resistance, electrical conductivity) of structural and functional epoxy-based composites and phenol-formaldehyde resins and similar compositions. The produced concentrate will contain 10% wt. CNT, despite the fact that the recommended percentage of application is in the region of 0.5%, which will significantly reduce transportation costs and increase the usability of this product. The superconcentrate will be supplied to the enterprise in a packaged form, it will only be necessary to dose the superconcentrate at the stage of mixing epoxy resin with other additives and hardener in a given percentage ratio. In the superconcentrate, the CNTs are in an already distributed and stabilized state; therefore,

their application process will not require significant re-equipment of already functioning lines [2].

In the framework of the implementation of this approach a 10% wt. superconcentrate of carbon nanotubes of the Taunit-M brand produced by LLC “NanoTechCenter” in epoxy- resin of the ED-22 brand was received. Obtaining such concentrations of CNTs in viscous media is a big problem, since the volume ratio of epoxy resin - CNT (bulk density) is 2: 3 respectively. It is often very difficult to achieve a combination of such media, not to mention the dispersion of CNT agglomerates. The resulting concentrate was examined for particle size distribution and showed an average particle size of about 221 nm. The nanomodified epoxy resin of brand ED-22, containing 0.5% and 0.1% wt. CNTs obtained by diluting the concentrate showed an average particle size of CNTs in the region of 81.3 nm (Fig. 1). Then, on the basis of this resin, samples were obtained for strength testing.[3]

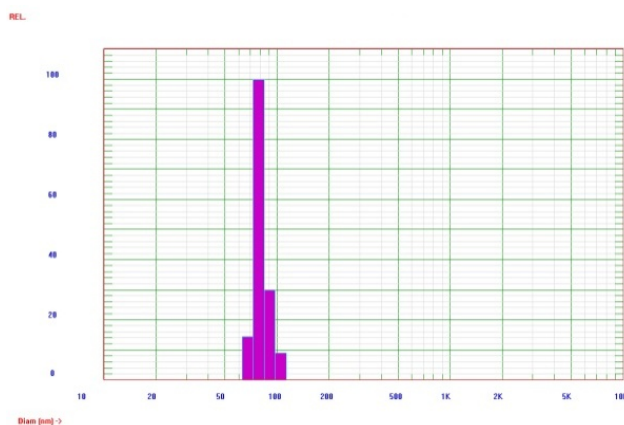


Figure 1 - Dispersion of 0.5% wt. CNT in epoxy resin ED-22

The dependence of the ultimate strength on the concentration when testing for bending and tearing and comparison with samples obtained from non-concentrate is shown in Figures 2 and 3. Samples using the concentrate were prepared by adding a given weight to the epoxy resin followed by stirring on a laboratory stirrer at the speed of 100 rpm during 10 minutes, while the epoxy resin was painted gray. The mixing time was determined by the uniform staining of the sample.

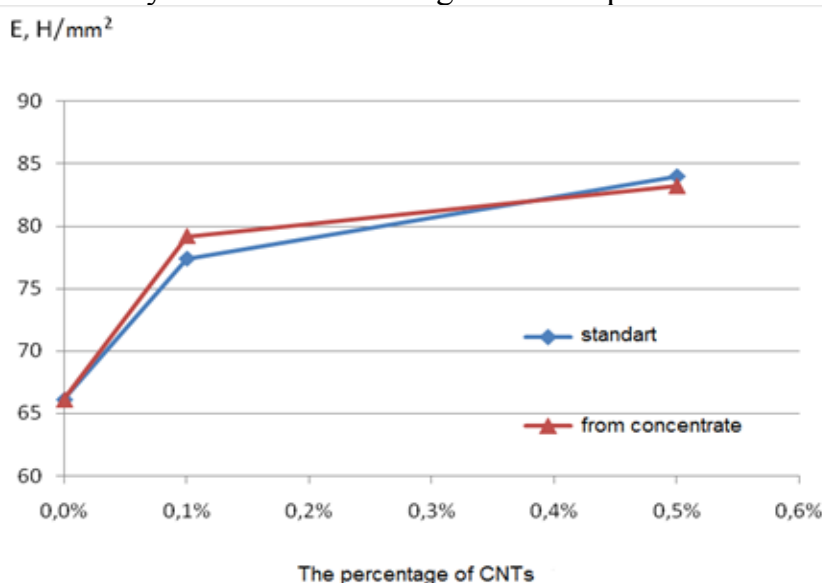


Figure 2 - Comparison of tensile strength

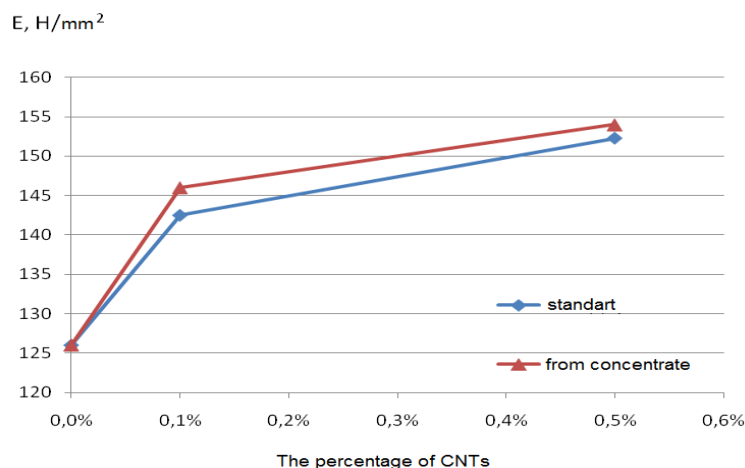


Figure 3 - Comparison of flexural strength

Conclusion

As can be seen from the graphs, samples obtained from the concentrate with a given concentration showed comparable values of the strength characteristics[4].

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СУПЕРКОНЦЕНТРАТ УГЛЕРОДНЫХ НАНОТРУБОК

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Аннотация:

Рассмотрен технологический процесс получения суперконцентрата многослойных углеродных нанотрубок в эпоксидных смолах для промышленных объёмов. В результате экспериментов были получены образцы из концентрата с заданной концентрацией, которая показала сильные прочностные характеристики.

Ключевые слова: наномодификация, нанотрубки, суперконцентрат.

УДК 531
ББК 35.10

THE EFFECTS OF SEGREGATION ON TECHNOLOGICAL PROCESSES AND NATURAL PHENOMENA

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Abstract

The work assessed the degree of study of the question of the effect of segregation. This is a consequence of the effect of the interaction of particles in the shear flows of granular media. They act on technological processes and natural phenomena. The direction of solving this problem has been determined.

Keywords: segregation, granular material, shear flow

Introduction

Technological operations of loading, unloading and transportation and processing of bulk materials (grinding, classification, granulation) and natural phenomena (rockfalls, avalanches, mudflows, sand movement) occur during the interaction of solid particles in fast shear flows, accompanied by the distribution of particles, denoted by the common term "segregation". The effects of interaction of particles have a significant impact on the kinetics of technological processes and natural phenomena. The process in the technology of processing bulk materials and predicting the effects of the corresponding natural phenomena is currently difficult due to the lack of a reliable theoretical basis for evaluating the effects.

Segregation process

Segregation is the process of separating inhomogeneous particles due to their interaction and secondary reciprocal movement accompanied by the formation of zones with a high content of homogeneous particles.

In nature, there are practically no ideally homogeneous granular materials; therefore, segregation occurs when there is any significant difference in particle size, shape, density, elasticity, roughness, etc.

According to the technological effect, the segregation process is the opposed to the mixing process, in connection with which it is almost impossible to obtain a perfectly homogeneous mixture of particles, even minimally differing in their physical and mechanical properties. However, in the general case, the technological effects of segregation cannot be assessed so unequivocally. For example, for the sieve classification process, segregation exhibits positive properties by pre-structuring the particle flow by size. For the mixing process, segregation can have both positive and negative effects and, in any case, does not allow the particles to be completely evenly distributed in the mixture.

In the chemical industry in the production of bulk materials, the quality of the finished product can significantly deteriorate at the stages of packaging, sorting, and transportation due to the manifestation of segregation effects.

Analysis of the physical mechanisms of segregation effects

At present, the principle of controlling the effects of segregation (from inhibition or intensification) has been proposed, by affecting segregated technological flows by distributed directed pulses. To control segregated flows, their particles selectively act on direct, countercurrent and transverse pulses that change the structure of a separate segregated stream. The authors of [1] summarized various methods for controlling segregation, indicating, inter alia, that, to reduce the tendency of particles to separate, they increase the connectivity of particles by introducing binding additives.

The full realization of the control by the effects of segregation, namely the interaction of particles, is possible with the presence of a physical model and a general equation of the dynamics of segregation. Currently there are many descriptions of segregation mechanisms in shear flows and their mathematical models.

The authors of the work [2], which presents the formula for determining the dynamics of segregation, derived on the basis of general kinetic regularities of technological processes, provided the greatest value in the study of segregation dynamics.

In [3], the authors, using DEM-modeling, considered segregation as two types of stress: kinetic and contact; in [4], the authors investigated the segregation model using the theory of binary mixtures; in [5], the authors proposed a “buoyancy” mechanism for gravity segregation in accordance with the density of particles. As can be seen from the available knowledge about the mechanism of segregation, there is no general physical model explaining the dynamics of segregation and the effects of the interaction of particles. It should be noted that in the work only a small part of the existing physical mechanisms of segregation was considered.

Conclusion

The creation of segregation mechanisms and the creation of a general model of the dynamics of particle interaction effects will help improve the processing technology of bulk materials by the methods of separation, heat transfer and mass transfer. This will also help to predict the occurrence of natural phenomena.

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ВЛИЯНИЕ ЭФФЕКТОВ СЕГРЕГАЦИИ НА ТЕХНОЛОГИЧЕСКИЕ ПРОЦЕССЫ И ПРИРОДНЫЕ ЯВЛЕНИЯ

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Аннотация

Работа оценивает степень изученности вопроса о влиянии сегрегации. Это следствие эффектов взаимодействия частиц в сдвиговых потоках зернистых сред. Они действуют на технологические процессы и природные явления. Определены направления решения этой задачи.

Ключевые слова: сегрегация, сыпучие материалы, сдвиговый поток.

УДК 656.1
ББК 39.3

WAYS TO REDUCE ENVIRONMENTAL POLLUTION CAUSED BY ROAD TRANSPORT

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Abstract

This article focuses on the problems of environmental safety of road transport and the amount of pollutant emissions. On the basis of the literature review concerning this issue, conclusions were drawn and techniques were proposed to resolve these problems.

Keywords: freight transportation, pollutants, transport ecology.

Introduction

The ecological state of the environment is becoming increasingly dependent on the road transport industry, which directly affects the quality of people. This became especially noticeable in the 20th century, when there was a rise in the development of industry and transport, as a result of which the amount of pollutants in the atmosphere, soil and water increased dramatically.

Negative effect

Thus, at present, the negative impact of the road transport industry on the environment and human health grows up every year. This is due to the large number of vehicles, which in turn increase the content of harmful substances in the air. We should not forget about the negative contribution that the automotive industry makes to ecology.

In addition, every year motor vehicles emit carbon monoxide, various hydrocarbons, sulfur dioxide etc. The air environment is polluted not only by toxic components of exhaust gases, fuel vapors but also by brake wear products. Fuel and oil products, detergents and soot precipitate in water bodies and soil (Fig. 1).

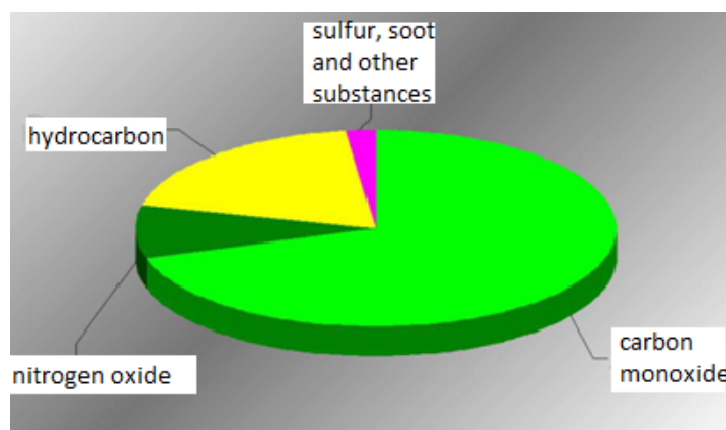


Figure 1 - Main pollutants

This aggravation of environmental problems is associated with the increased stress on the environment due to the lack of environmental strategies of many road transport enterprises. Waste generated in the production of vehicles contains secondary components that have some value and require complex processing schemes. The most dangerous products are: cyanide, lead, mercury and cadmium. Most enterprises have outdated equipment that leads to the inefficient use of resources, aggravating the impact on the environment. To solve this problem, it is necessary to introduce new production systems and equipment, as well as to optimize waste management and make it rational.

Paying attention to the information given above, an important goal is the creation of safe, environmentally friendly and economical cars. Experts from all over the world are intensely searching for ways and means of reducing the negative effects of motorization now.

To solve these problems, it is advisable to develop a system of measures aimed at improving the quality of atmospheric air. Currently one of the ways to improve the environmental performance of motor vehicles is its conversion to natural gas; this method will ensure the reduction of harmful emissions produced into the environment as a result of the operation of automobile engines. Some harmful substances in the composition of emissions can be controlled and minimized by updating the design of engines, introducing neutralization systems and improving the quality of motor fuel [1].

The main ways to solve problems related to the operation of the transport system are: first of all the replacement of internal combustion engines with environmentally friendly ones; the replacement of traditional fuel with the more environmentally friendly one; the uniform location of the main areas of work, residential, recreation areas; the expansion of streets, the creation of filters between the carriageway and residential buildings – green spaces; the arrangement of motorways for cargo transport beyond the city; the complete elimination of transport going through the residential quarter; the increase of green spaces; the introduction of environmental transport, as well as the introduction of modern transportation technology [2].

Also one of the ways to reduce the negative impact of road transport on the environment through the introduction of modern transport technologies of transportation, is the widespread use of piggyback technology for transporting foreign trade cargoes (Fig. 2).



Figure 2 - Piggyback technology of transportation

Large-capacity vehicles for long distances are moved by rail trains on specialized platforms then they are transported by means of special road transport to their destination. With the help of this technology the advantage of this technology is that the emissions resulting from the operation of rail transport is 15 times less than during the operation of the road transport.

Conclusion

The main focus for solving environmental problems is an integrated approach to the work of road transport in general. It is necessary to search for new technological, planning, organizational and technical measures for the development and implementation of environmental protection measures in accordance with the environmental forecast of the expected effects on the automotive industry. It is necessary to carry out constructive changes of vehicles that will reduce the amount of harmful waste substances emitted, to transfer cars to gas fuel and to introduce the widespread use of electric vehicles providing the necessary infrastructure for these technologies.

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СПОСОБЫ СНИЖЕНИЯ ЗАГРЯЗНЕНИЯ ОКРУЖАЮЩЕЙ СРЕДЫ АВТОМОБИЛЬНЫМ ТРАНСПОРТОМ

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Аннотация

Данная статья акцентирует внимание на проблемах экологической безопасности на автомобильном транспорте и количестве выбросов загрязняющих веществ. На основе анализа литературы освещающей этот вопрос, были сделаны выводы и предложены методики по разрешению указанных проблем.

Ключевые слова: грузовые перевозки, загрязняющие вещества, экология транспорта.

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ББК 38.58

LABORATORY METHODS FOR DETERMINATION OF SOIL PROPERTIES UNDER DYNAMIC IMPACT

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Abstract

The existing experimental laboratory methods for determining the evaluation of dynamic properties of soils are discussed.

Keywords: dynamic properties of soils, dynamic three-axis compression, laboratory tests, resonance columns, torsional shear.

Introduction

Dynamic properties are a group of physical and mechanical properties of soils, which determine their response to the action of dynamic loads. Issues of dynamic instability of soils are important in solving practical problems associated with a decrease in the stiffness and strength of soils under dynamic loads of different origin [1].

The need for experimental quantitative assessment of the dynamic properties of soils arises in the following basic situations:

- (1) calculation of the vibrations of structures operating under dynamic loads;
- (2) assessment of the seismic characteristics of soils and increments of seismic magnitude;
- (3) design calculations of additional sediment and tilts of structures under the action of dynamic loads;
- (4) assessment of the possibility of destruction, including the dilution of the soil and determination of its possible consequences.

Field methods for assessing the dynamic properties of soils; laboratory methods for dynamic testing of soils; laboratory methods for dynamic testing of physical models can be used to assess the dynamic properties of soils [2].

In this article, laboratory methods for dynamic testing of soils are discussed.

Laboratory methods for determining the dynamic properties of soils

In modern practice the most common laboratory methods for determining the dynamic properties of soils, including the assessment of their liquefaction are given in Table. 1. Their basis is the measurement of the soil reaction in terms of the deformation and pore pressure occurring in the soil provided that the initial stress state and the dynamic load, which are equivalent in energy to the expected impact, are correctly simulated [3].

Table 1 - Basic laboratory methods for dynamic testing of soils

Method
Dynamic triaxial compression
Dynamic shear tests
Dynamic torsional shift
Low-amplitude dynamic tests on resonant columns
Dynamic Ring Shift

The GOST “Soils. Laboratory Methods for Determining the Dynamic Properties of Dispersed Soils” described such methods as the dynamic triaxle compression, the low-amplitude dynamic test method in a resonant column, and the torsional shift method.

The essence of the dynamic three-axis soil compression method is to determine the possibility of soil destruction at the base of buildings and structures under dynamic loads. In the process of testing, additional deformations of dispersed soils in the conditions of application of dynamic loads are also determined, including the possibility of accumulating the critical value of the deformation of the soils of the base in the conditions of dynamic impact for a given building or structure - a quantitative characteristic. In addition, it is possible to determine the degree of dynamic soil liquefaction. This method allows evaluating the effects of dynamic soil liquefaction. The installation of dynamic triaxle compression is shown in Fig.1.



Figure 1 - Dynamic triaxle compression

The essence of the low-amplitude dynamic testing of soils in a resonant column method is to determine the dynamic shear modulus (G , MPa) and the absorption coefficient (D ,%) of the soil in the range of shear deformations. These characteristics are determined from the results of testing soil samples in resonant columns. Resonant columns are three-axis compression chambers that allow lateral expansion of a soil sample under conditions of three-axis axisymmetric static loading with simultaneous excitation of a small-amplitude torsional vibration in a sample of a given frequency range. The method is based on the theory of propagation of oscillatory motion in an elastic rod, the lower end of which is fixed, and the shear deformations on it are equal to zero.

The general view of the resonant column is presented in Fig. 2

Tests of sandy, clayey, organic-mineral and organic soils by the method of torsional shear are carried out to assess the degradation of the dynamic shear modulus and the growth of the absorption coefficient with increasing shear strain in the range of 0.1-1.0%. These characteristics are determined by the results of testing soil samples in torsional shear devices or resonant columns, which have the technical ability to create significant rotational forces and measure the corresponding deformations.

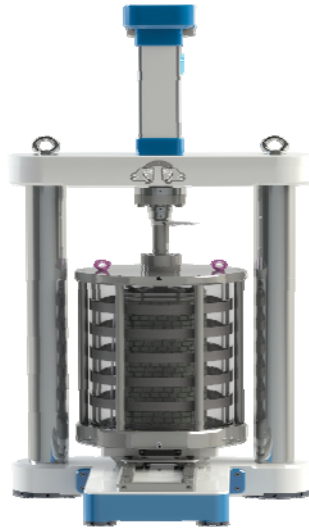


Figure 2 - Resonant column

Conclusion

There are no standards in Russia that regulate laboratory dynamic testing of soils, so there is a need to create an alternative method for testing soils for dynamic loads. Researching the effect of dynamic loads on the soil mass is possible with the help of static installations. This requires a creation of a reasonable theory of the behavior of soils under the action of dynamic loads and the development of uniform methods for determining the properties of the soil under the influence of dynamic loads, which could reflect the physical processes occurring in the soil.

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ЛАБОРАТОРНЫЕ МЕТОДЫ ОПРЕДЕЛЕНИЯ СВОЙСТВ ГРУНТА, НАХОДЯЩЕГОСЯ ПОД ДИНАМИЧЕСКИМ ВОЗДЕЙСТВИЕМ

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Аннотация

Рассмотрены существующие экспериментальные лабораторные методы определения оценки динамических свойств грунтов.

Ключевые слова: динамические свойства грунтов, динамическое трехосное сжатие, крутильный сдвиг, лабораторные испытания, резонансные колонки.

COMPUTATIONAL TOOLS FOR CREATION AND IMPLEMENTATION OF VIRTUAL LABORATORY WORKS

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Abstract

The requirements for learning outcomes of graduates enrolled in “Civil Engineering” are considered. The analysis of laboratory works was made regarding the training of students in accordance with the course “Steel structures”. The options of computer systems for the creation and implementation of virtual laboratory work are highlighted.

Keywords: computer software, educational and professional standards, laboratory works, steel structures.

Introduction

To improve the quality of construction radical modernization of the construction industry is necessary, which is impossible without the training of highly qualified personnel. The President of Russia gave the task to the Government of the Russian Federation to create conditions for the transition of the construction industry to BIM-technologies. The presidential order contains a list of seven items, one of which is “the training of specialists in the field of information modeling in construction”. Federal State Educational Standards (FSES) of the new generation with the enlarged group of specialties (EGS) 08.00.00 “Techniques and construction technologies” require developers of basic professional higher education educational programs to have a competence-based approach to their design (FSES) ++[1-3], updated according to professional standards, the educational organization gives the requirements for the results of its development in terms of professional competencies based on the relevant professional standards, those professional competencies must comply with generalized labor functions of the selected professional standards. All of the above logically leads to the understanding that in modern conditions completely new programs of architectural and construction education are also required, which are based on obtaining competencies for working with the building information model.

The analysis of educational programs and their requirement for laboratory works

An integral part of the educational process in the field of building structures is the performance of the laboratory work, which requires modern high-tech laboratories with the expensive equipment. The latter is a deterrent to the development of this form of training. However, laboratory works make it possible to improve the required competencies and prepare students for future labor functions (Table 1).

The analysis of the main educational programs used in universities of the Russian Federation, and the Master’s course “Steel structures” allowed creating a generalized list of laboratory works (Table 2).

Table 1 - Requirements of federal state educational standards and professional standards in the field of building construction

Federal State Educational Standards of Higher Education (FSES) 08.00.00 Techniques and technologies of construction (level - bachelor, master, specialty) [1-2]	Professional Standard “Specialist in the field of engineering design for town planning activity” [3]
<i>Universal Competences</i> Able to search, critically analyze and synthesize information, use a systematic approach to solve the problems	<i>Labor function</i> Conducting laboratory tests, special applied research on the study of materials and substances of the structure, foundation and surroundings of the object of town planning activity
<i>General Professional Competencies</i> Able to analyze, critically comprehend and represent information, search for scientific and technical information, acquire new knowledge, including the use of information technology. Able to participate in the design of construction and housing and community services, including the use of computer-aided design and computing software systems.	Professional standard “Specialist in the design of steel structures of buildings and structures for industrial and civil purposes” [4] <i>Labor function</i> Making calculations of steel structures.

Table 2 - Laboratory works for the course "Steel structures"

№	Topic of the laboratory work	Notes
1.	Investigation of the loss of stability of centrally compressed steel rods	Comparison of critical losses forces, determined experimentally using calculations
2.	Study of the work of welded and bolted joints	Determination of stress-strain state and the form of the destruction of compounds
3.	Investigation of the operation of a statically definable steel beam	Comparison of theoretical stresses with experimental ones
4.	Control of the stress-strain state of a pre-stressed steel beam	Determination of stresses in girder with stress and displacement control system
5.	Study of the truss	Determination of deformations and efforts in truss rods
6.	Study of steel frame elements of an industrial building on a model	Determination of stress-strain state of steel frame elements

The main features of these laboratory works are:

- Availability of a variety of technical equipment, controlling and measuring instrumentation and tools;
- Availability of experimental samples of single and multiple use;
- Research of the components of the stress - strain state as the main parameters;
- Lack of the opportunity to carry out tests on full-sized structures.

Conclusion

The analysis of the content of laboratory works showed the possibility of their creation and implementations with the help of computer software (SCAD OFFICE, LIRA, STARK ES, etc.). The main advantages of this approach will be:

- Reduction in material costs for equipment and experimental samples;
- Variety of parameters of investigated structures and compounds;
- Various possibilities of visualization and fixings of research results;
- Obtaining skills in the field of building information modeling.

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ВЫЧИСЛИТЕЛЬНЫЕ КОМПЛЕКСЫ, КАК ИНСТРУМЕНТ РЕАЛИЗАЦИИ ВИРТУАЛЬНЫХ ЛАБОРАТОРНЫХ РАБОТ ПО МЕТАЛЛИЧЕСКИМ КОНСТРУКЦИЯМ

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Аннотация: Рассмотрены требования формирования результатов обучения у выпускников направления подготовки «Строительство» по металлическим конструкциям. Проведен анализ лабораторных работ в части обучения студентов по дисциплине «Металлические конструкции». Показаны возможности вычислительных комплексов для создания и реализации виртуальных лабораторных работ по металлическим конструкциям.

Ключевые слова: вычислительные комплексы, лабораторные работы, металлические конструкции, образовательный и профессиональный стандарты.

OPERATION OF CONCRETE STRUCTURES IN CORROSIVE ENVIRONMENT

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Abstract

The aggressive external influences and ways of dealing with them are described. The relevance of the use of reinforced concrete is justified. The goals and objectives are formulated. Conclusions about the methods and ways to protect metal structures are drawn.

Keywords: aggressive concrete, corrosion, metal structures.

Introduction

The examination of reinforced concrete shows that one of the main reasons for reducing the bearing capacity of reinforced concrete structures is the impact of aggressive environmental effects. The most unfavorable result of such an impact is the chemical corrosion of concrete. In industrialized countries, the damage caused by corrosion is estimated to be 3 ... 5% of the gross national income, with 13 ... 19% accounted for by building structures

Quality and durability of building structures, both in technical and economic terms are increasingly attracting builders. It is obvious that in many cases the increase in the initial cost of design manufacturer, and its protection are economically justified if it reduces the number and cost of repairs during the operation.

In particular it relates to a reinforced concrete structure in which reinforcing steel can be well protected by concrete and the latter can be given a considerable resistance to the environment.

Long-term and systematic study of the resistance of a variety of reinforced concrete structures under different operating conditions showed that the most dangerous damage is caused by the development of corrosion of the reinforcement, and their removal is extremely difficult.

Methods of protection against corrosion, restoration and strengthening of reinforced concrete structures in aggressive environment

To achieve the goal of the research it is necessary to solve the following objectives:

- to study the influence of aggressive environment on work of reinforced concrete structures;
- to forecast the service life of reinforced concrete structures;
- to develop options for strengthening structural elements of the building frame.

The scientific novelty is based on the need to increase the reliability and durability of constructions, their amplification.

Corrosion of reinforced structures (concrete and reinforced concrete, stone, metal, etc.) depends on many factors: the type, chemical composition, concentration, solubility in water, humidity, ambient temperature and the conditions of contact with it, as well as

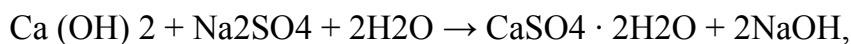
the parameters of the design (e.g. for reinforced concrete construction - on the structural cross-sectional shape, type and density of the concrete, the type, number and arrangement of reinforcement, the type and level of stress state, the presence and the width of the crack opening). Aggressive environment with regard to impact on building structures (relative reduction in strength of the material for 1 year) is divided into non-aggressive (strength reduction is not present), slightly aggressive (strength reduction of less than 5%), moderately aggressive (decrease in strength is 5 ... 20%) and strongly aggressive (reduced strength more than 20%).

A large number of “mechanisms” of concrete deterioration relate to three main types:

I type - the processes of dissolution of components of the cement stone and removal of products of calcium hydroxide $\text{Ca}(\text{OH})_2$ water (leaching) - physical form of corrosion. An indication of concrete corrosion is the presence of type I efflorescence at the surface that increase the cement paste porosity and reduce its strength.

II type - the result of the interaction of components of the cement stone or salts with acids, resulting in the formation of soluble or amorphous substances of eroded water (solubility product) $\text{Ca}(\text{OH})_2 + \text{H}_2\text{CO}_3 + \text{CaCO}_3 \rightarrow 2\text{H}_2\text{O}$, then $\text{H}_2\text{CO}_3 + \text{CaCO}_3 \rightarrow \text{Ca}(\text{HCO}_3)_2$; $\text{Ca}(\text{HCO}_3)_2$ - easily soluble product.

III type – is characterized by the accumulation in the capillaries and pores of the cement stone sparingly soluble salts with an increase of their volume. Pressure leads to destruction of the cement stone. At the initial stage of the density strength of the concrete increases. If corrosion protection is providing during this period, the concrete can be maintained.



$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ - plaster with a slight increase in volume interacts with tri-calcium hydroaluminates cement stone

$3\text{CaSO}_4 \cdot 2\text{H}_2\text{O} + 3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{H}_2\text{O} + 23\text{H}_2\text{O} \rightarrow 3\text{CaSO}_4 \cdot 3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 31\text{H}_2\text{O}$, $3\text{CaSO}_4 \cdot 3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 31\text{H}_2\text{O}$ - calcium hydrosulfoaluminate increases in volume by more than 2 times. [1]

Corrosion protection of structures

Protective agents are selected depending on the degree of aggressiveness and medium properties. When slightly aggressive environment satisfied paints and protective coatings, while moderately aggressive and highly aggressive mid- paint, mastic, Wood banding, facing.

Paints can be used with fillers and without HXX, with reinforcing foundation or without it. Materials for the lacquer coating are selected depending on the aggressiveness of the environment. These include:

(a) low aggressive environment - materials based on natural drying oils, polyester resins, etc.;

(b) moderately aggressive environment - perchlorovinyl materials based on epoxy resins and, chlorinated rubber, etc.;

(c) strongly aggressive environment - materials based on epoxy resins, chlorinated rubber with an increased number of layers, etc. [3]

Wood banding protective coating is made of three types of materials: roll - bitumen or polymer; polymer film; sheet of polymer. These materials may be reinforcing the foundation.

Conclusion

A systematic study of the durability of various reinforced concrete structures under various operating conditions has shown that the damage caused by the development of reinforcement corrosion is most dangerous, and their elimination is extremely difficult. It is necessary to improve the existing methods for predicting the service life of reinforced concrete structures in aggressive environment.

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ЖЕЛЕЗОБЕТОННЫЕ КОНСТРУКЦИИ, ЭКСПЛУАТИРУЕМЫЕ В УСЛОВИЯХ ВОЗДЕЙСТВИЯ АГРЕССИВНОЙ СРЕДЫ

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Аннотация

Описаны агрессивные внешние воздействия и способы борьбы с ними, обоснована актуальность использования железобетона. Сформулированные цели и задачи. Сделаны выводы о методах и способах защиты металлических конструкций.

Ключевые слова: агрессивный бетон, коррозия, металлоконструкции.

EVALUATION OF BEARING CAPACITY AND DEFORMABILITY OF WEAK WATER-SATURATED SOILS

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Abstract

The relevance of the study of the carrying capacity and deformability of weak water-saturated soils is focused on, and goals and objectives are formulated.

The causes of formation and development of sediments of weak water-saturated soils which take place in accordance with the time are investigated. The influence of hydrostatic pressure arising in the process of compaction on their strength and compressibility is considered. The conclusions about their bearing capacity and deformability are drawn.

Keywords: compaction, compressibility, pore water, sediment, strength.

Introduction

Weak water-saturated soils are soils with a degree of humidity greater than 0.8 and a total deformation modulus less than 5 MPa in the pressure ranges up to 0.3 MPa. Such soils are belt clays, marine freshwater silts, water-saturated loess and loess-like soils and other types of clay soils which have fluid and fluid-plastic consistency. [1]

Weak water-saturated soils are widespread in Russia. Often, due to the need to use a large amount of water for technological needs, industrial facilities are located in river valleys and along the coast of lakes and seas. Weak water-saturated soils are typical for such structures in most cases. Builders often have to use such soils as bases. Therefore, the study of the bearing capacity and deformability of weak water-saturated soils is relevant.

The aim of the research is to identify the features of deformability of weak water-saturated soils.

The objectives are to investigate the strength of weak water-saturated soils; and to consider the rate and causes of sediment formation of weak water-saturated soils.

The issues related to the study of weak water-saturated soils, were examined by M. Yu. Abelev [1], Corresponding Member of the Academy of Sciences of the USSR N. M. Gersevanov [3], Corresponding Member of the Academy of Sciences of the USSR N. Tsytoovich [4],], Professor B.I. Dalmatov [2]. Also, the study of weak water-saturated clay soils and their use as bases of buildings and structures was focused on at several presentations made at international congresses on soil mechanics and Foundation engineering (1957, 1961, 1965, 1968 and 1969) and a number of Union meetings (1939, 1956, 1965 and 1971).

Research of bearing capacity and deformability of weak water-saturated soils

Buildings and structures, the bases of which are weak water-saturated soils with a total deformation modulus of less than 5 MPa, experience large sediment caused by high compressibility of soils.

Sediments of buildings and structures on these soils take place for a long time. This is due to the fact that the compaction of water-saturated soils is often determined by squeezing water filling the pores of the soil to the drainage surfaces. The compaction process takes place over a long time, especially for the bases of large thickness, since the filtration coefficient of weak water – saturated soils is very small (10^{-6} - 10^{-9} cm/sec).

Observations of sediments show that buildings and structures the sediment of which occurred for a long time do not have cracks. They are formed in the case when the rate of sediment foundations significantly exceeds the rate of development of plastic deformations of structures.

The angle of internal friction of weak water – saturated soils is usually 5 – 12°, and the adhesion is 0.01-0.03 MPa (during unconsolidated-undrained test). If such soils are used as bases, it is very difficult to ensure the stability of foundations and individual structures on them. Providing stability of buildings with eccentric application of load to the foundations and under the action of horizontal forces (in the construction of buildings with a high center of gravity) is very difficult.

The movement of pore water in the process of compaction of weak water-saturated soils contributes to the formation of hydrostatic pressure, which reduces the stability of soils of the base. This leads to the development of shear zones. In this case, the natural structure of the soil is broken, which leads to a decrease in its strength and increases compressibility. In the process of compaction (consolidation) compressibility of the soil decreases (compared with its compressibility to compaction), and strength (shear resistance) increases. The slow increase in strength and modulus of general deformation of weak water-saturated soils is associated with low water permeability and slow extraction of pore water during compaction.

Conclusion

Weak water-saturated soils have low bearing capacity, gain strength for a long time. Due to high compressibility, weak water-saturated soils produce large sediments, which develop over several years.

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ОЦЕНКА НЕСУЩЕЙ СПОСОБНОСТИ И ДЕФОРМИРУЕМОСТИ СЛАБЫХ ВОДОНАСЫЩЕННЫХ ГРУНТОВ

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Аннотация

Обоснована актуальность исследования несущей способности и деформируемости слабых водонасыщенных грунтов, сформулированы цели и задачи. Исследованы причины образования и развития осадок во времени у слабых водонасыщенных грунтов. Рассмотрено влияние гидростатического давления, возникающего в процессе уплотнения, на их прочность и сжимаемость. Сделаны выводы об их несущей способности и деформируемости.

Ключевые слова: осадка, поровая вода, прочность, сжимаемость, уплотнение.

THE IMPACT OF TRANSPORT SYSTEMS ON THE URBAN ENVIRONMENT

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Abstract

The article discusses the types of negative impacts on the urban environment arising from the actively functioning transport systems from the point of view of environmental and socio-hygienic nature, as well as possible solutions for each of the identified factors.

Keywords: environmental pollution, motor transport, noise exposure, noise protection, transport systems, urban environment, vibrations.

Introduction

With the rapid growth of modern cities, the transport area is actively developing. The number of different types of transport is increasing: cars, trams, railroads, subways, etc. Their combination and interaction with each other is formed taking into account such factors as population size, relief, historical and economic conditions of a particular city and the country as a whole. Transport systems currently play an important role in urban development and the system of human settlement. The popularity of motor vehicles is increasing every year, but its massive use is accompanied by serious environmental pollution. It is also a source of high levels of noise and unwanted vibrations. Environmental damage from the operation of vehicles is caused by toxic emissions that annually enter the atmosphere in the form of various pollutants: carbon monoxide, oxides of nitrogen and sulfur, hydrocarbons, soot and others.

Types of impact

The negative effects of various types of road transport on the urban environment bring the following problems:

- environmental pollution of the city atmosphere;
- noise exposure;
- the impact of vibrations;
- the impact of transport systems on building.

Ecological pollution of the atmosphere of cities is the most urgent problem in the modern world, which requires an immediate solution. Motor transport systems in large quantities emit exhaust gases of automobile engines into the atmosphere. They contain dozens of harmful compounds that have a detrimental effect on the environment and the human body. Plants growing near the roadside fall into the zone of negative influence. An analysis of plant changes taking place against this background, directed towards their degradation, helps to see the picture fully reflecting the state of the urban environment.

The population living in residential buildings, located close to highways, is most susceptible to diseases, the root cause of which is environmental pollution. The formed urban environment cannot, to a degree, provide the appropriate parameters for comfortable and safe living, regarding the needs of the human body, both in terms of the noise component and the quality of atmospheric air.

The solution to this problem was the construction of filter buildings that reduce air pollution. The buildings use special panels for cladding facades that can absorb smog. Such structures are made of titanium dioxide-coated aluminum (TiO₂). Negative substances falling under the influence of direct sunlight are destroyed.

The architectural solution to the problem of air pollution in residential densely populated buildings was the construction of skyscrapers with vertical planting of plants. They absorb carbon dioxide and produce oxygen, clearing the city air. Such plantings also contribute to reducing road noise.

An important aspect when considering the transport impact on the urban environment is noise pollution. That is, residential buildings located near highways and roads with fairly heavy traffic, are constantly in a state of noise discomfort. Today, traffic noise is a serious problem that is on a par with chemical pollution of the environment.

To reduce the level of noise pollution, it is recommended to apply a number of measures to reduce the noise level to acceptable values. Such activities are:

- an increase in the area between the highway and the protected building;
- increase in the number of floors in residential buildings into the building plot;
- placement of landscaping along the roadside areas;
- the use of noise screens.

Types of screens that can be used are:

- relief elements, both artificial and natural, such as mounds and hills;
- external enclosing structures in residential buildings that have enhanced sound insulation;
- planning solutions in residential buildings where there are non-residential windows on the motorway side, or not more than one living room for three-room apartments.

Transport systems affect buildings and structures located in close proximity to them, through the propagation of vibrational energy, that is, vibration. These are movements or processes that are characterized by certain repeatability in time, amplitude and frequency. The result of the spread of vibrations is adverse effects on the technical condition of buildings and structures, up to the destruction of the building structure

To prevent negative influences from vibrations, there is a need for continuous monitoring and analysis of impacts on the structures of buildings and structures. The obtained data must be taken into account when constructing new objects. Also, timely detection of the problem avoids negative consequences, and makes it possible to prevent the occurrence of emergency situations through repair work. To reduce the level of fluctuations in the structures of buildings and structures, special architectural and structural solutions are provided. In industry, equipment is necessarily equipped with vibration-proofing. There are cases when it is impossible to prevent vibration exposure completely, for example, when objects are located near the railway, when elevators or cranes are working, etc.

All these factors have an influence on the formation of residential buildings and recreational spaces. The development of the adjacent areas is considered quite unfavorable. Residents are forced to watch from the windows of their homes daily heavy traffic of cars on the streets. Also, the population spends a considerable amount of time near the house adjoining spaces, but at the same time, in most cases the plots do not have protection from the negative impact of road transport systems. Cars parked in the courtyards of residential buildings, in the absence of organized parking and specially designated areas, are close enough to children's playgrounds, which cannot be called

favorable. These factors negatively affect the state of the environment, worsening the quality of life of the population. Gardening is a fairly effective way to reduce the harmfulness of transport factors, and to improve the environmental and hygienic characteristics of the environment. The positive result of reducing pollution largely depends on the types of geometric solutions for planting, as well as on their classification. It is important to note that vegetation has a positive effect on areas with acoustic pollution. Green plantings are used as a noise shield; the most common for its creation are elderberry red, oak red, Canadian erga. To protect against wind and draft, plants are also used, and the choice of the variety falls on trees with a sufficiently open crown. To reduce the level of air pollution, the use of hardwood is of no small importance, including the reduction of dust and carbon monoxide in the air.

Conclusion

The article identified factors that have a harmful effect on the urban environment through transport systems. But there are effective solutions of this problem. Modern methods of maintaining an environmentally friendly environment are not the same, previous proposals are being improved, and new innovative materials with great potential are being developed.

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ВОЗДЕЙСТВИЕ ТРАНСПОРТНЫХ СИСТЕМ НА ГОРОДСКУЮ СРЕДУ

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Аннотация

В статье рассматриваются виды негативных воздействий на городскую среду, возникающих из-за активно функционирующих транспортных систем, с точки зрения экологического и социально-гигиенического характера, а также возможные варианты решений для каждого из выявленных факторов.

Ключевые слова: автотранспорт, вибрации, городская среда, транспортные системы, шумовое воздействие, шумозащита, экологическое загрязнение.

EXPLOSION PROTECTION OF INDUSTRIAL BUILDINGS WITH LIGHT REMOVABLE STRUCTURES OF WINDOWS FRAMES

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Abstract

The article reveals the concept of light removable structure (LRS). The options of the existing structural solutions of LRS are given and the designs providing explosion and fire safety of buildings are offered by means of the device of modern easily thrown protecting building constructions.

Keywords: light removable structure, fire and explosion safety, window frames.

Introduction

Operation of any explosive industrial buildings can lead to emergency situations. According to the Ministry of emergency situations only in 2016 in the Russian Federation 5 explosions, which killed 10 people and injured 61 people, were recorded. The main causes of accidents were non-compliance with safety regulations, violations committed in the design and construction of buildings and structures, operation of faulty equipment, physical deterioration of technological equipment, buildings and their parts.

Fire safety of buildings

According to the main Department of EMERCOM of Russia in the Tambov region, the region approved by the government of the Russian Federation 56 categorized object of explosive production, 30 of them are explosive (category A,B). The main part of these buildings was built in the 60s, has a significant physical wear of bearing and enclosing structures, and requires not only technical re-equipment of technological equipment, but also the reconstruction of buildings. Particular attention should be paid to the premises of categories a, B on fire and explosion safety. In accordance with the code of regulations SP 4.13130.2013 they should be equipped with external light removable structure (LRS). Therefore, the objective of ensuring fire and explosion safety of buildings by modern light removable structure is relevant.

Hazardous facilities are locations in buildings where explosive mixtures of combustible.

LRS are used to reduce the overpressure, to ensure strength and stability of the main bearing structures of buildings, arising from the interaction of combustible vapor-gas-dust mixtures inside the production, warehouse or other premises. These include: wall and roof panels, windows, swing doors, gates and other enclosing structural elements, the destruction or opening of which occurs when the excess pressure does not exceed the permissible for the main bearing and enclosing structures of the building.

The most effective and most common of the elements of the LRS are window structures that can be installed in the walls of the building (in the form of glazed window covers), and in the lights mounted on the surface of the structure. The formation of openings in the glazed window covers and lanterns occurs as a result of the destruction of glass under the influence of excess pressure that occurs in the room during the explosion.

In normative documentation, it is established that in rooms of category A and B it is necessary to provide external easily thrown off protecting designs as which it is necessary to use a single glazing of Windows and lamps. Reinforced glass, double-glazed Windows, triplex, stalinite and polycarbonate do not belong to LSK.

In the process of operation, we have to face a problem the essence of which is that when performing major repairs and reconstruction of buildings of category A and B, the maintenance services are faced with the task of replacing the old LSCS that have physical wear of more than 60% of HH53-86 (p) [5], window covers, box, window sill are completely affected by rot and bug, the doors do not open or fall out, all interfaces are broken, do not meet the requirements of SNIIP 23-02-2003, and require a complete replacement of window blocks with modern PVC structures, with breakable under a given load fastening units, the filling of which is a double-glazed unit meeting the requirements of GOST56288-2014.

Conclusion

Work on major repairs or reconstruction must be carried out on the design and estimate documentation (DED), approved by the state examination and Rostekhnadzor. However, Supervisory organizations, due to the inconsistency of regulatory documents, do not give approval for this replacement. Although modern window LSC allows increasing explosion safety of buildings, work comfort, reduce energy costs, reduce the consequences of an emergency and thereby reduce the severity of the problem.

On the basis of the above, in the master's thesis it is necessary to perform the following:

- to conduct a comparative analysis of options for existing design solutions LRS.
- to assess the technical condition of buildings of explosive enterprises of the Tambov region.
- to assess the impact of loads caused by the explosion on the structure of the building.
- to develop recommendations on the choice of LSK depending on the production conditions.

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ОБЕСПЕЧЕНИЕ ВЗРЫВОБЕЗОПАСНОСТИ ПРОИЗВОДСТВЕННЫХ ЗДАНИЙ ПУТЕМ УСТРОЙСТВА ЛЕГКОСБРАСЫВАЕМЫХ КОНСТРУКЦИЙ ОКОННЫХ ЗАПОЛНЕНИЙ

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Аннотация

В статье раскрывается понятие легкобрасываемые конструкции (ЛСК). Приведены варианты существующих конструктивных решений ЛСК и предложены конструкции, обеспечивающие взрывопожаробезопасность зданий, путем устройства современных легкобрасываемых ограждающих строительных конструкций.

Ключевые слова: легкобрасываемые конструкции, взрывопожаробезопасность, оконные конструкции.

REDUCTION OF WATER-ABSORBING CHARACTERISTICS OF PLYWOOD BY ITS IMPREGNATION

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Abstract

During operation, plywood is often exposed to moisture, resulting in the process of rotting, which significantly reduces the bearing capacity of building structures. Also, often the construction of wood products takes significant force effects, which also helps to reduce their durability. In this regard, currently, active development is underway to improve the performance of wood. The biggest increase in durability of wood is achieved through its modification by impregnation.

Keywords: impregnation, samples, water absorption, water, "Oxol".

Introduction

Plywood is a glued laminated wood structure, which consists of three or more glued together sheets of wood with a mutually perpendicular arrangement of fibers in the adjacent layers. With this arrangement increases the strength of the material, the shape is saved compared to conventional wood structures. It is lightweight, resistant to temperature changes, easy to combine with other materials, has an aesthetic appearance. Its strength, thermal conductivity and environmental performance is much higher than other wood-Board materials such as chipboard, fiberboard and MDF.

Plywood has good resistance due to the content of phenol-formaldehyde in the glue. It also prevents insects, microorganisms and fungi from affecting the surface of its structure. Lamination and processing of the ends allow us to resist the effects of adverse weather conditions and use plywood not only indoors.

However, it is not recommended to prevent the humidity at 20% above the norm and restrictions on the access of oxygen. In case of violation of these conditions may begin the process of decay. To avoid blue, mold and discoloration, plywood is impregnated with special solutions, as well as to improve the quality of plywood (to increase strength, reduce water absorption) it is affected by various modifiers. Drying oil "oxol" sunflower is one of the most not expensive impregnations capable to cope with these tasks. The surface treated with it is characterized by greater durability, hardness, elasticity, water resistance.

"Oxol" is a film-forming substance, which is made from natural vegetable oils subjected to oxidation (in this case, sunflower), desiccant and solvent.

The disadvantages are high toxicity and flammability due to the presence of solvent and oils in the composition.

Methods of research of plywood on water absorption

Studies were conducted on samples of seven-layer plywood. The samples have dimensions of 120x10x12 mm.

Tests to determine the water absorption depending on the different modes of impregnation were carried out as follows. Six samples for each impregnation mode and six samples without impregnation are selected. Plywood impregnated with drying oil “oksol”. To obtain the first mode of impregnation, it is applied in one layer to the surface of six samples, after which it is waited for about 24 hours. To get the next mode, the varnish is applied again, waiting for the complete drying of each layer. Six samples are left untreated. After all the layers of impregnation are completely dry, the samples are ready for testing.

With the help of lever scales the mass of each sample in the dry state is measured. After that, we should prepare the container and fill it with water. Then all samples are immersed in water and wait for 30 minutes, after which the samples are removed from the container and re-weighed. Similarly, the same samples are kept in water for 1 hour, 2 hours, 1 day and 7 days from the start of the dive and their mass is measured on a lever scale.

Water absorption is determined by the formula $W=(MVL - MSU/MSU) \cdot 100\%$ for each sample, and then determine the average of the six samples corresponding to a certain period of soaking time in a container with water.

These values are used to plot the dependence of water absorption on the time of soaking the samples in water.

Fig. 1 shows a graph of the dependence of water absorption of samples without impregnation on the time they are kept in water.

The graph is a smooth curve coming from the origin. In the first 2 hours there is the most noticeable increase in water absorption, and then the process slows down, but does not stop. Then the curve smoothly turns into a straight line.

Figures 2-4 show graphs of the first, second and third impregnation modes. They behave the same way.

Comparing these graphs with each other can be judged on how this drying oil “oxol” affects the ability of samples to absorb water. Water absorption capacity of the relevant time intervals with increase in the mode of impregnation gradually reduced. This suggests that the more layers of impregnation applied to the surface, the less water will absorb plywood.

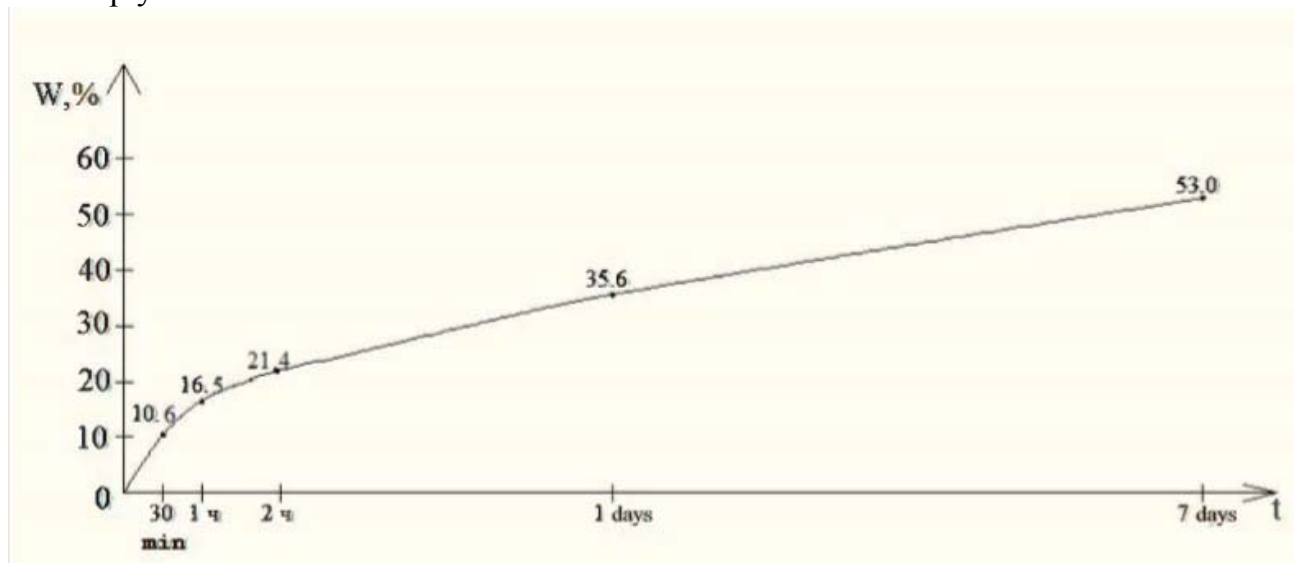


Fig. 1 - Water absorption without impregnation

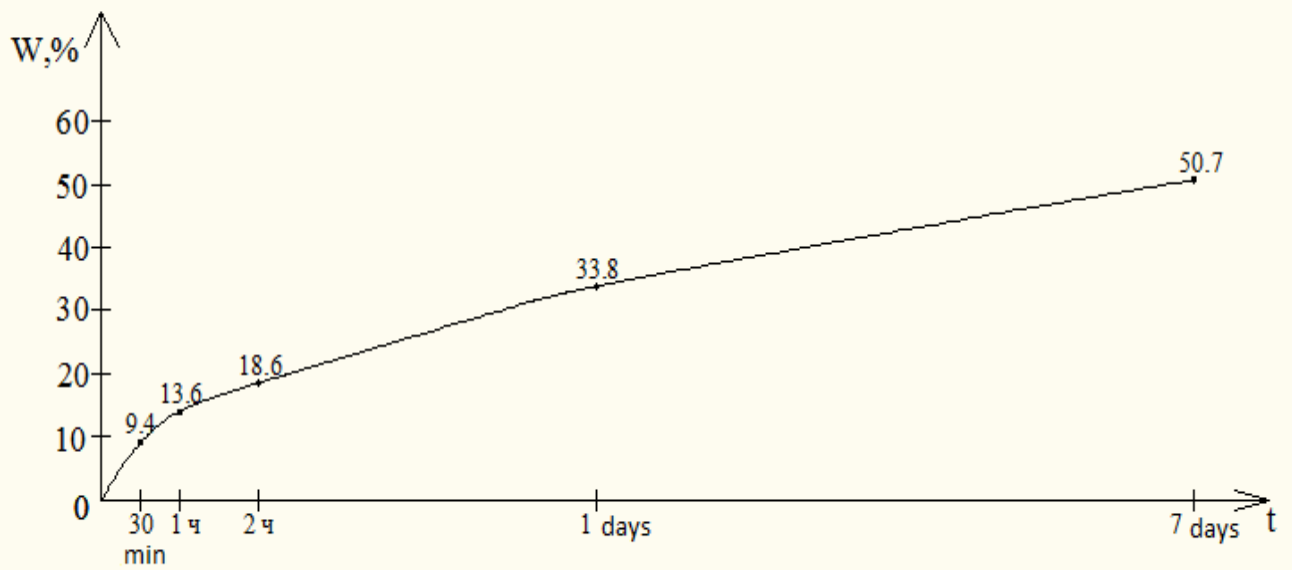


Fig. 2 - Water absorption (mode 1)

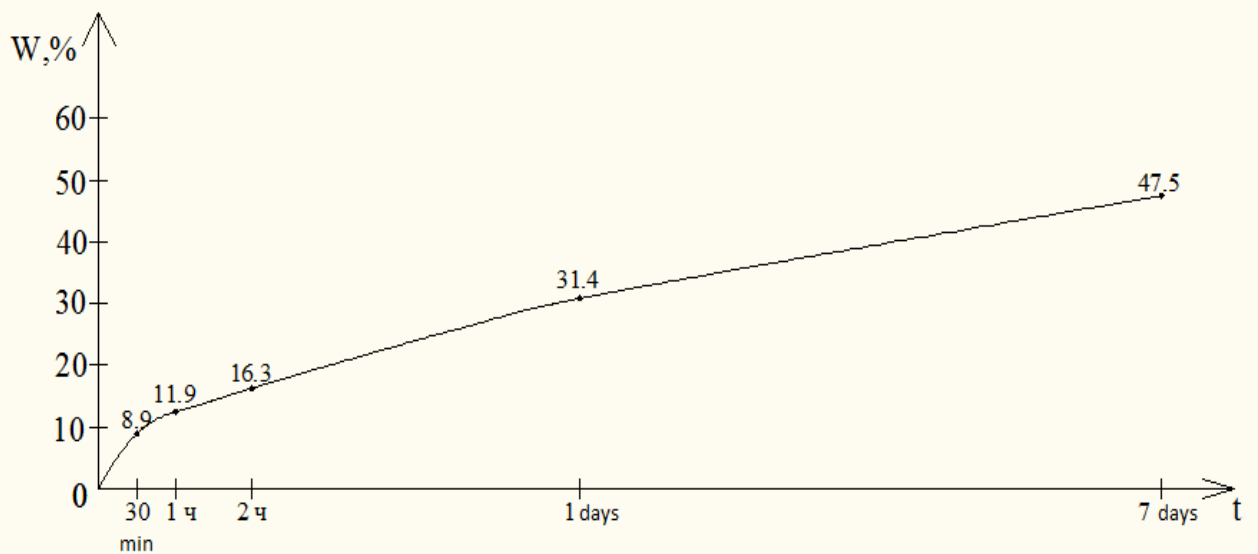


Fig. 3 - Water absorption (mode 2)

Conclusion

1. It is established that impregnation of drying oil “oxol” reduces ability of plywood to absorb water.
2. Due to the change in the mass of the lowered plywood samples in water, the change in their water absorption at different time intervals under different impregnation regimes and in the absence of impregnation was investigated.

3. It is investigated that at increase in number of layers of this impregnation water absorption of plywood decreases.

4. Due to the change in the height of the lowered plywood samples in the water, the change in their swelling of different time intervals at different impregnation modes and in the absence of impregnation is investigated.

5. It is established that the impregnation of the oil “oxol” reduces the ability of plywood to increase in size with prolonged immersion in water.

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СНИЖЕНИЕ ВОДОПОГЛОЩАЮЩИХ ХАРАКТЕРИСТИК ФАНЕРЫ ЗА СЧЕТ ЕЕ ПРОПИТКИ

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Аннотация

Рассмотрены способы увеличения прочности древесины за счет ее модификации путем пропитки. Выявлены факторы, влияющие на свойства древесины. Отмечается, что при воздействии влаги, возникают процессы гниения, что значительно снижает несущую способность строительных конструкций. Также строительные изделия из дерева подвергаются значительным силовым воздействиям, что также способствует снижению их долговечности.

Ключевые слова: пропитка, образцы, водопоглощение, вода, оксоль.

CONSTRUCTION PROPERTIES OF ROCK AND ELUVIAL SOIL

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Abstract

The relevance of the study of the construction properties of rock and eluvial soils is substantiated. The interrelation of changes in physicommechanical and deformation characteristics of rock and eluvial soils depending on their genesis and post-genetic processes has been investigated. The influence of ablation on their strength and compressibility is considered. The features of the construction properties of rock and eluvial soils are revealed. Conclusions about their bearing capacity and deformability are made.

Key words: ablation, base, fracture, genesis, strength.

Introduction

The aim of the work is to identify the features and differences in the construction properties of rock and eluvial soils, taking into account the origin and subsequent processes that affect their characteristics.

The objectives are to study the construction classification of rock soils, to study the genesis of eluvial soils, and to identify the features of construction on rock and eluvial soils.

Rock soils by origin are divided into igneous, cemented sedimentary and metamorphic rocks, which are divided by strength, softness and solubility. They are characterized by hard crystallization bonds, which determine the class of rocky soils as a high-strength base. [1]

Such soils include: granites, marbles, sandstones, gneisses, quartzites, basalts, etc.

Research of physical and mechanical characteristics of rock and eluvial soils

Igneous rocks have structural crystalline bonds between mineral grains that arise in the formation of the rock. All soils of magmatic origin have strength that is much higher than the loads known in engineering practice, and they are also practically waterproof. However, depending on the composition, structure, fracturing and tendency to ablating, the physicommechanical and deformation properties of igneous rocks vary in a wide range.

Metamorphic rocks are in many ways similar to magmatic in their physico-mechanical and deformation properties. Deformability and filtration of these rocks are possible only by cracks or of ablation zones. In real conditions, metamorphic rocks are deformed as elastic bodies. However, due to the origin, metamorphic rocks have anisotropic properties due to their schistosity. So the compressive strength, shear strength and modulus of elasticity are much lower along the schistosity than across.

Engineering geological features of cemented sedimentary rocks are determined by the size of cemented fragments or particles, the nature of the cement and the degree of lithification of the rock. The most characteristic types of cement are quartz, ferrous, carbonate and clay cements. Less common are cemented gypsum rocks. The most lasting (наиболее прочные) among them are quartz and ferrous cements. Their strength is not less than the strength of cemented grains and in some cases exceeds the last one. A

feature of carbonate cement is its high strength, but it has strong susceptibility to water solubility. Clay cement is of low strength and gypsum has high solubility.

The main position of soil science is a statement about the dependence of the properties of soils on their composition, structure and texture. Composition, structure and texture, and hence the properties of rocks are formed in the process of their genesis and change under the influence of postgenetic processes.[3]

Eluvialsoils are products of ablation of rocks, which were formed due to cracking, decompression, breaking and grinding of source rocks and remained at the place of their formation. Depending on the initial rocks that have undergone ablation, eluvial soils of igneous, metamorphic and sedimentary cemented rocky soils should be distinguished, and according to the quartz content, the eluvial soils should be divided into two groups: containing quartz and quartz-free. They are distinguished by their complex structure and spatial variability. Upper soil layers undergo additional ablation and are considered weakened. Varieties of eluvial soils, depending on their degree of ablation and the origin of the original rocks, are given in Table 1.

Table 1 Varieties of eluvial soils

Variety	Coefficient of ablation K_{wr} for rock soils	
	Igneousandmetamorphic	Sedimentarycemented
Young	1	1
Mature	$1 \geq K_{wr} \geq 0.9$	$1 \geq K_{wr} \geq 0.95$
Old	$0,9 \geq K_{wr} \geq 0.8$	$0,95 \geq K_{wr} \geq 0.85$

Eluvial soils are sediments remaining at the ablation site. Clay soils in these sediments can have a different consistency. Owing to the presence of clay particles, these soils may be subject to frost buckling. [4]

As the weight of the erected structures increases, the requirements for the foundations become more stringent, since the load from the foundations has to be transferred to more dense and durable soils. All this determines the relevance of the study of physico-mechanical and deformation properties of rock, as well as their derivative - eluvial soils.

Conclusion

- properties of igneous rocks are determined by their mineral composition, structural and textural features, and most importantly fracturing;
- physicommechanical and deformation properties of metamorphic rocks are determined by their anisotropy;
- properties of cemented sedimentary rocks largely depend on the physico-mechanical properties of cement and its origin;
- eluvial soils have significant heterogeneity in depth, their physico-mechanical properties depend on the properties of the original rock soils and the degree of ablation.

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СТРОИТЕЛЬНЫЕ СВОЙСТВА СКАЛЬНЫХ И ЭЛЮВИАЛЬНЫХ ГРУНТОВ

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Аннотация

Обоснована актуальность исследования строительных свойств скальных и элювиальных грунтов. Исследована взаимосвязь изменений физико-механических и деформационных характеристик скальных и элювиальных грунтов в зависимости от их генезиса и постгенетических процессов. Рассмотрено влияние выветривания на их прочность и сжимаемость. Выявлены особенности строительных свойств скальных и элювиальных грунтов. Сделаны выводы об их несущей способности и деформируемости.

Ключевые слова: выветрелость, генезис, основание, прочность, трещиноватость.

ABOUT THE NEED FOR THE PRODUCTION OF ARTIFICIAL STONE

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Abstract

A typical building cannot satisfy aesthetic needs. That is why bas-reliefs, stucco works, pilasters and other decorative ornaments are gaining in popularity. It is important to replace them with an artificial stone.

Key words: aesthetics, artificial stone, bas-reliefs, economy, individuality, natural stone, typical.

Introduction

After long years of Soviet orientation to massive, functional construction, where the reduction of terms and estimated construction costs comes first, and the unique appearance, was out of the question, the society is beginning to return to pre-revolutionary values [1]. Recently, there has been an increasing trend towards individuality, and this is seen in all aspects of our life. Most of all this is observed in the appearance of us and our housing. Thematic arrangement of the exterior and interior of housing has become very popular; it can be arrangement under ancient Greece, medieval Europe and pre-revolutionary Russia. Today, bas-reliefs, stucco works, pilasters and other decorative ornaments are again in fashion (Fig.1).



Figure 1 – Comparison of typical and individual designs.

Technology of production of artificial stone

The main difference of this is that the economy affects the whole life of a person. In most cases the problems availability of natural materials, such as marble, granite, etc., arise. That is why the question arises of replacing expensive materials with analogues that are not inferior in quality and aesthetic appearance to natural materials. In this role, artificial stones can be made by various techniques, such as: casting, molding, for which only molds, dry construction mixtures and subsequent processing are required. An artificial stone made by such methods is certainly different from the original stone, but in

terms of price-quality ratio, it clearly benefits the natural one, of course, provided that the production technology is strictly adhered to, including the technological parameters [2].

In the open access, including the Internet, you can find a huge amount of technologies of artificial stone production. For example, the technology of production by injection molding consists of several main stages. At the first stage, a matrix consisting of a wood is created to prevent adhesive interaction between the working surface of the matrix and the polyester resin. At the second stage a gelcoat is applied on the working surface of the matrix with the help of a cup nebulizer, which is a gel-like composition. Its main function is to give the finished product with protective functions, as well as the effect of a polished surface. After the gelcoat has hardened, prepare a mixture of polyester resin with the addition of marble chips is prepared. The mixture is poured into forms that remove air from the mixture vibrate. After this, the material is sent to the oven to dry. After cooling, the material is removed from the mold [4] (Fig. 2).



Figure 2 – Cast stone

Conclusion

The authors and manufacturers of these technologies claim that the technological schemes and production parameters make it possible to obtain a high-quality competitive product. However, in practice, these statements do not hold water [3]. With full observance of the production technology, the required set of operational characteristics is not required or is obtained far from the ideals of aesthetics. That is why the practical testing and optimization of existing technologies in real time is an urgent task.

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ПРЕДПОСЫЛКИ ПОЯВЛЕНИЯ ИСКУССТВЕННОГО КАМНЯ

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Аннотация

Типовое массовое строительство в настоящее время не может удовлетворить эстетические потребности. Именно поэтому опять в моде барельефы, лепнины, пилястры и прочие декоративные украшения, устройство из них дорогостоящие удовольствия. Поэтому актуальным является их замена искусственным камнем.

Ключевые слова: барельефы, натуральный камень, типовой и искусственный камень, индивидуальность, экономика, эстетика.

HISTORICAL HYPOTHESES REVIEW OF EXPLANATION FOR TIME-DEPENDENCE OF SOLID BODIES STRENGTH

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Abstract

The emergence of a kinetic theory of the solids destruction is described. Different views of scientists (Smekal, Oroan, Margetroyd, Ponsel, and others) on the participation of thermal activation processes in the kinetic destruction of materials are considered. The rationale for the participation of the atoms motion in a solid body at the destruction is given.

Keywords: Griffiths theory, kinetic energy, solid strength, thermo-activation process.

Introduction

At the background of the ambiguity of the Griffiths theory, which appeared at the beginning of the 20th century, the phenomenon of the time dependence of the strength of solids was discovered. This was caused primarily by the accumulation of a large amount of experimental data. The time dependence of strength expresses the relationship between durability (τ), load on the body (σ) and constant temperature $const = T$. This picture of destruction did not fit into the mechanical concept, suggesting that the destruction occurs critically (figure 1). It is the time dependence of the strength under static load, called mechanical fatigue by the mechanics that made the researchers try to modernize the mechanical concepts of the destruction process. This gave rise to the kinetic theories of the destruction of solids, which were intended to interpret this phenomenon. Several hypotheses were formulated, which formed the basis for the development of theoretical studies.

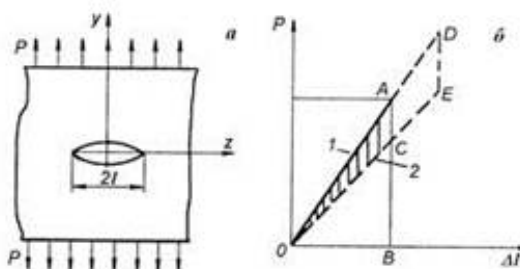


Figure 1 – Chart “load-elongation”

For the first time, considerations about the participation of thermo-reactive processes in the kinetics of destruction were expressed by A. Smekal in 1936. Later, several different approaches to explaining the phenomenon of the time dependence of the strength of solids appeared. In 1944, the works of E. Orovan, Margetroyd, Ponsel, Tobolskij and Eyring were published [1]. All these scientists have proposed different interpretations of this phenomenon.

Oroan explained the dependence of strength on time, the action of an external factor - the influence of an “aggressive” environment on the surface of a crack. The concept of

Oroan, explaining the time dependence of strength, is based on the fact that the external component of the environment (in this case, moisture) affects the surface layers of the sample, which contain “griffith” cracks, and reduce the surface energy of destruction. The growth of “Griffith” cracks is shown in Fig. 2.

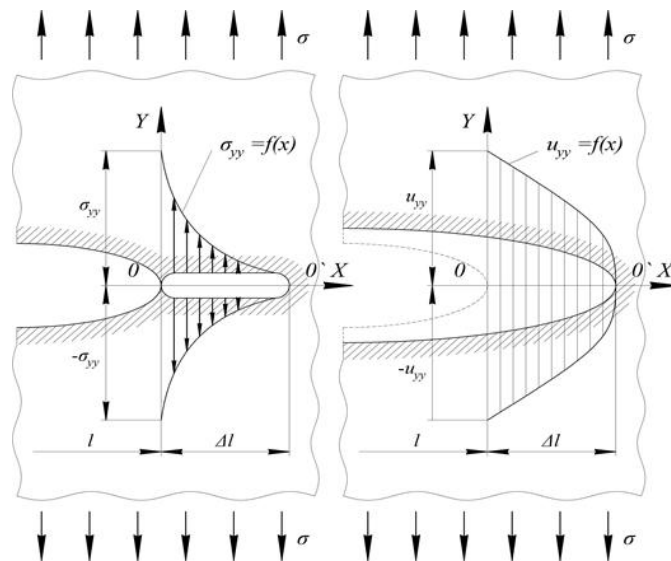


Figure 2 – Promotion of the end of the cut by the value of Δl

Hypotheses review

Margetroyd advanced the theory of non-uniform flow of material, the consequence of which should be an increase in local stresses to a discontinuous level (molecular strength limit). He believed that the temporal dependence of the strength is due to the flow of material in quasi-viscous regions of the heterogeneous system. If such a system is subjected to stretching, with the passage of time, the stress on the elastic elements will increase due to the relaxation of stress in viscous-plastic microregions. When the stress concentration on the elastic elements reaches the tensile strength, an instantaneous break will occur. The greater the applied load, the faster the redistribution of voltage from one phase to another, and the shorter the lifetime of the sample.

Poncelet expressed the hypothesis of thermal-fluctuation decay of stressed bonds at the top of a fracture crack. According to this theory, the greatest in magnitude strain is taken as the strength criterion. It is assumed that the violation of strength in the general case of the stress state occurs when the greatest deformation ϵ_{max} reaches its dangerous value ϵ_{pred} . The latter is determined by simple stretching or compression of samples from this material. That is, according to Ponsel, the main factor of destruction is the thermally activated mechanism of breaking intermolecular bonds, in which the fluctuation behavior of confining forces ensures the occurrence of temporary effects in the destruction of matter.

All these various hypotheses were proposed to explain the phenomenon of destruction of the same object - silicate glass. Tobolsky and Eyring, proceeding from the ideas of the theory of absolute reaction rates, suggested a kinetic interpretation of the time dependence of the strength of polymers, believing that it is based on overcoming the bonding forces between macromolecules (Fig. 3). According to this theory, the reaction takes place as a result of a collision between molecules with the formation of an intermediate (active) complex, which is in thermodynamic equilibrium with the starting materials and

gradually turns into products. This means that the reaction rate is determined by the speed of its last stage [2].

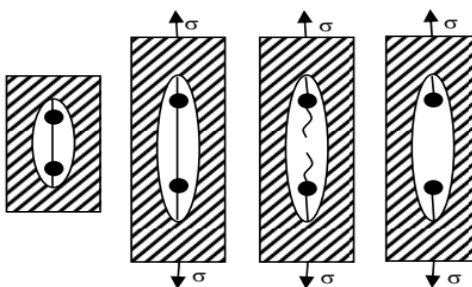


Figure 3 – Thermal-fluctuation decay of interatomic bonds in a stressed body

Conclusion

Destruction models based on continual consideration of the environment with certain rheological properties are of practical use. At the same time, such models still cannot claim to be an exhaustive explanation of the temporal and temperature dependence of strength for a wide class of solid media. In addition, they introduced the concept of damage. At the same time, there is no answer to the main question: how and at the expense of what energy are multiple microcracks formed with a purely mechanical approach. The decrease of the strength values with increasing temperature and with increasing loading time indicates a common reason for the dependence of the "tensile strength" on these parameters.

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ИСТОРИЧЕСКИЙ ОБЗОР ГИПОТЕЗ ОБЪЯСНЕНИЯ ВРЕМЕННОЙ ЗАВИСИМОСТИ ПРОЧНОСТИ ТВЕРДЫХ ТЕЛ

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Аннотация

Описано возникновение кинетической теории разрушения твердых тел. Рассмотрены различные взгляды ученых (Смекаля, Орована, Маргетройда, Понселье и др.) на участие термоактивационных процессов в кинетическом разрушении материалов. Дано обоснование участия движения атомов в твердом теле при разрушении твердого тела.

Ключевые слова: кинетическая энергия, прочность твердых тел, теория Гриффитса, термоактивационный процесс.

OPERATION PROBLEMS OF PANEL BUILDINGS OF THE FIRST MASS SERIES

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Abstract

The article deals with the problems of operation of panel houses of the first mass series in the period from the 1950s to the 1970s. A description of the characteristic design features, advantages and disadvantages of prefabricated houses of the period of mass construction is given, and the necessary list of works to eliminate the faults accumulated over the actual period of operation are compiled.

Keywords: advantages and disadvantages, capital repair, housing fund, list of works, panel houses, service life, typical series 1-464.

Introduction

The exploitation of residential buildings is technologically and technically complex. The main purpose of building maintenance is to comply with normal operating conditions, which allowing to preserve the integrity of the structural elements of the building and its decorative finishing.

The housing stock of many towns consists of premises built from the 1950s till 1970s. Depending on the materials of the bearing framework, there is a wide variety of types of such buildings. The houses of the first mass series were erected with brick, block, panel walls and reinforced concrete floors.

Characteristic of features panel buildings

According to the analysis, which was conducted on the territory of Tambov, based on the data of the housing and communal services [1], it was found that more than 10% of the housing stock is made up of panel houses of an average number of storeys. Such houses are located, as a rule, in the central areas of the town or adjacent territories and occupy sites the attractive on the plan town.

The panel houses belong to the 2nd group of capital, according to [2], and have a normative service life of 125 years. To date, the actual life of the panel buildings is about 50 years, that is, close to the middle of the normative. Many of these houses had never been repaired for the entire period since their construction.

For effective conducting capital repair, it follows to establish the necessary list of works on elimination of defects accumulated over the actual service life.

The list of works, as well as the regularity and the need holding for capital repairs, are directly influenced by the design features of the building.

Among panel buildings, the series 1-464 was recognized as quite successful and widely distributed throughout the USSR. On the example of this typical series, we will consider the design features, advantages and disadvantages of panel houses of the period of mass construction.

The basis of a constructive solution for houses of the 1-464 series is a crisscross-wall system. The design scheme is made with load-bearing transverse walls arranged in steps of

2.6 and 3.2 m, with the support of the floor panels along the contour. The spatial rigidity of the building is provided by a system of transverse and longitudinal walls of reinforced concrete panels the size of a room.

In these houses strip foundations of precast concrete pillows and concrete blocks are designed.

The outer walls are made of three-layer panels, consisting of two reinforced concrete walls and a layer of insulation between them, or single-layer concrete panels. The panels are smooth painted or unpainted with gravel dusting. The balconies are located between 3.2 m wide panels. The internal load-bearing walls are 12 cm thick, and the floor slabs are 10 cm thick, and they are reinforced concrete decking of continuous section. The roof is projected as flat combined non-ventilated with roll soft roofing. Drainage, as a rule, is external unorganized.

The buildings have the following engineering equipment: the heating is central aquatic; the cold water supply - is centralized; the sewage is centralized; the hot water supply is centralized or local; the ventilation is physic in the kitchen and in the bathroom. The ventilation channels are located in the wall between the bathroom and the kitchen. The apartments are equipped with a bathroom and a gas cooker. Lift and garbage chute in such houses are missing. The height of the premises is 2.5 m.

In the operation course of houses of a standard series 1-464 advantages and shortcomings in planning and constructive decisions were revealed.

The main advantages of such houses include the moderate cost of housing and the developed infrastructure around the building. As a rule, in residential areas there are kindergartens, schools, shops and excellent transport accessibility.

The crisscross-wall construction of the building is more lasting and durable, in almost all apartments there are balconies and built-in wardrobes, as well as separate bathrooms, unlike the other popular typical series 1-335.

In Tambov, buildings of this series as the external bearing walling structures have walls of expanded clay concrete panels, which have shown better operational qualities than three-layer reinforced concrete panels, since they are more durable and have good thermal insulating ability.

The main disadvantages are: the presence of walk-through rooms, an inflexible schema of the planning solution, the small size of the kitchen, insufficient sound insulation of the interroom panels and interfloor overlaps, small reconstructed possibilities, inexpressiveness and monotony of the facades.

The buildings have low thermal insulation of external enclosing structures in accordance with modern requirements, but it is worth noting that in the design and construction of these houses the thermal insulation of external walls met all existing standards at that time.

The operational qualities of the combined non-ventilated roofs are also low. In the summer, there is an overheating of the rooms, especially the upper floors, and in the winter, freezing of junctions and walls. The experience of using and operating the combined roofs of large-panel residential buildings has shown that, due to the low durable of the roofing, these roofs are leaking. In unfavorable conditions there are existed living rooms of the first floors, where the microclimate is significantly affected by the presence of poorly insulated basement rooms, the unsettled of vestibules and entrance doors.

The destruction of inter-panel seams is a serious problem in panel houses. According to [3], the periodicity of repair of interpanel seams is 6-8 years. As practice shows, only cosmetic repairs and sealing of small areas of the seam are performed, and complex repairs are almost never performed, so the problem remains unsolved.

The balcony slabs of panel buildings are often in disrepair, that is, destroyed the protective layer of concrete, the lack of waterproofing, there are grids or single deep cracks on the surface of the plates, as well as corrosion of reinforcement.

In the process of overhaul, the necessary list of works should include the:

- technical inspection of the building and preparation of design and estimate documentation;
- comprehensive repair of interpanel joints;
- boosting of thermal insulation with the use of ventilated facade
- boosting sound insulation of interroom panels and interfloor overlaps;
- replacement of fillings window and exterior door with more energy efficient;
- rebuilding of non-ventilated combined roofs;
- replacement of in-house engineering equipment.

Conclusion

For each specific building, it is necessary to survey a full technical inspection. This is necessary to establish priority works on the replacement or repair of structures. In provincial towns such as Tambov, the preservation and reconstruction of panel houses is relevant.

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ПРОБЛЕМЫ ЭКСПЛУАТАЦИИ ПАНЕЛЬНЫХ ЗДАНИЙ ПЕРВЫХ МАССОВЫХ СЕРИЙ

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Аннотация

В статье рассматриваются проблемы эксплуатации панельных домов первых массовых серий, возводимых в период с 50-х по 70-ые годы XX века. Приводится описание характерных конструктивных особенностей, достоинств и недостатков панельных домов периода массового строительства, а также составляется необходимый перечень работ по устранению накопившихся за фактический срок эксплуатации неисправностей.

Ключевые слова: достоинства и недостатки, жилой фонд, капитальный ремонт, панельные дома, перечень работ, срок службы, типовая серия 1-464.

CALCULATION OF THE TRANSVERSE FRAME OF PRODUCTION BUILDING FOR DYNAMIC LOADS

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Abstract

The relevance of the study of methods for calculating dynamic loads is substantiated, and goals and objectives are formulated. The types and classifications of dynamic loads are investigated. Methods for calculating frames for the action of dynamic loads are considered. Conclusions on the types of dynamic loads and methods for calculating frames for the effect of dynamic loads are given.

Keywords: frame, dynamic load, dynamic calculation.

Introduction

Dynamic loads are those that vary in time and space. They arise from the work of various machines and mechanisms, without which most technological processes are impossible. Loads adversely affect the strength and stability of buildings, as well as the health of workers.

A relatively high application rate is characteristic, for dynamic loads which require the calculations to take into account the inertial mass of both the object causing the load and the element subjected to the load in calculation. In other words, it is necessary to take into account the nature of the movement of the object creating the load, as well as the fact that the inertial masses of the structural elements exposed to dynamic load move with acceleration and affect the stress-strain state of the elements.

The aim of the research is to determine the refined methods for calculating the transverse frame of an industrial building. [1]

The objectives include:

- analysis of the types and classification of dynamic loads.
- analysis of methods for calculating dynamic loads.

The issues related to the study of the calculation of frames for the action of dynamic loads were examined by A.V. Dukart, A.I. Oleinik, member.-correspondent of the Academy of Sciences of the USSR E.S. Sorokin, Professor I.M. Rabinovich, and Professor B.G. Korenev.

Analysis of types of dynamic loads and methods for calculating frames for the action of dynamic loads

The loads are divided into general, shock, distributed and concentrated.

General loads result from the movement of a certain object along the surface of the structure under study (along the element axis). Shock loads occur at the moment of contact of a moving object with the surface of the structure under study (along or across the element axis). Concentrated loads are loads whose application area is negligible compared to the area of the design structure. The concentrated load is the force acting on

the structure. The area of the force is not taken into account, and therefore the concentrated load in kilograms or Newtons is measured.

Dynamic frame calculation using the force method

The main stages of calculation for free and forced oscillations of a flat frame by the method of forces are considered.

Only mass oscillations associated with the bending of rods are taken into account (elastic deformations of the bending of rods). To determine the number of degrees of freedom of the mass of an elastic system, it is necessary to provide displacements of each mass along and across the axis of the rod on which this mass is located. Next, the static and kinematic indefinability of the problem is determined by the known dependencies of the static of buildings.

Bending moment diagrams are made for a given system from dimensionless unitary inertia forces of the masses applied along the directions of the degrees of freedom of each mass. The number of these individual diagrams is equal to the number of degrees of freedom of the masses of the elastic system.

To form a system of equations of free vibrations, it is necessary to calculate single displacements (compliance) by “multiplying” the corresponding auxiliary curves of bending moments according to the Vereshchagin rule. The system of equations is a system of linear homogeneous equations.

The diagram of the bending moment from the amplitude values of the vibration load is made for a given system. Disturbing forces (vibration load) are applied to the masses of the elastic system and in the direction of their degrees of freedom. Based on the principle of independence of the forces and the linear relationship between the load and the deformation, the loading diagram is made by algebraically combining separate diagrams of bending moments increased by amplitude.[2]

To form the system of equations of forced oscillations, it is necessary to calculate the displacements from the amplitude values of the disturbing forces by “multiplying” the load diagram by the single diagram of the bending moments for a given system. The system of equations is a system of linear inhomogeneous equations. It is recommended to solve equation using the method of Gaussian exceptions. As a result of the solution, the amplitude values of the inertia forces of the masses are determined.

Based on the principle of independence of the action of forces and the linear relationship between load and deformation, we can write the following expression for making a diagram the bending moment from the action of a vibration load, diagram of bending moments from the action of inertial mass forces equal to one. The transverse force diagram is made according to the known methods for differentiating the diagram of the bending moment, and the diagram of the longitudinal force is made according to the diagram of transverse forces by alternately cutting the nodes and drawing up equilibrium equations.

A necessary condition for controlling the solution of a problem is a static check: the equality to zero of the sum of the amplitude values of the vibration load, the amplitude values of the inertia forces of the masses and the reactions of the supporting parts.[3]

Conclusion

On the basis of this analysis, the following conclusions were made:

- dynamic loads are divided into general, shock, concentrated, distributed.

- dynamic calculation is carried out by the method of forces, the method of displacements and in the matrix form.

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РАСЧЕТ ПОПЕРЕЧНОЙ РАМЫ ПРОИЗВОДСТВЕННОГО ЗДАНИЯ НА ДИНАМИЧЕСКИЕ НАГРУЗКИ

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Аннотация

Обоснована актуальность исследования методов расчета динамических нагрузок, сформулированы цели и задачи. Исследованы виды и классификации динамических нагрузок. Рассмотрены методы расчета рам на действие динамических нагрузок. Даны выводы о видах динамических нагрузок и методах расчета рам на действие динамических нагрузок.

Ключевые слова: рама, динамическая нагрузка, динамический расчет.

INFLUENCE OF THE IMPREGNATION DURATION ON THE COEFFICIENT OF LINEAR THERMAL EXPANSION OF CHIPBOARD

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Abstract

During operation, particle board is subjected to thermal effects. The most common increase in the operational properties of plywood was a way to modify it by impregnation.

Key words: chipboard, impregnation, optical dilatometer, thermal expansion.

Introduction

Thermal expansion (linear and volumetric) is studied by dilatometry science. With the help of dilatometry, the processes of crystallization and glass transition, melting anomalies, transitions of one crystalline modification to another, and conformational transitions in polymer melts, etc. are investigated. These transitions are studied most often at a constant heating or cooling rate with dilatometers of various designs. These dilatometric studies allow us to determine not only the temperature of phase transitions, but also to investigate the influence of various factors on them (molecular weight, thermal history, heating rate, etc.).

Description of the effect of impregnation time on the coefficient of thermal expansion

Chipboard is a material obtained by flat hot pressing of wood fibers with the addition of synthetic resins, which are used as a binder material. The raw material used to create the material is waste of sawmilling, woodworking and plywood production. Compared with natural wood, chipboard is devoid of many drawbacks: voids, knots. This material has a uniform composition and equal rigidity over the entire area. And the presence of synthetic resins in the composition of the product, such as phenolic and formaldehyde, contributes to reliable retention of fasteners in its thickness.

This material has a heterogeneous composition, it is a composite material made by hot pressing of wood particles, mainly chips, mixed with a binder of non-mineral origin with the introduction of special additives, if necessary. The presence of chipboard in the damp affects the durability of the material; its properties for tensile strength and bending significantly deteriorate.

In order to improve the quality of chipboard (increase strength properties, reduce water absorption) it is affected by various modifiers. Drying oil "Oksol" sunflower is one of the most inexpensive impregnations capable of coping with these tasks. The cost of this material is much lower than the cost of natural linseed oil, despite the fact that the characteristics differ slightly, so it is quite profitable to use it.

To determine the coefficient of linear thermal expansion, the sample was placed in the groove of the optical dilatometer and laid with a bar so that it did not completely block the through channel provided for illumination, and at the same time did not overlap

the viewing gap of 1×10 mm. The crosshair, located in the eyepiece micrometer, was induced on the edge of the sample and was applied every 10 °C with simultaneous fixation of the elongation. The linear heating rate was set to latry, the voltage was maintained equal to 100 V. The temperature was recorded with an alcohol thermometer, the ball of which was installed in the housing near the sample.

The data obtained are recorded in the general table, in which the sample test number, the number of modifier layers, the temperature (every 10 ° C), the elongation that occurred with the sample with increasing temperature, and the initial sample length are indicated. Testing of one sample is carried out three times, as a result of which the average value of sample elongation is taken. Further, on the basis of this table, graphs of the dependence of sample elongation on temperature are constructed, their description is made, after which a general conclusion is made: how does the number of layers of the modifier affect the coefficient of linear thermal expansion.

Dilatometric curves can be divided into three sections. The first corresponds to the temperature range from 30 to 40 C. In this area there is a sharp elongation of the samples. In the second section, a temporary stabilization of the process occurs at a temperature range from 60 to 80 ° C (which may be caused by the further confirmation of the phenol-formaldehyde value). At the third (> 80 C) site, the process of elongation of the studied samples continues.

Sample covered with three layers of modifier:

$$\sum \alpha_i \cdot \Delta T = 3.13E-04$$

$$A_{av} = 4.48E-06$$

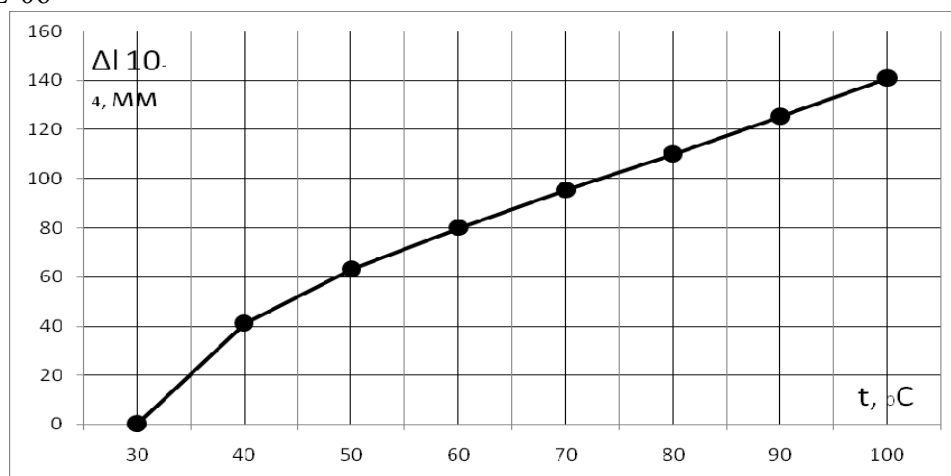


Figure 1 - The average elongation of the sample, covered with three layers of the modifier

Sample, without modifier processing:

$$\sum \alpha_i \cdot \Delta T = 4.06E-04$$

$$A_{av} = 5.80E-06$$

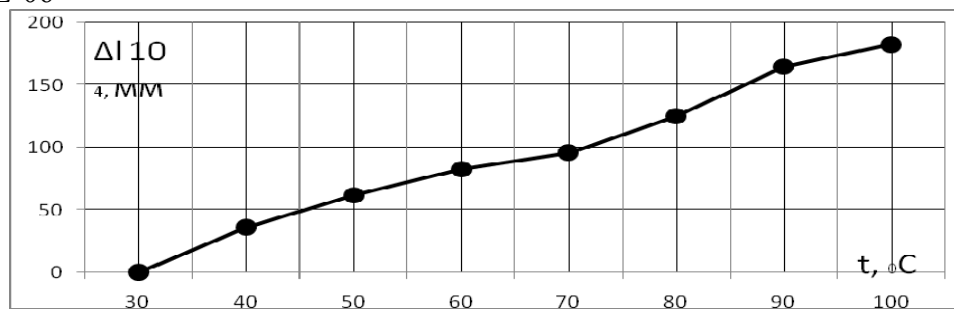


Figure 2 - The average elongation of the sample, without processing modifier

Conclusion

Experiments have shown that the elongation values of the material subjected to drying with linseed oil, turned out to be a third lower than that of the material in normal conditions. Consequently, the linear thermal expansion coefficient was lower. Thus, products made of wood-based panels resist thermally noticeably more effectively when they are coated with a protective linseed oil.

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ВЛИЯНИЕ ДЛИТЕЛЬНОСТИ ПРОПИТКИ НА КОЭФФИЦИЕНТ ЛИНЕЙНОГО ТЕРМИЧЕСКОГО РАСШИРЕНИЯ ДРЕВЕСНОСТРУЖЕЧНЫХ ПЛИТ

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Аннотация

В процессе эксплуатации древесностружечная плита подвергается термическим воздействиям. Наибольшее распространение повышения эксплуатационных свойств фанеры получил способ ее модификации путем пропитки.

Ключевые слова: ДСП, пропитка, термическое расширение.

THE STUDY OF ENERGY EFFICIENCY OF BUILDINGS AND STRUCTURES BY THERMAL IMAGER BASED ON “TAMAK “COMPANY

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Abstract

This article focuses on the research conducted by the construction company TAMAK. This company produces frame-panel and timber houses. The article represents thermal calculations of the enclosing structures of a private residential house using the Testo 875-2 thermal imager. The results of the calculation are presented in table form and on histograms.

Key words: Energy efficiency, thermal imager, thermal insulation.

Introduction

TAMAK is one of the largest enterprises in the field of construction and woodworking technology with 100% Austrian capital. One of the main principles of the enterprise is using of environmentally friendly wood, the desire to satisfy the human needs in modern housing. In addition to reliability, economy, aesthetics, and durability, TAMAK technology houses are very energy efficient. Effective thermal insulation, special connection nodes, a feature of the materials used, a specially designed wall “pie” to maintain a comfortable temperature inside the house. The standard external wall panel with TAMAK technology has a design heat transfer resistance $R = 2.985 \text{ (m}^2 \cdot \text{°C)/W}$, brick cladding: $R = 3.216 \text{ (m}^2 \cdot \text{°C)/W}$, KOMAK PLAT ventilated facade: $R = 4.010 \text{ (m}^2 \cdot \text{°C)/W}$, facing by plates (clinker plate on polystyrene foam): $R = 4.675 \text{ (m}^2 \cdot \text{°C)/W}$. The calculated heat transfer resistance R is calculated in accordance with SP 50.13330.2012 “Thermal protection of buildings”. Confirmation of energy efficiency of “TAMAK” structures is objects not only in the central European part of Russia, but also in other extreme climatic regions [2].

Hypothesis review

We examine a one-apartment residential house number 235 in Seleznevskaya ul., the township Raduzhny of the Tambov Region and we will conduct a thermal imaging scan of this project, which was realized by TAMAK company.

The researching was conducted by: object inspection, measurement using a laser rangefinder, a Testo 875-2 thermal imager, a Testo 605-H1 thermohygrometer, using of regulatory and technical literature, IRSoft, photo-recording using a digital camera [1].

During the examination the quality of thermal insulation of buildings’ walling defines: thermal imaging of outdoor fences, measurement of external air temperatures in relation to the internal air temperature in internal rooms.

The survey allows detecting defects in wall panels and in the joints between the panels, corner joints; Complex exits and infiltrations in the joints between the panels or in the fillings of light apertures, etc. In addition, they can be identified as potentially dangerous places in terms of removing the dew point on the inner surface and frost penetration.

As a result of thermal imaging inspection - the place and the size of the area are determined where it is necessary to perform a work to restore the required heat-shielding qualities of the structures, which leads to thermal losses of resources [5].

Besides, software processing of the results of a full-scale studying makes it possible to estimate the quantitative heat-shielding characteristics of external enclosing structures with a sufficient degree of reliability [4].

We examine a frame-panel house, researching by the Testo 875-2 thermal imager (Figures 1-4).

According to the results of the thermal imaging scan of the external enclosing structures of the residential building No. 235 in Seleznevskaya ul., township Raduzhny of the Tambov Region was recorded that the heat transfer resistance of the outer walls along their surface, taking into account the framework, is lower than the required value according to [3], but at the same time corresponds to the allowable level by 37%.

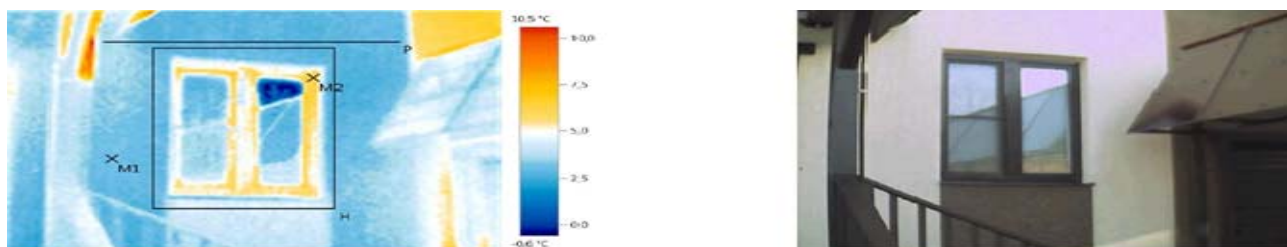


Figure 1 - Thermal research. Fragment 1

Table 1 - The results of thermal imaging studies. Fragment 1

Measured objects	Temperature°C	emitting	Reflect Temp, °C	Notes
1	2	3	4	5
Measuring point 1	3.3	0.95	23.0	
Measuring point 2	6.4	0.95	23.0	

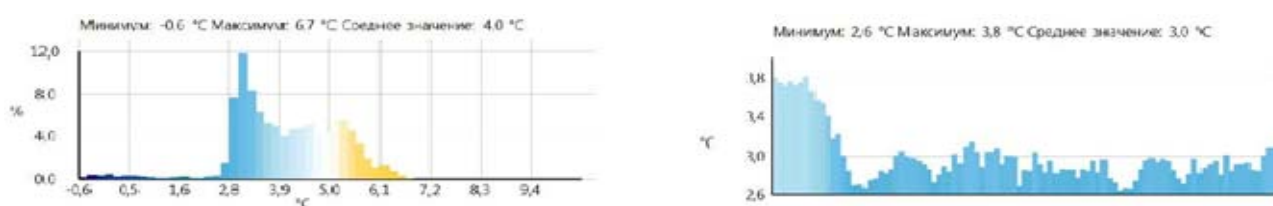


Figure 2 - Histogram and profile line. Fragment 1

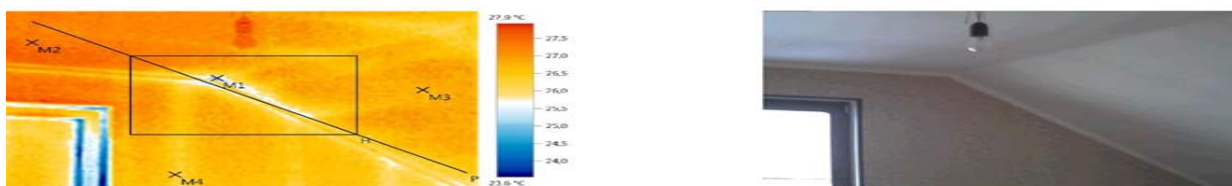


Figure 3 - Thermal imaging scan research. Fragment 2

Table 2 - The results of thermal imaging. Fragment 2

Measured objects	Temperature°C	emitting	Reflect Tepm, °C	Notes
1	2	3	4	5
Measuring point 1	25.2	0.95	23.0	
Measuring point 2	27.4	0.95	23.0	
Measuring point 3	26.8	0.95	23.0	
Measuring point 4	26.3	0.95	23.0	

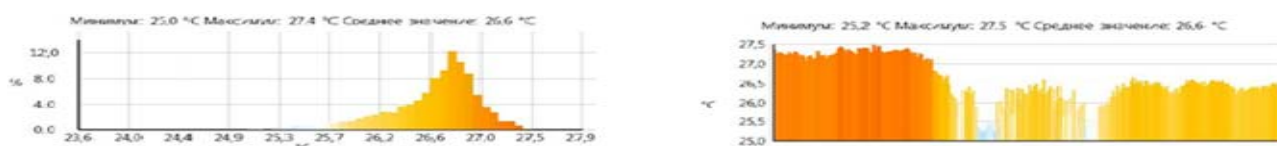


Figure 4 - Bar chart and profile line. Fragment 2

Conclusion

Carefully designed and high-quality done projects of energy-efficient houses of TAMAK companies allow decreasing by a half the cost of heating in comparison with similar stone buildings. Nowadays, energy efficiency is one of the basic characteristics of prestigious and high-quality housing. Such saving is one of the key factors in the sale of houses in the resale market and contributes to the minimum reduction in houses cost in times.

In the Russian Federation for each region are developed certain parameters of the heat and energy characteristics of enclosing structures. Wall panels "TAMAK" significantly exceed most of the current standards.

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ИССЛЕДОВАНИЕ ЭНЕРГОЭФФЕКТИВНОСТИ ЗДАНИЙ И СООРУЖЕНИЙ ПРИ ПОМОЩИ ТЕПЛОВИЗОРА НА ОСНОВЕ КОМПАНИИ «ТАМАК»

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Аннотация

Данная статья основана на исследованиях, проводимой строительной компанией «ТАМАК», занимающейся проектированием и возведением каркасно–панельных и брусовых домов. Приведены тепловизионные расчеты ограждающих конструкций частного жилого дома при помощи тепловизора Testo 875-2. Результаты расчета представлены в табличной форме и на гистограммах.

Ключевые слова: тепловизор; теплоизоляция; энергоэффективность.

MODERN DESIGN BASIS OF ENERGY-EFFICIENT BUILDINGS

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Abstract

The stages of designing an energy efficient building are considered in this paper. Energy subsystems are highlighted and their description is given.

Keywords: building design, energy efficiency, energy saving, optimization.

Introduction

Until recently, the building was considered as energy-efficient, if during design, construction and operation the maximum number of measures aimed at saving fuel and energy resources was taken. The main ways to save energy in buildings are to increase thermal efficiency. This is achieved through building structures, architectural planning solutions, engineering systems, and the use of non-traditional types of energy. In particular, the following measures are actively taken: an increase in the thermal protection of walls (including joints), windows, attics, etc.; improvement of the moisture regime of external fences; reduction of the outer surface of the building; rational layout of the premises; use of advanced heating and ventilation systems (for example, air-radiant heating); automation of heating systems with frontal regulation; automation of air-conditioning system (building microclimate control); heat recovery exhaust air leaving through external fences, etc.

The heat and power effect of the outdoor climate on the heat balance of a building can be optimized. This is achieved through the choice of the shape of the building, its location and the area of filling the light openings, the regulation of filtration flows, and the expense of other events. Often, an energy efficient building is presented as several independent, innovative, energy efficient solutions. At the same time, it turns out that the fact that these independent decisions can mutually reduce their initial effectiveness, and in some cases even lead to a negative effect, is not revealed

Initial stages of designing an energy efficient building

Modern methods allow finding the best architectural and engineering solutions of the designed energy efficient building.

The purpose of designing and building of energy-efficient buildings is to use the energy resources expended in building energy more efficiently. This is done through the use of innovative solutions. They should be technically feasible, economically sound, and ecologically and socially acceptable. They do not change the usual way of life. Priority in the selection of energy-saving technologies is given to technical solutions that simultaneously contribute to the improvement of the indoor microclimate and environmental protection.

The design methods of an energy efficient building are based on the analysis of a building as a single energy system. There is a representation of an energy efficient building as the sum of independent innovative solutions. This violates the principles of consistency and leads to a loss of energy efficiency of the project. Designing an energy efficient building in accordance with the foregoing involves three stages:

(1) construction of a mathematical model of heat and mass transfer processes in a building (their description is in the language of mathematics);

(2. selection of the objective function (determination of limiting conditions depending on the optimization goal - reduction of heating costs, reduction of equipment installation capacity, reduction of energy costs for building air-conditioning in the annual cycle, etc.);

(3) solution of the optimization problem.

It is advisable when designing an energy efficient building to consider two independent energy subsystems:

- outdoor climate as an energy source;
- building as a single energy system.

The analysis of the first subsystem allows us to calculate the energy potential of the outdoor climate and determine the methods of its use for heat and cold supply of the building. Analysis of the second subsystem allows you to determine the characteristics of architectural, structural, thermal or energy performance of the building as a single energy system.

Decomposition of a building as a single energy system can be represented by three main energy-related subsystems:

(1) the energy impact of the outdoor climate on the building envelope;

(2) energy stored (contained) in the building envelope, that is, in the external building envelope;

(3) energy from building air-conditioning systems and internal technological sources.

If necessary, each of these subsystems can be represented by smaller energy-related elements.

Designing an energy efficient building consists in optimizing energy-related subsystems. This optimization consists of several stages. The first one is connected with the determination of the optimal architectural planning, heat engineering or energy parameters of individual elements of the building, taking into account the relationship between them. The second is connected with the definition of the optimal architectural planning, heat engineering or energy parameters of the building as a single energy system.

Conclusion

In real design, the choice of the optimal set is based on the relationship of individual solutions. But innovative architectural, planning and engineering solutions for an energy-efficient building may be constrained by a number of restrictions (for example, the height or length of a building). At the same time, an optimization problem with given constraints is posed. The goal is achieved by obtaining the optimal solution with given limitations.

The final decision is within the competence of the responsible person (most often a group of persons). Those are given the right of final choice and the responsibility for this choice. When making a choice, it is necessary to take into account, along with the recommendations arising from the mathematical calculation, a number of quantitative and qualitative considerations that were not taken into account in the calculations.

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ОСНОВЫ СОВРЕМЕННОГО ПРОЕКТИРОВАНИЯ ЭНЕРГОЭФФЕКТИВНЫХ ЗДАНИЙ

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Аннотация

Рассмотрены этапы проектирования энергоэффективного здания. Выделены энергетические подсистемы и приведено их описание.

Ключевые слова: оптимизация, проектирование зданий, энергосбережение, энергоэффективность.

REDUCTION OF TRAFFIC ACCIDENTS INVOLVING PEDESTRIANS

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Abstract

The problem of reducing the accident rate of road traffic with the participation of pedestrians is particularly relevant for the Tambov region. According to the statistics, accidents with pedestrians in the city of Tambov over the past year amounted to 123 or 25% of the total number of accidents. The fact is that both drivers and pedestrians are guilty almost equally. This paper focuses on improvements in such spheres as: criminal procedure legislation and traffic rules of the Russian Federation.

Keywords: accident statistics, pedestrian traffic accidents, road safety,

Introduction

In accordance with the law of the Russian Federation “On road safety”: a traffic accident is an event that occurred during the movement of a vehicle on the road and with its participation in which people were killed or injured, vehicles were damaged, structures or other damage was caused [1].

The problem of reducing the accident rate of road traffic with the participation of pedestrians is particularly relevant for the Tambov region. The level of accidents on the roads, despite a slight decrease in its absolute indicators, remains high. According to 2017 statistics, more than 100 people died and 1709 were injured as a result of an accident [2].

The article examines the main trends in the development of the problem, the causes and conditions that contribute to the occurrence of traffic accidents with a pedestrian, and suggests specific measures aimed at reducing accident rates and its socially dangerous consequences.

The analysis of road traffic accidents in Tambov and measures to improve the situation

In total, from January to December 2017, there were 169 thousand road traffic accidents. This is 2.5% less than at the same period of 2016, which indicates a continued decline in the number of accidents on the country's roads.

Accidents with pedestrian range from 35 to 55% of all accidents with injuries (the latter value corresponds directly to situations in cities). With the participation of pedestrians in the city of Tambov, 123 traffic accidents or 25% of the total number of accidents occurred over the past year. Let us consider the causes and consequences of these accidents in more detail [2].

Table 1 - Distribution of accidents involving pedestrians

	Amount	%
Total number of accidents	123	100
The driver's fault	56	46
The pedestrian's fault	53	43
Both are guilty	14	11

As we see from the above table, both drivers and pedestrians are guilty, almost equally.

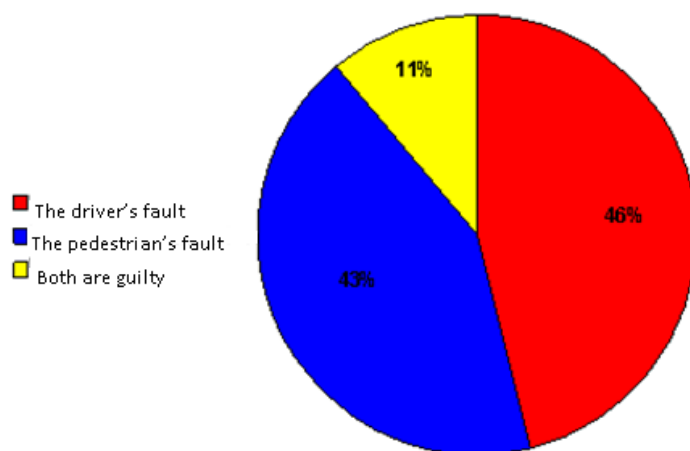


Fig. 1 - Distribution of the number of accidents involving pedestrians in Tambov according to the degree of guilt in 2017

With all the variety of accidents with a vehicle and a pedestrian, they have common features that make it possible to significantly use a single research methodology based on the synchronism and interconnection of actions of a pedestrian, driver, vehicle in a single time scale.

Full disclosure and investigation of every traffic crime is one of the important tasks of the internal affairs bodies. At the same time, a number of problems impede the quality assurance of their investigations. To improve the methods of examination of road accidents involving pedestrians, we propose to take some measures.

Suggestions for improving the criminal procedure legislation:

- provide for the possibility of conducting forensic examinations prior to the initiation of criminal proceedings;
- due to the need, when investigating a road accident involving a pedestrian, to conduct investigative experiments to establish the entire accident mechanism.

Suggestions for improving the Road Traffic Rules of the Russian Federation:

- due to the need to stop the vehicle at the sight of a pedestrian crossing the road to give way to pedestrians, in paragraph 12.4 the words “at pedestrian crossings and closer than 5 m in front of them” should be replaced by the words “at pedestrian crossings closer than 10 m in front of them and 5 m after them”, as well as to add “except for in cases where the driver is obliged to give way to pedestrians.

Conclusion

Investigation of road accidents requires high professionalism from those participating in it. Knowledge is needed in the field of forensics, forensic medicine, law, traffic management, autotechnical expertise, as well as in other areas of science and technology. However, practice shows that traffic police investigators and investigators do not always possess such knowledge.

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СОКРАЩЕНИЕ ДОРОЖНО-ТРАНСПОРТНЫХ ПРОИСШЕСТВИЙ С УЧАСТИЕМ ПЕШЕХОДОВ

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Аннотация

Проблема снижения аварийности дорожного движения с участием пешеходов является особенно актуальной для Тамбовской области. По статистике наезды на пешеходов в городе Тамбове за прошедший год составляют 123 дорожно-транспортных происшествия или 25% от общего количества происшествий. Интересно то, что и водители, и пешеходы виновны, практически, в равной степени. В данной статье предлагаются совершенствования в: уголовно-процессуальном законодательстве и правилах дорожного движения Российской Федерации.

Ключевые слова: безопасность дорожного движения, дорожно-транспортные происшествия с пешеходами, статистика дорожно-транспортных происшествий.

IMPROVING THE ENERGY EFFICIENCY OF BUILDINGS THROUGH THEIR MODERNIZATION AND RECONSTRUCTION

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Abstract

The methods of improving energy efficiency in the reconstruction of buildings on the basis of their operation are presented, on the basis of which conclusions are made about what the savings will be in the consumption of thermal energy. The relevance of the work lies in the fact that the use of these methods will solve housing problems and energy conservation problems in the Russian Federation. The purpose of this work is to identify the results of improving the energy efficiency of buildings through their modernization and reconstruction.

Keywords: energy saving, energy efficiency; houses of the first model series; modernization; modern requirements; reconstruction.

Introduction

Quite significant problems of Russia are providing the population with housing, improving the quality of housing conditions and the formation of an urban environment that meets the needs of our time. The solution to these problems lies not only in the rapid and multiple construction of new buildings, but also the timely repair and modernization of the old housing stock. This is the best option, both from an economic and from an environmental point of view.

The main approaches to research on the modernization and reconstruction of buildings

In the 1950-1960s, large-scale building of panel, block and brick residential buildings was carried out according to standard designs of the first generation, which now require reconstruction. As the exterior of buildings, the performance characteristics for heat, water and noise insulation and standards used for their construction do not meet modern requirements, and insulating materials are ineffective.

Now the unit costs of fuel in the housing sector have reached a considerable size, the reason for this was a violation of heat engineering standards and regulatory deadlines for major repairs and reconstruction. Replacing all inefficient buildings with efficient ones will allow saving heat energy, however this is prevented by very slow demolition (0.5% per year) of inefficient housing stock. The situation can be changed by building insulation, as a result of which savings at a reasonable cost can reach 60% of the current level of consumption.

During and after the completion of reconstructive works, modernization of engineering equipment is required. This is directly related to the organizational scheme for the reconstruction or overhaul, since they can be carried out with full or partial, temporary or permanent relocation of residents, and more often without it.

The main problem of residential buildings that have been in operation for some time is low energy and resource efficiency and environmental friendliness, which is explained

by the deterioration of the structural elements of the buildings and the failure to carry out restoration work.

As a result of the reconstruction, one of the most important operational characteristics of residential buildings - their thermal efficiency - is improved. It is determined by the average annual fuel consumption for heating and hot water supply of one square meter of the total area.

Energy consumption of buildings depends on the level of heat-shielding qualities of external walling, space-planning solutions, ventilation systems and engineering equipment. There are important features of energy saving in the houses of the old building, due to the fact that the low level of thermal protection of the enclosing structures is the main cause of the violation of comfort and energy overspending on the heating of the building.

The role of the heat-shielding qualities of external walling in the energy balance of a building during operation, as a rule, is constant in time. This is not relevant to the role of heating, ventilation systems, control and regulating equipment for the release of heat, as well as heat exchangers that take heat from polluted air emitted into the atmosphere. It may decrease as a result of wear and mismanagement and, conversely, increase when replaced with a more advanced system and improve technical operation [1].

The main heat loss through the building envelope is on average only about 1/4 of the total energy consumption for the operation of the building. Therefore, it is hardly justified to focus on increasing the thermal protection of fences, especially non-translucent, since with such a structure of the energy balance, an increase in heat transfer resistance of even two (!) times will reduce the total energy consumption by only 12.5%. At the same time, a much larger place (about half) in the energy balance of old buildings is occupied by the cost of heating the air, mainly in systems of natural or mechanical ventilation [2]. Also, the change in the heat-shielding qualities of the external walls entails a change in their temperature and humidity conditions, strength, durability, and also complications in the design of fences.

Since the degree of wear of wooden windows in the reconstructed buildings is high, it is necessary to use the energy-saving properties of new designs of energy-efficient windows, which are an extremely beneficial technical solution along with the insulation of the outer walls of old buildings [3,4]. Thus, as a result of the reconstruction of houses of the first model series, when energy-saving measures are carried out, on average, heat energy savings can reach 59%, and among them:

25 %	by increasing the thermal protection of exterior walls and attic floors in cold attics
10 %	by increasing the thermal protection of windows
6 %	by reducing the excess air exchange in the apartments
18 %	due to the installation of an automated control unit for the heating system and the installation of thermostats on heating devices

Conclusion

Based on the above, information it can be concluded that the reconstruction and modernization of the existing housing stock and, first of all, residential buildings of the first mass series, is one of the most important directions in solving the housing problem and energy saving problems in the Russian Federation. It is a complex of construction

measures and organizational and technological measures aimed at updating residential buildings and engineering infrastructure in order to preserve and increase the housing stock and improve living conditions, to bring their operational qualities in line with modern requirements. The result of these activities will be a decrease in the volume of housing disposal due to decay, a reduction in consumption costs and loss of energy resources.

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ПОВЫШЕНИЕ ЭНЕРГОЭФФЕКТИВНОСТИ ЗДАНИЙ ПУТЕМ ИХ МОДЕРНИЗАЦИИ И РЕКОНСТРУКЦИИ

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Аннотация

Приведены методы повышения энергоэффективности при реконструкции зданий на стадии их эксплуатации, на основании которых сделаны выводы о том, какова будет экономия потребления тепловой энергии. Актуальность работы заключается в том, что при использовании указанных методов будут решены жилищные проблемы и проблемы энергосбережения в Российской Федерации. Целью данной работы является выявление результатов повышения энергоэффективности зданий путем их модернизации и реконструкции

Ключевые слова: дома первых типовых серий; модернизация; реконструкция; современные требования; энергосбережение; энергоэффективность

PHYSICAL MECHANISM OF INTERACTION BETWEEN POWDERED MINERAL FILLERS AND THE CEMENT-SANDY BINDER

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Abstract

The methods of increasing the strength of fine-grained concrete by introducing window glass waste into its composition are presented. The relevance of the work lies in the fact that the use of these methods will increase the strength of concrete while reducing the number of injected aggregates. The purpose of this work is to determine the optimal composition of fine-grained concrete with the addition of glass breakage.

Keywords: cement-sand concrete, fine-grained concrete, gypsum concrete, water concrete ratio, water gypsum ratio.

Introduction

To increase the strength of the composition of fine-grained concrete the waste window glass was introduced. The glass was previously crushed and distributed into fractions by sieving through a set of sieves. According to the results of studies, the optimal composition is the samples with 33% mass content [1], from phosphogypsum-sand component, glass breakage with a grain size of 0.63 mm.

Experimental

Portland cement M500 and gypsum G4 were used to make samples of fine-grained concrete filled with industrial waste. Samples of 20x20x20mm were made of the concrete mix for compression tests and 20x20x120 mm for transverse bending. The amount of waste in mass fractions ranged from 2 to 100%. The grain size of the filler is from 0.32 to 40 mm.

Short-term and long-term tests were carried out on special lever stands in the mode of specified constant voltages (σ) and temperatures (T). Constant temperature was maintained using the overhead heat chamber. During the tests, the breaking load or the time from the start of loading to the destruction of the specimen (τ) were recorded. The test results were processed in the coordinates $\lg \tau - \sigma$ (see Fig. 1).

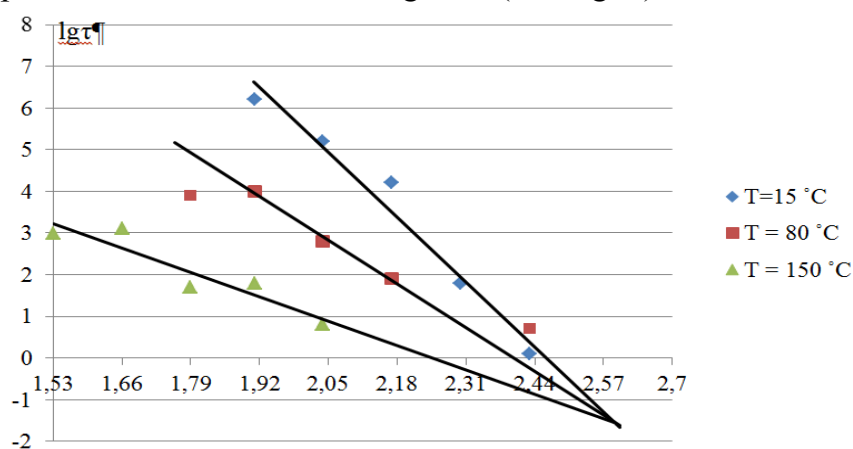


Figure 1 - Dependence of time up to failure on stress for gypsum concrete with DACW

It can be seen from the figure that the dependencies obtained represent a family of fan-shaped straight lines and are described by the equation [2]:

$$\tau = \tau_m \exp\left[\frac{U_0 - \gamma\sigma}{R}(T^{-1} - T_m^{-1})\right]$$

with physical constants (γ is a structural-mechanical constant, τ_m is the minimum time of material destruction, U_0 is the maximum activation energy of destruction, T_m is the limiting temperature of the material, R is the universal gas constant).

The values of physical constants calculated by the graph-analytical method [2] are presented in the table. Substituting the values of the constants in the formula, it is possible to calculate the durability or long-term strength of concrete in a wide range of basic operational parameters - loads, temperatures and time to failure.

Table The values of the physical constants of the equation

Structure of composition	Type of tests	U_0 , kJ/mol	T_m , K	$\lg\tau_m$, [s]	γ , kJ/(mol*Mpa)
Gypsum concrete with DACW					
Concrete c W/G=0.5 DACW:G=0.2	Cross bend	319	645. 16	0.01 78	142.75
Gypsum concrete c DACW with haydite (H)					
Concrete c W/G=0.5 DACW:G=0.2 H:DACW=0.75	Cross bend	84	900. 9	-1.48	17.46
Fiberglass reinforced cement-sand concrete					
C:FG-S= 1:3 W/C=0.5 15% fiberglass	Cross bend	84	900. 9	-1.48	17.46
Cement-sand concrete with crushed glass					
C:S= 1:3.5 W/C=0.5 33% glass with a particle size of 0.63mm	Central compression	98.1	-	-2.54	5.77
Cement-sand concrete with crushed glass					
C:FG-S= 1:3 W/C=0.5 33% glass with a particle size of 0.63mm	Cross bend	69.8	3067 .48	-1.46	12.22
Fiberglass reinforced cement-sand concrete					
C:S= 1:3.5 W/C=0.5 15% fiberglass	Cross bend	96.07	-	-2.6	19.88
Cement-sand concrete with DACW					
C:S= 1:3.5 W/C=0.5 33% DACW	Cross bend	45.6	3125	-0.32	13.9

W/G – water gypsum ratio, W/C – water concrete ratio

For example, we calculate the long-term strength of concrete with DACW and the addition of expanded clay crumb, given the durability $\tau = 50$ years and the operating temperature $T = 200 \pm 30\text{C}$.

$$\sigma_{\text{дл}} = \frac{1}{\gamma} \left(U_0 - \frac{RT}{1 - \frac{T}{T_m}} \cdot \lg \left(\frac{\tau}{\tau_m} \right) \right) = \frac{1}{107,76} \left(364 - \frac{4,6 \cdot 4,2 \cdot 293 \cdot 10^{-3}}{1 - \frac{293}{546,5}} \cdot (9,2 - 0,0063) \right) = 2,068 \text{ МПа}$$

Conclusion

Thus, the limiting bending stress should not exceed 2 МПа. The results obtained (see table) allow us to predict the service life of products from fine-grained concrete with various fillers for a given power load (loading type and voltage value).

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О ФИЗИЧЕСКОМ МЕХАНИЗМЕ ВЗАИМОДЕЙСТВИЯ ПОРОШКООБРАЗНЫХ МИНЕРАЛЬНЫХ НАПОЛНИТЕЛЕЙ И ЦЕМЕНТНО-ПЕСЧАНОГО ВЯЖУЩЕГО

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Аннотация

Представлены методы повышения прочности мелкозернистого бетона путем введения в его состав отходов оконного стекла. Актуальность работы заключается в том, что использование этих методов позволит повысить прочность бетона при одновременном уменьшении количества добавляемых заполнителей. Целью данной работы является определение оптимального состава мелкозернистого бетона с добавлением боя стекла.

Ключевые слова: цементно-песчаный бетон, мелкозернистый бетон, гипсобетон, водоцементное соотношение, водо-гипсовое соотношение.

PRINCIPLES OF ECONOMIC OPTIMIZATION OF CONSTRUCTION AND DESIGN OF STEEL FRAMEWORKS

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Abstract

Principles of economic optimization of construction and design of one-storey steel frameworks are considered in the paper. Economic factors of construction and design of steel frameworks are defined. Advantages of typification of designs are revealed.

Keywords: constructive decisions, economic framework, optimization of constructive decisions.

Framework is the bearing of the basis building which consists of cross and longitudinal elements. Cross elements are frames which bear loadings from walls, coverings, snow, cranes, and wind-affecting external walls.

Optimization of constructive solutions of technical objects has wide circulation and is directed at mainly more economic decisions [1]. The expediency of optimization of constructive solutions of buildings is also obvious costs of construction and the subsequent operation of an object can be significantly reduced in case of optimal solutions [2, 3].

The most effective way of optimization of frameworks of buildings is the choice of the rational constructive scheme for a designed project. Constructive decisions are diverse, but there are some general principles of economic frameworks design:

- concentration of the material. It is favorable to concentrate weight in some bearing elements in most cases. At the same time a part of elements turns out rather heavy, but their quantity is reduced;

- the fullest use of durability of all the volume of the material in designs. This principle is implemented by the choice of the constructive scheme, use of the tensile surfaces stressed equally along the area, regulation of efforts in flat and spatial designs (including preliminary tension);

- combination of functions of elements;

- the smallest way of transfer of loads on the base.

These principles can be used in the qualitative analysis of possible versions of constructive decisions, the choice of options for the subsequent application of the computer-aided engineering system

Accounting of the spatial work of a framework allows reducing the consumption of steel and other materials; the expediency of this account is established in each separate case proceeding from specific conditions – the sizes of a construction, its constructive scheme, the nature of the influence of external loadings and other factors.

Thus, first of all, the expenses connected with the construction of a building, including the cost of materials, production, transportation and installation of frame metalwork refer to economic factors of construction of steel frameworks. It is necessary to consider the effect gained from the reduction of time of construction and the early beginning of the production and as well as the expenses connected with the maintenance of the construction, providing conditions of its normal operation during all service life.

Typification of designs refers both to constructive schemes of the building in general, and to their separate elements.

The initial process of typification of structural elements is the reduction of the sizes of key parameters of the building (flights, steps of columns, heights) to a reasonable minimum. It is reached by standardization of dimensional schemes of buildings. Then schemes of standard structural elements are developed (columns, rafter and sub-rafter farms, sub-crane beams, connections, auxiliary designs). The final stage of typification is the development of working drawings of a range of standard structural elements which a building framework is made of.

The main prerequisite of typification is the principle of modularity, i.e. commensurability of the sizes of elements, frequency rates to their certain size called the module:

- reduction of a number of assembly elements;
- decrease of the volume of enlarging assembly to a minimum on the building site thanks to the integration of dispatch elements;
- transportability of structural elements;
- simplification of assembly interfaces of elements;
- necessary rigidity of elements at transportation and installation of a metal framework;
- reduction of time of design. Standardization of space-planning and constructive decisions allows to reduce sharply a number of standard sizes of structural elements of frameworks of buildings and opens a possibility of developing standard designs for repeated application.

Now drawings of standard columns, farms, subcrane beams, lamps, auxiliary designs are developed for production buildings of general purpose.

Depreciation of installation of frame buildings from metalwork is reached by using standard designs. Separate elements of a framework are gathered on the special platform in the rigid spatial blocks entirely set to the design position.

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ПРИНЦИПЫ ЭКОНОМИЧЕСКОЙ ОПТИМИЗАЦИИ ВОЗВЕДЕНИЯ И ПРОЕКТИРОВАНИЯ СТАЛЬНЫХ КАРКАСОВ

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Аннотация

В статье рассмотрены вопросы экономической оптимизации возведения и проектирования одноэтажных стальных каркасов. Определены экономические факторы возведения и проектирования стальных каркасов. Выявлены достоинства типизации конструкций.

Ключевые слова: оптимизация конструктивных решений, конструктивные решения, экономичный каркас.

RESEARCH INTO FOUNDATION WITH VARYING THICKNESS

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Abstract

The overuse of material has become a global problem recently, so this paper considers one of the possible ways of increasing the resource intensity of building structures, in particular, the foundation. It's expected that the study of the foundation work on bulk soil of changeable thickness will allow finding a way to reduce the size of foundation.

Keywords: construction cost, economic requirement, foundation, sediment, soil.

Introduction

Currently the construction industry is developing rapidly. The number of buildings and structures put into operation steadily increases every year. According to the state Federal Statistics Board, the number of commissioned buildings and structures was 119.7 thousand in 2000, and this number increased to 306.4 thousand in 2015.

Table 1 - Building commissioning

	2000	2005	2010	2013	2014	2015
Number of buildings – total, thousand	119.7	141.6	216.5	258.1	304.5	306.4
Including						
Residential	110.8	131.0	201.7	239.1	283.0	286.1
Non-residential	8.9	10.6	14.8	19.0	21.2	20.3
Total building volume – total, mln. m ³	172.4	265.4	397.4	526.7	617.8	622.8
Including						
Residential	131.6	202.2	271.8	343.5	404.4	415.7
Non-residential	40.8	63.2	125.6	183.2	213.4	207.1
Total area of buildings – total, mln. m ²	44.7	66.3	91.5	117.8	138.6	139.4

It is a well-known fact that the cost of designing and constructing the foundation accounts for a significant part of the cost of the building work. So, for example, the placing of the foundation and basement takes up to 8% of the total cost of building work, earthworks - from 3 to 5%, depending on the depth of the foundation.

Relevance of the research

Today, one of the main requirements for buildings and structures is economic one, according to which the construction being built must meet functional, technical, architectural and artistic requirements, and the cost of its design and construction should be minimal.

Thus, the need to select the minimum cross-section of all structures (including the foundation), as well as the required area of reinforcement, which meet the design requirements, is urgent. For all structures, there have been various methods of selecting

and checking sections for a long time, but in order to eliminate the material overuse, we need to know for sure the operating conditions of the structure, the design diagram and the load on it.

The foundation is the main bearing structure, which transfers and evenly distributes the load from the building to the ground. Therefore, the state of the structure depends on the quality of the foundation. In order to correctly choose the type, size and reinforcement of the foundation it is necessary to determine soil conditions as accurately as possible because they determine the depth of the foundation, the shape and sediment of the foundation.

Due to the high cost of construction sites, more recently, sites that were previously considered unsuitable for the construction of buildings or structures have been used more and more because of their relatively low cost. The relief of such areas often does not meet the established requirements, therefore, bulk soil is often used for its leveling. Also, the construction often has to be carried out on slopes and in ravines, where the bulk of the soil is likely to have a changeable thickness.

The construction of the foundation on the bulk soil has its own nuances, due to the heterogeneity of this soil and the difficulty of predicting its further compaction. The properties of natural soil and bulk soil are different. First, the natural base was being compressed for many years reaching the maximum carrying capacity at the given time. In turn, the bulk of the soil self-compacted for a comparatively small period of time, it is heterogeneous, so it is very difficult to predict its behavior during the construction of the foundation. In addition, there is no clear methodology for calculating the foundation on the basis of bulk soils. [2]

Bulk soil is a heterogeneous loose mixture, which consists of various components: local soils, clay, sand, slag, plant residues, etc. These components have heterogeneous characteristics, including compression and compaction, water permeability and connectivity. Such soils are unstable, or subsidence.

In this regard, such a foundation has certain "dangerous" properties and unpredictable behavior:

- under pressure, compaction and sediment of sandy soils occur simultaneously with the application of force, and clay - gradually, over a long time (up to 2-3 years);
- in case of saturation of sandy soils with water, their volume does not change, and clay - increase in volume;
- the ignorance of the features of the foundations on the bulk or sandy soil can lead to precipitation, as a result of which deformation of the above-mentioned supporting structures occurs (lifts of foundations, distortion of the entire building). [3]

Conclusion

A number of experiments and studies are needed to find out how the sediment of the foundations of various forms occurs in these cases, and also how it is necessary to apply a load to the foundation in order to try to minimize the difference in the sediments at the extreme points of the foundation. That is why the study of the foundations work on the basement of variable thickness is currently an urgent task.

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ИССЛЕДОВАНИЕ РАБОТЫ ФУНДАМЕНТОВ НА ОСНОВАНИИ ПЕРЕМЕННОЙ ТОЛЩИНЫ

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Аннотация

В последнее время перерасход материала становится глобальной проблемой, поэтому в данной статье рассматривается один из возможных вариантов повышения ресурсоёмкости строительных конструкций, в частности, фундамента. В процессе изучения работы фундаментов на насыпном грунте переменной толщины ожидается нахождение способа уменьшения размеров фундамента.

Ключевые слова: насыпной грунт, осадка, стоимость строительства, фундамент, экономическое требование.

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ESTATE PARKS AS A TOURIST RESOURCE IN THE TAMBOV REGION

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Abstract

The article discusses the estates on the territory of the Tambov region, which are historical monuments. The problem of restoration and further use of historical heritage is considered. Solutions for the development of tourism in the region with the use of estate complexes are given.

Key words: architectural and historical heritage, country tourism, tourist program, tourist route.

There are many estates that are historical monuments in the Tambov region. Some estates have tourist routes, but they do not offer excursions to all the estates of the region. Such routes are unproductive for the development of tourism. They do not allow tourists to further explore the local traditions, cultural characteristics of the territory of the Tambov region. The development of a program to unite the estate parks into a multi-day tourist route will serve the socio-economic development of these territories.

A number of historical and cultural monuments are concentrated in the Tambov region, which are of interest as objects of tourism. The region is known for the life and work of many prominent people: the poets G.R. Derzhavin and A.M. Zhemchuzhnikov, the artists F.A. Vasiliev, V.D. Polenov, A.M. Gerasimov, musicians P.I. Tchaikovsky, S.V. Rachmaninov, V.I. Agapkin, the author of the composer march "Proshchaniyeslavyanki", diplomat G.V. Chicherin, scientists I.V. Michurin and V.I. Vernadsky, manufacturer M.V. Aseev and others.

We believe that great attention should be paid to the estates and their parks - historical monuments that are endangered due to the lack of their operation and restoration. The significance of the restoration of historical heritage is clearly observed. The estate of the Chicherins is a historical and cultural monument of federal significance in the village of Karaul. It became widely known in the 19th century. This fame was promoted not only by the nobility of the owners but also by the extraordinary wealth of the estate. A large collection of cultural property was collected by Chicherin. The serious interest was the architectural and landscape ensemble of the estate with a church and a park. It is abandoned today. A fire destroyed this ensemble in 1996. Restoration work is underway at the present time.

As a result of the material studied we found out that only nine estates have been preserved and are functioning for tourism purposes in the Tambov region today: the estate Zagryazsky-Strogonov in Znamenka, the estate of academician V.I. Vernadsky in the village of Vernadovka, the estate of S.V. Rakhmaninov in Ivanovka, the Vorontsov-

Dashkov estate in the village of Novotomnikovo, the Aseev estate “Arzhenka” in Rasskazovo, which was recently renovated, the Aseyev estate in Tambov, the estate of G.V. Chicherin in Tambov, A.M. Gerasimov in Michurinsk, the house of I.V. Michurin in the city of Michurinsk.

Restoration and adaptation to the modern requirements (They can be used as museums, cultural, educational, public, and residential, recreational objects) are necessary to preserve the historical heritage. This is a necessary factor in maintaining the state of the monument especially if it is located outside the city.

We concluded that the development of tourism in the Tambov region will have a positive effect on economic growth on the basis of the studied Russian and foreign experience. Promotion of cultural and educational activities and the development of leisure activities will create additional jobs for the residents of these territories, and will also contribute to the preservation and rational use of historical and cultural heritage.

Cultural and educational tourism is one of the most common types of tourism. It provides for familiarizing tourists with the traditions, history, culture and customs. Manor is part of the history, so the manor tourism over the years has become increasingly popular [1].

We believe that it is necessary to restore important for the region estate parks, home gardens, wineries, apiaries, livestock and other types of production for the development of manor tourism in the Tambov region.

Historical and cultural heritage of noble estates, including ensembles, parks and gardens, interiors will provide an opportunity for tourists to experience the atmosphere of the estate life.

We propose to develop multi-day tourist routes including the estates of prominent figures with accommodation and meals for the cultural and educational interest of the Tambov region. Our proposal is based on the resolution of the administration of the Tambov region “Development of culture and tourism” for 2014-2020. [3]

We propose to include not only a classic tour of the manor-museum in the tourist program, but also other thematic events: children's events, creative activities, organization of holidays, musical and literary events, festivals, exhibitions, and concerts.

Undoubtedly, the historical and cultural wealth of the region can serve as a resource for creating programs for the development of its territory as a tourist center. United estate complexes will be combined into a common tourist space. This decision will help increase the flow of tourists to the Tambov region.

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УСАДЕБНЫЕ КОМПЛЕКСЫ КАК ТУРИСТИЧЕСКИЙ РЕСУРС ТАМБОВСКОЙ ОБЛАСТИ

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Аннотация

Рассмотрены усадьбы на территории Тамбовской области, являющиеся памятниками истории. Затрагивается проблема восстановления и дальнейшего использования исторического наследия. Представлены решения по развитию туризма в области с использованием усадебных комплексов.

Ключевые слова: архитектурное и историческое наследие, туристическая программа, туристический маршрут, усадебный туризм.

EXPERIENCE OF TRANSFORMING HISTORICAL BUILDINGS IN RUSSIA AND ABROAD

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Abstract

The paper focuses on the most popular approaches to the restoration and preservation of cultural heritage. The considered methods have shown that ideas about the optimal approaches to the preservation of objects of architectural heritage are constantly refined and changed. It is necessary to rethink the usual processes, try to find new tools to interact with the urban environment.

Keywords: cultural heritage, historical environment, monuments of architecture.

Introduction

Memory is an inherent human quality; the life of the experience of previous generations and culture of each next generation is based on it. The architectural heritage is unique as material memory which can really be seen and touched. Monuments of architecture are the main sources reflecting the historical stages of life of the city. Architecture, more than any other art, is a living witness to history. Each building is a product of its time, the intersection of social, political, cultural and technological phenomena [2]. Together they can give the right impression about culture and life, they better illustrate the life of the time in which they were built and used.

Objects of cultural heritage and methods of their preservation

At the present, there is a critical situation when the cultural heritage of historic cities is increasingly threatened with destruction. Together with the architectural heritage, the individuality of each city disappears, which negates the beauty and reduces the interest of art historians and tourists. Losing memory, we become poorer regarding those centuries that we have lost.

Monuments of the history and culture of Russia play an integral part of the world cultural heritage, which testifies to the enormous contribution of people to the development of the world civilization [1]. Therefore, the relevant problem is the preservation of these monuments in order to pass on the cultural heritage to future generations. It is necessary to rethink the usual processes and search for new tools to interact with the urban environment. The priority in relation to the object being restored is minimization of interference and maximum preservation of authenticity or imparting material and aesthetic integrity of the object. Intervention measures for the transformation of historic buildings may vary and depend on many factors [2].

The historical buildings include all constructions that had appeared before the development of large-panel housing and the transition to buildings for residential areas and microdistricts, i.e. until the mid 1950s. The historical buildings include:

- objects of cultural heritage (historical and cultural monuments) of the peoples of the Russian Federation included in the unified state register [1];

- identified cultural heritage sites;
- objects possessing the attributes of an object of cultural heritage that are under consideration to establish the historical and cultural value of the object;
- buildings with properties of cultural and historical value, illustrating certain ways of development of the city.

Our study was based on the review of the available information in the field of conservation of architectural heritage in Russia and abroad. On the basis of the materials studied, we found out that at present specialists can distinguish three types of work that can be done concerning monuments: restoration, conservation and repair.

Conservation (as the most passive method of transformation) is a set of measures ensuring the preservation of monuments for a long time in its present form, the suspension of destructive processes. It is necessary when the monument is not used for any reason and is in an unsatisfactory or emergency condition. Preservation of monuments involves the constant care of them. Preservation as a way to use the historical and cultural heritage is the easiest way to protect monuments. If an object is subject to museification and, therefore, it was identified as a monument, it is important to uncover the social memory enclosed in the object.

Restoration is a holistic restoration of monuments. Restoration aims to complete restoration of destroyed structures. This method of restoration was widely used after the war, when architectural monuments of world significance were destroyed or after thoughtless demolitions of objects. This approach seeks to the integrity of the object, but it contradicts the modern principles of working with the monument, ignoring the historical value of the object and often causing irreparable harm to it as a historical source. The famous Frauenkirche in Dresden was destroyed by war. It was restored almost from scratch in the early 2000s (Figure 1). Peterhof Palace is another example of such a restoration.



Fig. 1 - Frauenkirche church in the historic center of Dresden

Adaptation for modern use is a method of preserving historic buildings means changing the function of a historic building. Also, the building may not meet the necessary requirements for any use, so there is a need for extensions and additional floors, perhaps even changes in the structural system.

Also one of the ways to preserve heritage is **the inclusion of a historic building in a complex of modern complexes**. For example, a historic building can serve as interiors in the new buildings (Fig. 2).

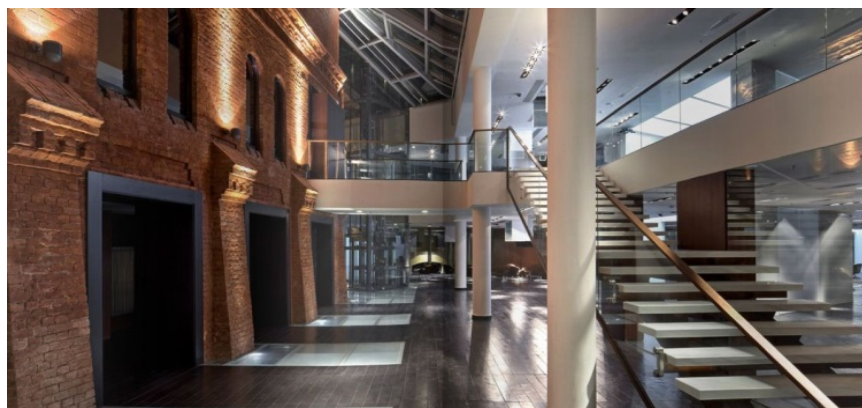


Fig.2 - Theater-Cultural Center "New Stage of the Alexandrinsky Theater"

Conclusion

Cities age with each passing year, and the number of buildings that need help is increasing. As a result of the study, we found that in scientific discussions, ideas about optimal approaches to the preservation of cultural heritage objects are constantly refined and changed. By applying the right approaches to the right places, you can achieve good results in the field of preservation of cultural heritage. These approaches to the reconstruction and adaptation of the historical environment must be justified by the mode of operation, and are based on the established historical context. Decisions must be accepted individually, for each building separately.

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ОПЫТ ПРЕОБРАЗОВАНИЯ ИСТОРИЧЕСКИХ ЗДАНИЙ В РОССИИ И ЗА РУБЕЖОМ

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Аннотация

В статье отражены наиболее популярные подходы к восстановлению и сохранению культурного наследия. Рассмотренные методы показали, что представления об оптимальных подходах к сохранению объектов архитектурного наследия постоянно уточняются и изменяются. Необходимо переосмысление привычных процессов, попытаться найти новые инструменты взаимодействия с городской средой.

Ключевые слова: историческая среда, культурное наследие, памятники архитектуры.

THE RESIDENTIAL BUILDINGS BUILT IN 1940–1950S: PROBLEMS OF CONSERVATION, OPERATION AND OVERHAUL

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Abstract

The article discusses the buildings built in 40–50–ies, their advantages and disadvantages, as well as the problem of operation.

Keywords: floors, nomenclature houses, operation, prefabricated reinforced concrete floors, reconstruction, residential buildings, Stalin houses, structures

Introduction

Buildings from the 1940s–1950s are usually attributed to residential buildings of the Stalin’s period. “Stalinka” is capital apartment buildings with a height of 2 floors, with walls made of non-combustible materials and communal amenities: water supply, sewage, central heating. All “Stalinkas” were exclusive in its own way and decorated with stucco, arches and columns. The architects of the Stalin era did not save on the space of apartments and entrances. On the floor, usually, there are only 2-4 apartments. Be sure to have elevators, often in the kitchen there is an individual garbage chute. The apartments traditionally have high ceilings (more than three meters), large kitchens, separate bathrooms, rooms from 15 to 25 square meters, and in some places even up to 30 square meters.

Main problems of brick buildings in the 1940-1950s

Residential buildings built in the 1940-1950s were divided into several types:

– elite housing (built for the highest strata of Soviet society. They were mostly inhabited by party, government and economic leaders, senior military officials and employees of power structures, major representatives of the scientific);

–director’s housing (usually “director’s” houses have classical architectural forms and poor decor, the buildings themselves are large, with a high mezzanine. When building a building, they were plastered and decorated with stucco decoration; the floors are reinforced concrete or combined)

–ordinary housing (ordinary “stalinkas” were built for workers and were more modest. In the blocks there are both three- and four-room apartments, which are classic for that period, and post-war “corridor” dormitories). Ordinary “stalinkas” were built, as a rule, in working settlements located near factories, on the outskirts or in the depth of quarters. During construction, the project was copied, which led to the emergence of similar residential areas.

The main building material used in the construction of “stalinkas” was brick, in the prewar buildings mainly the red one was used, in the later ones the white brick was used. The outer walls are usually 2.5 brick thick (65 cm), the inner bearing walls are 1–1.5 brick (25–38 cm).

The ceilings in the “stalinkas” are often wooden or combined - concrete was used in the places of the bathrooms. Wooden floors were laid on wooden beams in the form of a log or a bar, sometimes on steel beams. In the houses above 2 floors with wooden floors made of non-combustible materials, staircases and platforms are made. When reconstructing or repairing after fires, wooden floors were often replaced with plates or metal structures with subsequent solid casting.

The service life for the “stalinkas” of the prewar period is 125 years; the standard demolition time is 2050-2070. The lifespan for the “stalinkas” of the postwar period is 150 years; the standard demolition time is 2095–2105.

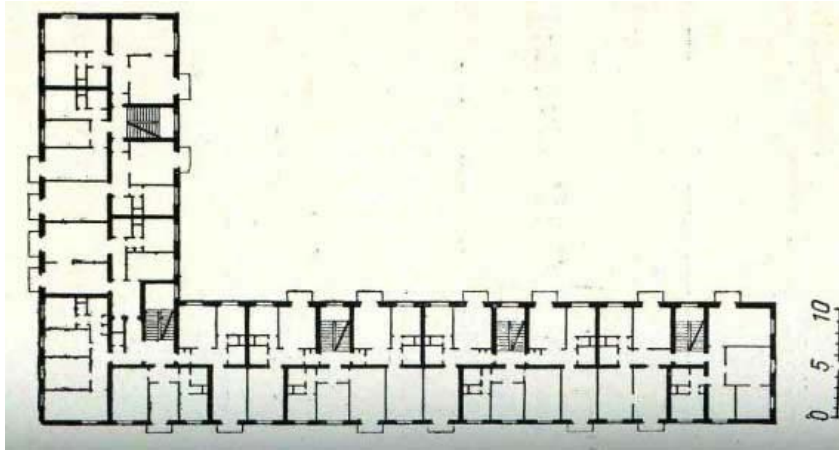


Figure 1 – Planning of a typical Stalin-era building on the example of the 1–405 series

Outdated hardwood floors can be considered one of the main problems in the operation of Stalin houses. Due to the fact that the houses are built quite thoroughly, in most buildings it is necessary to replace short-lived wooden floors with significantly more durable reinforced concrete, which in turn increases the fire resistance of the building. In assessing the technological effectiveness of projects for the reconstruction of residential buildings, one must keep in mind that the expediency of using precast concrete structures can only be considered if it is possible to use tower cranes in the production of works.

Replacing floors will be considered more rational if the condition is fulfilled: firstly, it is a complete replacement of the floor, attic and interfloor floors, as a result of which it is possible to supply prefabricated reinforced concrete elements to the installation zone through the upper edges of the walls during the construction and repair works; secondly, there should be a change in the design of the reconstructed building, the erection of new load-bearing walls and load-bearing walls, or the construction of an internal reinforced concrete or steel frame.

In this case, the condition must be satisfied that the use of large-sized precast concrete elements does not entail the need to strengthen and repair more than 25% of the area of external walls, and the carrying out of extensive work to strengthen the foundations and foundations.

Works on the construction of interflooroverlappings in reconstructed buildings from large-sized precast reinforced concrete hollow core flooring with discharge ribs are performed in such a technological sequence. Works are performed from bottom to top in areas limited by existing capital walls. Precast concrete flooring serves to the installation site tower crane.

To install the floorings in the design position, in one of the walls, nests of 1–1.5 brick depth, one brick width and 5–6 rows of brickwork are punched. In the second wall, a furrow of the same height 0.5 bricks is made. Furrows and nests are pierced from the inventory scaffolding to several decks at once according to preliminary marking. On the bottom surfaces of the nests a bed of hard cement is made. On the lower surfaces of the furrows a bed of cement mortar is also performed.

The floorings are fed to the installation site in an inclined position and set in the design position by turning in the plane of the interflooroverlappings. After the installation of decking, anchoring is made in the outer walls and a thorough seal of the nests, furrows, as well as holes, nests, and fines left in the existing walls after dismantling the old structures of the reconstructed building. The nests and grooves are filled with bricks with all the voids between the old and the new brickwork jammed with brick rubble and cement mortar.

Conclusion

Evaluation of design solutions from the point of view of their manufacturability should be made according to the specific labor intensity of the reconstruction, which is the total complexity of the implementation of the design decision, related to the unit of the building area obtained after the completion of the reconstruction. For each specific building, it is necessary to conduct an analysis of the technological implementation of design solutions for individual structural elements should be carried out as part of the assessment of specific labor intensity.

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ЖИЛЫЕ ЗДАНИЯ ПОСТРОЙКИ 40-50-Х ГОДОВ. ПРОБЛЕМЫ СОХРАНЕНИЯ, ЭКСПЛУАТАЦИИ И КАПИТАЛЬНОГО РЕМОНТА

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Аннотация

В статье рассматриваются здания постройки 40-50-х годов постройки, их достоинства и недостатки, а так же проблемы эксплуатации.

Ключевые слова: жилые здания, конструкции, номенклатурные дома, перекрытия, реконструкция, сборные железобетонные перекрытия, сталинские дома, эксплуатация.

CONSTRUCTION OF MARTIAL ARTS CENTER IN TAMBOV AS AN EXAMPLE OF ENHANCING ACCESSIBILITY FOR DISABLED

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Abstract

The opening of the sports center “Center of Martial Arts” is of great importance for Tambov. In this center, classes and sports events for children and adults are planned. In this paper, we explore the issues of accessibility, security, availability of information, and comfort of the Martial Arts Center for disabled people and other less mobile groups of people.

Keywords: low mobile groups of the population, ramps, side stone, structural elements, tactile tablets, width of sidewalk

In Tambov, the sports center “Martial arts Center”, which is the largest in Russia (Fig. 1), has been opened. This center it is planned to organize sports events and to hold all-Russian and international competitions. The great importance here is the center accessibility, especially for the low-mobile groups of the population.



Figure 1 - Building of “Martial Arts Center”

Activities to ensure the access of disabled people to the sports building (complex of the Martial Arts Center in Tambov) were developed in accordance with the requirements of the current standards (Fig. 2.3).

As a draft adopted the variant “B” (reasonable adaptation) of the organization of accessibility for the low-mobility groups of the population was adopted [1]. Despite the lack of accessible equipment of the whole building, special rooms, zones or blocks adapted for the disabled people are allocated at the entrance level.

The project provides the conditions for unhindered and convenient movement of low-mobility groups of the population along the site to the building, taking into account the requirements of town-planning standards.

From the side of the main facade, places for parking vehicles of the visitors, including disabled people have been designed. At the same time, for disabled people's cars the places that are as close to the entrances of the building as possible are reserved. They are allocated with markup and are indicated by special symbols. The layout of such parking for wheelchair cars is provided with a size of 6.0 x 3.6 m, which makes it possible to create a safe area on the side and behind the car - 1.2 m. The number of places for disabled cars in general parking is taken from the calculation of 5%, but not less than 1 seat with the number of seats up to 100 inclusively [1], which corresponds to 2 cars / seats.

The width of the sidewalk for the oncoming traffic of the disabled on the wheelchairs is designed 3.0 m, taking into account the overall dimensions of the wheelchairs. The longitudinal slope of the traffic path, which makes it possible for disabled people to travel by wheelchairs, does not exceed 5%. The transverse slope of the path of movement is accepted within 1-2%.

In places where the sidewalk intersects with the roadway, a curb ramps is provided. Curb ramps are performed with a slope of no more than 1:12, completely located within the pedestrian zone and should not protrude on the roadway. The difference in heights at the exit points to the roadway should not exceed 0.015 m.

The height of the side stone along the edges of pedestrian paths on the site is 0.05 m. The pedestrian zone is covered with concrete slabs with a thickness of seams between the slabs - not more than 0,015 m.

On all routes of traffic available for disabled people, a system of information support is provided, in accordance with State Standard 52875. When crossing pedestrian routes by vehicles at the entrance to the building and on the site near the building, early warning of drivers about the crossing points is provided. On both sides of the passage through the roadway there are curb ramps.

The main entrance is made in the form of a wide platform, which is equipped with steps and a ramp for disabled people, with fences and handrails, taking into account the technical requirements for stationary devices in accordance with State Standard R 51261 [1]. The length of each march of the ramp does not exceed 9.0 m, between which there is a dividing platform with a length of 1.5 m.

The second entrance to the building equipped with a ramp for disabled people is of secondary importance. Entrances to the building are equipped with canopies, drainage and have a transverse slope of 1-2%. Entrance tambours are designed in accordance with the requirements of the set of rules for design and construction [1].

The surface of the entrance areas has a hard coating, which does not allow slipping when wet. Stair steps on the tracks for the disabled movement are designed with the same geometry and dimensions along the width of the tread and the height of the steps. The width of the steps is not less than 0,3 m, and the height of the steps is not more than 0,15 m. Along the stairs with a height difference of more than 0.45 m, fences with handrails are installed taking into account the technical requirements for stationary devices, according to State Standard R 51261.

In the outer door canvases accessible to disabled people, sight panels filled with transparent and shockproof glass, the lower part of which should be located between 0.5

and 1.2 m above the floor level, are provided. The lower part of the glass door panels at a height of at least 0.3 m from the floor level is protected by a shockproof strip. On the transparent door leaves, a bright contrast marking is provided, with a height of at least 0.1 m and a width of at least 0.2 m, located at a level not lower than 1.2 m and not more than 1.5 m from the surface of the pedestrian route.

External doors accessible to disabled people can have thresholds. The height of each element of the threshold should not exceed 0.014 m. Internal doors with thresholds exceeding 0.014 m are equipped with removable ramps with a slope of 1:20. They are stored in close proximity and are used if necessary.

Outside doors are equipped with mechanical door closers, providing a delay of automatic closing of doors, duration of not less than 5 seconds. Swing doors with door closer (with an effort of 19.5 Nm) are used.

When designing a sports complex, particular attention was given to the creation of an accessible environment and to ensure the access of low-mobility groups to the building, as well as to unimpeded movement on it. A separate role in the formation of a barrier-free environment is played by the creation of pedestrian links, taking into account the specificity of the movement of people with disabilities of various categories. At the same time, appropriate planning, constructive and technical measures are envisaged:

- in the places of height difference ramps with a slope of 1:20 are provided;
- planning and equipment of public premises are designed taking into account the possibility of staying disabled people there;
- all rooms accessible to disabled people are marked with special signs or symbols.

The project provides for unhindered access of low-mobile groups to the stands of the universal hall. For wheelchair users of the mobile group, in accordance with the requirement [2], places at the mark of +0,000 are projected. The number of seats is based on the calculation of 2% of the total capacity plus 1 seat for every 100 with a capacity of more than 1000 spectators (p.5.18). There are 16 places in total.

Places are located in close proximity to the evacuation exits in front of the stands and are separated by a barrier. The depth of the row with places for disabled people is 1.5 m.

Toilets for the disabled people are equipped with an alarm system (alarm buttons), by which, in case of emergency, they can communicate with the attendant at the reception desk.

It is recommended to place visual information:

- outside the building - at an altitude of at least 1.50 m and not more than 4.50 m from the surface of the traffic. Thus signs and indicators of tactile contact are allowed to be placed in the zone of visible horizon of the paths of movement at an altitude from 1.20 m to 1.60 m;

- inside the building - information about the purpose of the room - next to the door at an altitude of 1.40m to 1.60m from the side of the door handle.

It is not recommended to place acoustic devices so that their coverage areas overlap each other, creating sound interference.

Acoustic devices and media are designed to provide assistance with visual impairments, as well as to duplicate visual information in the most critical places; sound beacons must meet the requirements of GOST 21786. The equipment for driving them into operation must be located not less than 0.80m before the warning section of the track.

In the dark, the use of light or illuminated signs, including advertising, is recommended.

Ways of movement of disabled people inside the building are designed taking into account the regulatory requirements for the ways of evacuation of people from the building.

Access to low-mobile groups of population is provided for the 1st and 2nd floors of the building. On the ground floor this room is a universal hall. And on the second floor there is a bathroom for disabled people. Access to the 2nd floor of wheelchair users is carried out using an elevator, and for evacuation a crawler-mounted hoist is used, which is located in the immediate vicinity of the staircase in the lobby.

The flooring is designed from ceramic tiles with a thickness of seams of not more than 0,015 m. The structural elements inside the building and the devices placed in the dimensions of the tracks on the walls and other vertical surfaces should have rounded edges, and should not protrude more than 0.1 m at a height of 0.7 to 2.0 m from the floor level.

Sections of the floor on the paths of movement at a distance of 0.6 m in front of the doorways and before turning the communication paths must have tactile warning signs and / or a contrasting painted surface in accordance with State Standard 12.4.026.

Zones of “possible danger”, taking into account the projection of the motion of the door leaf, should be indicated by the contrasting color of the surrounding space with the marking paint.

Pictograms and tactile tablets with the indication of service areas, names of premises (with the duplication of Braille alphabet), direction of movement and evacuation should be provided. On the handrails along the tracks and at their ends, tactile signs with a relief font of at least 15 mm or Braille characters of State Standard R 50918 should be installed.

The ultimate goal is the accessibility, security, informative and comfort of the Martial arts Center for the disabled and other low-mobile groups which include not only people with disabilities moving around on wheelchairs, but also other people - with hearing, vision, locomotor and mental development disabilities. In this case, even mothers with strollers or a person carrying a load on their hands belong to the category of low-mobile groups of the population. For all categories there are specific features and specifics of designing a space that is convenient for them, which were taken into account in the design and construction of this complex.

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РАЗВИТИЕ ДОСТУПНОЙ СРЕДЫ ДЛЯ ИНВАЛИДОВ В ГОРОДЕ ТАМБОВЕ НА ПРИМЕРЕ ПОСТРОЕННОГО ЦЕНТРА ЕДИНОБОРСТВ

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Аннотация

Важное значение для г. Тамбова имеет открытие спортивного комплекса «Центр Единоборств». В данном центре планируются занятия, а также проведение массовых спортивных мероприятий для детей и взрослых. Не маловажное значение уделено доступности, безопасности, информативности и комфортности центра Единоборств для инвалидов и иных маломобильных групп населения.

Ключевые слова: маломобильные группы населения, пандусы, бортовой камень, конструктивные элементы, тактильные таблички, ширина тротуара.

THE PROBLEM OF THE SURVEY OF INDUSTRIAL BUILDINGS

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Abstract

The problem of the survey of buildings and structures, the correct specification of their service life on the basis of the surveys being conducted is considered. The article is focused the importance of surveying building structures on the example of industrial buildings.

Keywords: Industrial buildings, reconstruction, service life, structures, surveys.

Introduction

After the end of the Great Patriotic War, the state was given the task of restoring the housing and productive funds destroyed during the war. In this regard in the postwar period many buildings were erected, the service life of which is 60 years at the present moment. During this period, both civilian (public and residential) and industrial buildings were built. And there is a constant renewal of housing funds now, industrial buildings have already been exploited for many years without any renewal. Manufacturing enterprises provide an economic basis; their stable functioning often ensures the well-being of the whole city. That is why the clarification of the service life of buildings is a problem of great national economic importance, since it solves the problems of new construction and the preservation of the existing fund.

A high-quality and effective survey of buildings provides complete and reliable information on the actual technical condition of the object, which, in turn, is a source of significant savings of financial resources which can be done by reducing the costs of inefficient reconstruction.

Problems of industrial buildings surveys

Inspection of buildings and structures is a whole complex of works aimed at determining the technical state of buildings and structures, which is carried out in order to establish the category of the state and degree of wear of foundations and supporting structures, determine the possibility of perceiving additional loads during reconstruction, obtain a quantitative assessment of actual indicators of the quality of structures with taking into account changes occurring in time. All this is necessary to establish the composition and scope of work on the overhaul or reconstruction, as well as to develop measures to strengthen the structures.

The current state of the supporting structures is described, above all, by the residual carrying capacity. Its value depends on many factors and changes during the operation. The significant variation in service life is due to the random nature of the parameters characterizing the physical state of the structures and the conditions of their operation. The analysis of the causes of destruction and damage to structures allows you to prevent the most frequently made errors at all stages of the construction process from design to operation.

Numerous surveys of chemical industry buildings show that areas of destruction are often located randomly both along the length of the element and over its cross section. The change in the strength characteristics of concrete is also accidental.

Calculation of structures taking into account these factors is an extremely difficult problem with low validity. Often, the reinforcement is performed with a metal profile from the assumption that it takes full load. Such solutions are not effective due to the high material consumption. The department of constructions of buildings and structures proposed a number of ways to restore the bearing capacity of products with defects to achieve the initial resistance of structures [1]. With this approach, much of the money is saved.

For the development of measures to restore the performance of structures, it is necessary to conduct their examination in order to identify the causes of premature wear and tear of their carrying capacity.

At present, various organizations, joint-stock companies, etc., are engaged in surveys of the production environment and technical condition of buildings and structures in one or another volume, most of which were not previously engaged in this type of construction activity. As a result, works of low quality often appear, weakly reflecting modern achievements in the field of construction equipment and measuring instruments. There is practically no generalization of the results of surveys conducted even by specialized organizations, which adversely affects the further improvement of space-planning and design solutions for buildings and structures.

At present, a large number of state standards, instructions and recommendations on the determination of individual physical-technical characteristics of building materials and structures in natural and laboratory conditions have been developed. However, there are almost no works covering the whole range of issues related to surveys of the state of the production environment (microclimate) and performance (strength, heat engineering, etc.) of both individual structures and buildings in general, and the literature on modern methods of building surveys is extremely limited.

The lack of standardized methods and techniques for surveys is largely due to the lack of a unified methodological approach to conducting surveys, a variety of survey tasks and measurement tools used and methods for processing and summarizing the results, which in many cases makes the data obtained by different implementers incompatible.

Reports and conclusions on building surveys carried out by various organizations and specialists are heterogeneous both in content and form, which is explained by the diversity of space-planning and design solutions, types of construction materials and operating conditions for buildings of various purposes (residential, public, industrial, agricultural and others) as well as the experience of specialists involved in the inspection of buildings and structures.

As for the study of existing structures directly, it is obvious that inspections of buildings and structures of various industries should be carried out by specialized organizations and specialists with the knowledge in various fields of construction science, as well as knowledgeable features of technological processes in industrial buildings. Considering that higher education institutions did not train specialists in building inspections taking into account the specifics of relevant industries, and there was insufficient coverage of survey questions in course books, the problem of creating relevant educational literature, practical manuals and manuals remains an urgent task [2].

Conclusion

Over time, the problem of updating production assets is becoming more acute. Modern methods of strengthening structures make it possible to restore their performance in many cases. To select the most optimal ways to restore industrial buildings, it is necessary to conduct high-quality surveys as starting points for a repair or renovation project.

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ПРОБЛЕМА ОБСЛЕДОВАНИЯ ПРОМЫШЛЕННЫХ ЗДАНИЙ

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Аннотация

Проблема обследований зданий и сооружений, корректного уточнения их срока службы на основе проводимых обследований освещается нешироко. В статье рассматривается важность изысканий строительных конструкций на примере промышленных зданий.

Ключевые слова: конструкции, обследования, промышленные здания, реконструкция, срок службы.

ECOLOGICAL DESIGN IN RUSSIA AS A MODERN DIRECTION IN ARCHITECTURE

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Abstract

The article deals with the development and prospects of eco-design in the Russian market taking into account the demand for environmental services. The article focuses on the formation of architectural methods for creating ecological buildings and interiors with the use of environmentally friendly building materials that do not harm the external environment and contribute to improving the energy saving of buildings. The Russian developments in eco-design are considered, the range of services in this direction and the stage of eco-design development in Russia are analyzed.

Keywords: eco-design, nature, “green houses”, “green design”, eco-friendly architecture, ecological market, energy efficiency.

The relevance of this research is expressed in the active development of eco-design at the background of global environmental problems in the world, reflected in new solutions for which the application of design ecology, architecture, interior design, and the use of natural energy sources are inherent.

In modern society, the problem of ecology and environmental protection is becoming more urgent and contributing to the development of eco-design. For the first time the concept of eco-style appeared in the 1980s and 1990s, when environmental problems began to cause strong disturbances among people. It was believed that a man is a part of nature and he/she should preserve the natural environment. Eco environment has always had a great impact on human life, but only now special attention is given to it as to an independent design industry. The creators of eco-style are Scandinavian designers and Japanese traditionalists who use the motives of nature in designing.

Specialists in eco-design believe that this industry contains the esoteric Feng Shui, which promotes the release of positive energy, struggling with pathogenic zones and negative energy. It should be noted that the connection of the perceived environment between the physical and mental health of society is significant. The concept of “ecological design” covers an extensive set of measures to protect the external environment, the appropriate attitude to nature and harmonious existence in it, the competent use of its resources and the treatment of industrial waste.

The main goal of this article is to study the domestic experience in relation to existing firms that are currently operating in environmental entrepreneurship, as well as to generalize the knowledge of architectural methods for creating ecological buildings and understanding of the “eco-design” concept by Russian people.

The definition of “eco-design” in the Russian mentality refers to the “cleaning of the space around him”, which implies opposition to the negative influence of industrial activity on the human body, but at the same time, reasonable behavior in relation to nature or the emphasis on the behavioral aspect is not observed in wide application. Therefore, there is a decrease of services set offered in eco-design. At the same time, Russia is gradually making progress in this direction - an environmental certificate is in force, which is a business paper that assures the necessary set of environmental parameters for high-quality operation premises or a building. When performing an

environmental survey, an environmental certificate is provided through the system of CQS (Certified Quality System).

However, in the case of applying the laws of ecological design, there are unnecessary costs. From this side, environmental design goes much more in value, in contrast to a less environmentally-friendly project, because it is based on the use of high-quality, expensive biomaterials and more complex developments in production and construction. But in real construction, after large initial investments and after a while, one can derive considerable benefit from using the methods formulated on the basis of the provisions of ecological materials in the design.

It should be noted that that the Russian eco-design market as a whole remains at the initial stage of formation. Observation leads to the fact that at this stage it is rather difficult to talk about the existence of a formed market with well-developed ways of functioning and a set of development units. In Moscow, the most diverse range of services related to eco-design has been demonstrated. In Tambov, the eco-design market is not really studied, as well as in other cities of Russia, where this direction is practically not used. Environmental entrepreneurship in Moscow has emerged relatively recently and is now beginning to improve rapidly. As noted above, due to the severe lack of information on the environmental market, it is difficult to truly determine the exact volume of supply and demand for environmental products, work, and services. But it is necessary to emphasize that the environmental entrepreneurial activity of Tambov firms is mainly focused on production organizations and includes environmental certification and preparation of environmental documentation. A low share of companies is involved into the area of buildings ecology. In Tambov, about 100 companies are engaged in environmental entrepreneurship in the field of environmental protection. They include authorized bodies; enterprises providing energy-saving equipment, lighting, ventilation; firms based on industrial ecology; providing environmental protection in all spheres of ecology; executed clearing of natural surfaces; recycling garbage and using secondary resources. Most of them are small companies. Large-scale eco companies often refer to industrial ecology, voluminous in-depth research, are created on the basis of scientific institutions and have been developing in this direction since the mid at 1990s.

Ecological design can be of any design form that prevents negative impacts on the environment, integrating with natural ecosystems. Let us demonstrate it by the example of a “green building”. Such buildings have not been widely used in Russia, but their main positive feature is the economy manifested at the expense of natural phenomena: the use of rainwater, solar energy, and green walls inside the house. For a long time green walls have been included in one of the most striking and interesting elements in the interior design: offices, entertainment facilities, private and multi-storey buildings, began to use hanging greenhouses in the decoration in the interiors. Using green walls, designers were able not only to create a natural environment in the room, but also to provide a cozy, relaxing atmosphere, which influenced the improvement of business and the increase of customers.

For eco-design, taking into account design and construction work, natural materials can be used. Based on the architectural solutions rooms are oriented to the sides of the world, the wind rose, and the layout of the rooms depends on the necessary lighting, which corresponds to the size of the windows. The ventilation of the premises of the building is projected based on their area, and the calculation of heating appliances with the area of premises and window openings. The modern engineering solutions for residential and public buildings use solar energy, maximum heat preservation, secondary water treatment and other achievements of scientific and technological progress. In order

to increase energy efficiency, it is necessary to rationalize the thermal insulation of the roof and walls, which will lead to a decrease in the energy consumption and reduce the cost of heating.

Equally important in eco-design is the use of environmentally friendly building materials. If we talk about stone and wood - they can be used both in the interior of the building, and in the exterior decoration of the facade, they do not harm the health and organize a harmonious environment in the room. When decorating a room, both wooden products and natural stone are used. One of the latest trends is the use of eco-friendly bathroom design, a shower that flows from the ceiling, wooden consoles, and a bowl of natural stone bath. In addition, to decorate walls in eco-design, you can choose paint with a low content of volatile organic substances. Wallpapers are made from papers or from bamboo or reeds. And one of the simplest and natural ways is decoration with fresh flowers.

In Russia, eco-design has just begun its gradual development; in comparison with other countries the concept of "eco-design" has not yet been fully formed. Especially from the point of view of teaching (beginning with the junior classes), formation of responsible people's behavior in relation to nature, as well as a certain way of life of people should be focused on the preservation of nature. It is important to note that it is necessary to expand the range of eco-design services offered for further development prospects at the Russian market, which will increase the demand for environmental services. The article shows the architectural methods of creating ecological buildings and interiors. Thereby further scientific and technological progress, it is possible to improve them.

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ЭКОЛОГИЧЕСКИЙ ДИЗАЙН В РОССИИ, КАК СОВРЕМЕННОЕ НАПРАВЛЕНИЕ В АРХИТЕКТУРЕ

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Аннотация

Рассмотрены проблемы становления и перспективы развития экодизайна на российском рынке с учетом спроса на экологические услуги. Изложены этапы формирования архитектурных методов создания экологических зданий и интерьеров с использованием экологичных стройматериалов, не наносящих вреда окружающей среде и способствующих улучшению энергосбережения зданий. Представлены российские разработки в экодизайне, проанализирован спектр услуг в данном направлении и стадии развития экодизайна в России.

Ключевые слова: экодизайн, природа, «зеленые дома», «зеленый дизайн», экологичная архитектура, экологический рынок, энергоэффективность.

WAYS TO IMPROVE ENERGY EFFICIENCY AND RESOURCE CONSERVATION OF HOTELS

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Abstract

The article discusses the problems of improving energy efficiency and resource conservation. Examples of improving energy efficiency of a building are given.

Keywords: energy saving, energy efficiency, hotel complexes, heat loss, resource saving.

Using the example of a hotel complex, we have analyzed the ways to improve energy efficiency and resource conservation. The buildings of the hotel belong to public buildings, the design of which is carried out on the basis of [1,2,3,4].

Improving the energy efficiency of a hotel building is possible in various ways.

We consider three main ways to save energy in hotels:

(1) saving energy in lighting is achieved by:

- maximum use of daylight (increased transparency and window area, additional windows);

- an increase in the reflectivity of surfaces (use of interiors in bright colors);

- use of lighting devices only when necessary;

- replacement of incandescent bulbs for energy-saving, transition to LED lighting;

- the use of lighting control devices (motion sensors).

(2) saving energy in general is achieved by:

- the optimal placement of electrical heating devices to reduce the time and the required power of their use;

- the use of temperature control devices, including devices of automatic switching on and off, reducing power depending on temperature, timers;

- the replacement of electrical heating for heating using heat pumps;

- the acquisition of modern energy-saving refrigerators;

- prevention of the formation of frost, in the refrigerator;

- keeping air conditioning windows and doors closed - otherwise the air conditioner will cool the street or corridor;

- preventing unnecessary use of the chargers for mobile devices in the network (very important due to the increasing volume of such devices);

(3) saving heat is achieved by:

- reduction of heat loss (use of heat-saving and heat-insulating materials during construction / modernization, exterior decoration of buildings)

- installation of heat-saving window systems and doors.

Additionally, the energy efficiency of a building can be enhanced by an energy-efficient space-planning solution. The shape of the building affects its ability to retain heat. Heat losses are proportional to the surface area through which they occur. Therefore, the smaller the total surface area of the walls, roof and floor of the first floor,

the less heat will leave the building. Projections and niches, ledges and other architectural elements, of course, adorn the house, but increase heat loss. The sphere has the smallest surface area of geometric bodies of equal volume. We are most accustomed to and convenient rectangular rooms, but we have, in order to improve resource-saving properties, the building of the hotel, in plan, taken a wavy shape, with a minimum number of ledges (Fig. 1).

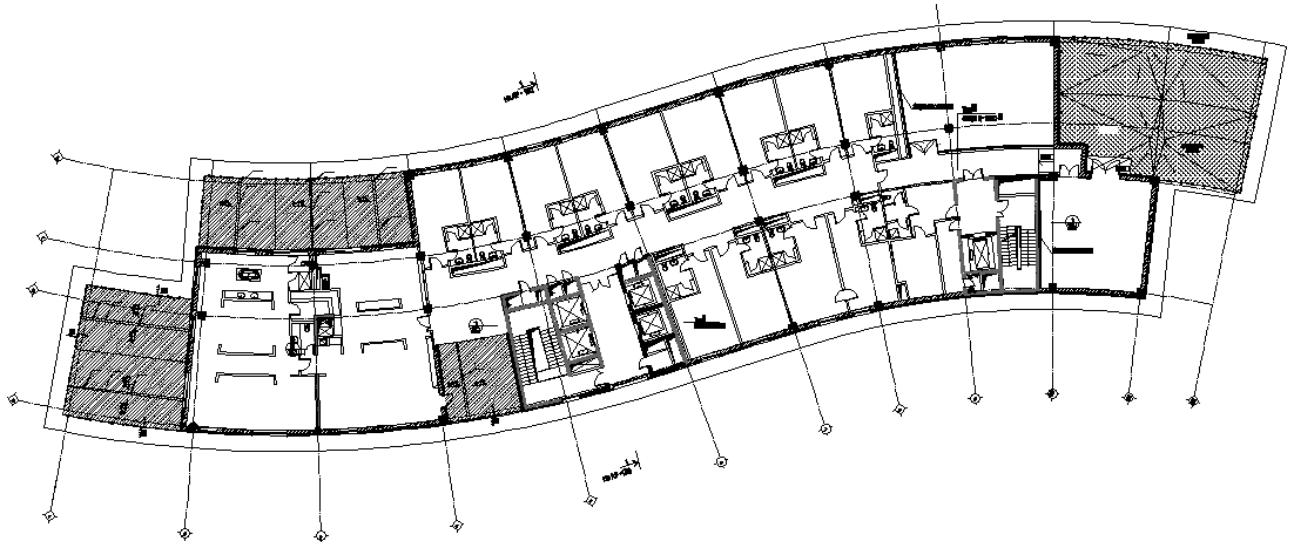


Figure 1 - Typical floor plan

In addition, when designing a hotel, we will take into account the basic conditions recommended by specialists for reducing energy costs: instrumental accounting of resources, integrated use of energy-saving equipment and automation of management of all engineering systems of a building, including heating, cold supply, ventilation, air conditioning, water supply, etc. Various systems are used abroad, where three decades ago they were faced with the problem of reducing energy costs.

From the operating experience of energy-efficient hotel buildings, it is known that even when equipping a building with modern energy-saving equipment, heat / cooling control circuits and distribution of heat / coolant by zones and types of consumers, their operation modes are most often set manually on local, unrelated controllers, which leads to inconsistent work of the entire system as a whole.

In the overwhelming majority of hotels there is no detailed accounting that is why regulation has to be carried out in fact "blindly," without the possibility of assessing the effect of a particular action. That is, the efficiency of energy saving here depends on the human factor - the integrity of the hotel staff and the consciousness of the guest.

We will consider an example. The guest often, for the speediest achievement of the desired temperature in the room, sets the extreme positions of the thermostat sensor. Usually it is from $+10$ and $+30$ °C, while he/she himself/herself may then be out of the room. This leads to unreasonable "overheating" or "overcooling" of the room. After the release of the room, the responsibility of the maids is to install the thermostat in the economy mode (approximately $+18$ °C), but it is not possible to follow this. It is possible to adjust this moment by applying innovative technologies in the management of the hotel building.

When designing a thermal protection of a building, one should remember about “cold bridges”, through which significant heat losses are possible. In our case, we will consider several options for constructive solutions of wall fencing, window, door openings and the most effective decisions will be made for the further development of the project.

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ОСНОВНЫЕ СПОСОБЫ ПОВЫШЕНИЯ ЭНЕРГОЭФФЕКТИВНОСТИ И РЕСУРСОСБЕРЕЖЕНИЯ ГОСТИНИЧНЫХ КОМПЛЕКСОВ

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Аннотация

Рассмотрены проблемы повышения энергоэффективности и ресурсосбережения. Приведены примеры повышения энергоэффективности здания.

Ключевые слова: гостиничные комплексы, тепловые потери, ресурсосбережение, энергосбережение, энергоэффективность.

THE VARIATION METHODS USED FOR THE SOLUTION OF CONSTRUCTION PROBLEMS

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Abstract

The paper focuses on the study of principles of variation methods of calculation used for the solution of construction problems. Classes of construction mechanics problems are described. The advantages of variation principles are revealed.

Keywords: building, calculation, construction, construction materials, design, facilities.

General information on variation methods is presented in numerous papers, for example, in the articles of L.S. Leibenzon (1951), S.G. Mikhlina (1970), G.I. Marchuk (1977), V.Z. Parton and P.I. Perlin (1981), A.N. Rosin (1978), K. Vasizu (1987), Yu.V. Veryuzhsky, etc. The calculus of variations is one of the oldest mathematical disciplines.

The merits of the variation principles are noted [1]:

- great commonality;
- invariance of the form of representation of the basic equations;
- clear and logically justified setting of problems.

In engineering practice and scientific research, the most commonly used variation methods of Ritz–Timoshenko and Kantorovich–Vlasov are used. Variation methods for the solution of problems related to the theory of elasticity, are based on various variation principles from which Lagrange's principle is the most known one [3].

The scientist G.I. Marchuk wrote variation methods for multidimensional problems when a number of independent parameters is more than two [2].

Solutions are given for Bernoulli and Timoshenko beams on an elastic base, taking into account shear deformations, calculating tangential stresses in bending of straight and curvilinear rods.

In the monograph by V.I. Slivker the following classes of construction mechanics problems are considered [4]:

- bend of thin plates – Kirchhoff-Lyava's theories;
- static-geometric analogy in the theory of plates;
- bend of plates of average thickness – Reissner's theory;
- torsion of massive rods – Saint-Venant's theory;
- thin-walled cores of an open profile – Vlasov's theory;
- thin-walled cores of the closed profile – Umansky's theory;
- multicircuit thin-walled cores of the closed profile;
- thin-walled cores of the combined profile;
- problems connected with the;
- the variational principles in problems of stability.

The variation principles are described. The advantages of variation principles are revealed. Methods for making variation-difference schemes, fictitious domains, extreme problems with restrictions are considered.

The application of variation methods for the solution of spatial problems of the theory of elasticity is also considered. They are aimed at minimizing the functional for the corresponding boundary conditions.

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ВАРИАЦИОННЫЕ МЕТОДЫ, ИСПОЛЬЗУЕМЫЕ ДЛЯ РЕШЕНИЯ ИНЖЕНЕРНО-СТРОИТЕЛЬНЫХ ЗАДАЧ

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Аннотация

В статье поставлены цели изучить основы вариационных методов расчета с помощью использования их при решении строительных задач, а также ознакомиться с задачами, решаемыми вариационными методами. Показаны классы задач строительной механики. Выявлены достоинства вариационных принципов.

Ключевые слова: здания, конструкции, проектирование, расчет, сооружения, строительные материалы.

THE PROBLEM OF PRESERVING HISTORIC BUILDINGS IN TAMBOV

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Abstract

The problem of preservation of cultural heritage, ordinary historic buildings and objects which have properties of historical buildings was examined in this paper. Data about lost historic buildings and cultural heritage sites that are in poor condition were collected and analyzed during the study. The aim of this work was to consider the problem and offer several options for solving it. The study was based on a literature review and analysis of the information received.

Keywords: architectural monument, cultural heritage object (CHO), historic buildings.

Introduction

Preserving the historical heritage and image of the city is a very important and urgent problem, but it often has difficulties. The spontaneous development of modern cities often leaves in desolation ordinary historic buildings that are not part of them, preserving the historical center. Undoubtedly, this is due to the existing requirements for historical urban development.

Analysis and research

The Soviet times passed and resulted in great losses of the architectural heritage, but despite this, the problem of preserving the environmental historical landscape is very relevant for Russia, including Tambov. We will consider several interesting historic buildings that have disappeared completely and which were cultural heritage objects (hereinafter referred to as CHO) of regional significance or could be monuments of environmental development, as well as the problem of preserving the existing historic buildings in this article.

On the one hand CHO registries began to form in Soviet times, with more and more new buildings gradually being added to them. However, the registered CHO were not even insured against destruction. It should be noted that a survey of the central part of the city in order to identify the most interesting and significant buildings for the urban environment was conducted in 2008. The research team made a recommendation: *«The uniqueness of the city is ensured not only by the preservation of individual monuments of history and architecture, but also by the buildings that make up the urban environment. Therefore, taking into account the frontality and high density of buildings on Kommunalnaya, Nosovskaya streets, sections of Sovetskaya, Oktyabrskaya, Leningradskaya, Lermontovskaya and Kronstadt streets, we suggest preserving the existing ensembles of buildings and not disrupting the existing line of buildings on these streets with newly constructed buildings. Construction can take place in the farther in quarters according to the Regulations for building the central part of the city»* [1]. In the same year several buildings were demolished despite the work done.

The list of most of the lost buildings in Tambov with a certain architectural, historical or city-forming value is given in Table 1.

Table 1- Lost objects of Tambov









No	Photos	Description	Significance/Value
1	 <p>Photo of 2000</p>	Hospital building on Stepan Razin St., a cultural heritage site of regional significance	Organically fit into the ensemble of historic buildings, had architectural, cultural and aesthetic values.
2	 <p>Photo of 1962</p>	The House of the Protasievs (104, Sovetskaya St.), was identified as an object of historical and cultural heritage in 1992 and demolished in 2005	Probably the most interesting building in the city throughout its history, it also had a cultural and aesthetic value
3	 <p>Photo of 1990</p>	House of the merchant Anosov, a cultural heritage object	Preserved historical appearance of the street, it had an architectural, cultural, aesthetic and historical value.
4	 <p>Photo of 1975</p>	House of artist N.M. Shevchenko, built 1910 on the territory of Aseev's estate in 1910, was destroyed in the middle of the twentieth century.	The building had an original architectural image, historical, cultural and aesthetic value. It should also be noted that the building perfectly entered the ensemble of the estate itself.
5		Several buildings on street, Sovetskaya St. (82 in 2016, 84 and 86 in 2008), identified as a monument of environmental development.	Preservation of the special historical appearance of the main street of the city, which had cultural and aesthetic value

	Photo of 2015 82, Sovetskaya st.		
6	 Photo of 2016	Identified CHO - Town Planning Ensemble "House of Workers" on Proletarskaya St., 148-160	The buildings were of historical importance, an example of a typical construction of a group of houses.

On the other hand, many CHO or buildings that have properties of a cultural heritage object that have been preserved at the moment are in very poor condition. They are systematically destroyed before the eyes of the townspeople and need some immediate work to preserve.

Table 2. CHOs in unsatisfactory condition

No	Photos	Description	Significance/Value
1	 Photo of 2018	"The estate of engineer TeofilSvirchevsky", an object of cultural heritage of regional significance	The building is valuable for its architecture, preserves the authentic environment of the main street of the city and has historical significance.
2	 Photo of 2018	House of Sergeev-Tsensky, 37, Komsomolskaya St.	The building has a historical and cultural value, and also stands out for its architecture.

Not all historic buildings of architectural and artistic and aesthetic value are architectural monuments, but also have the right to preserve their original appearance. But, unfortunately, the idea of preserving not only monuments of architecture or history, but also ordinary historic buildings, which relate to the history of the city, may not always be correct. Imagine a situation in which the historical center becomes almost a "city museum", it preserves all the buildings, their environment and communications. This may mean two ways of further development of this area. If it is truly unique, tourist attractions will be arranged, perhaps the historic building will be rented for a short time, etc. But if a large urban part is an old collapsing historic building, which in itself has no value either in terms of architecture or in terms of history, the buildings of standard designs, the number of which is countless in Russia. Such a museum will be completely unpopular, and the historic buildings will be definitely destroyed.

We can consider the other side of this problem. Virtually every historic building has a legal owner, who is solely entitled by law to dispose of it. But the problem is that not every owner has the means or the desire to maintain and reconstruct the historical heritage.

Thus, historic buildings are not demolished, but they are not preserved properly. They seem to be left to live out their time and "die".

The city can be compared to a tree, which acquires more and more new branches, and the old withered branches die. In the urban structure is similar to that: new areas appear and development gradually moves to the periphery. In turn, the historical center remains unclaimed.

Creating unique museum areas of the city that will preserve their historic appearance and attract visitors with the authentic atmosphere is the most relevant solution to this problem, in my opinion. Also, historic buildings can get various social functions, thereby obtaining a new modern life. For example, the building for a new branch of the bank will not have to be built if it is located in a historic area. Encouragement of owners of historic buildings to reconstruct objects with the help of subsidies from city budgets or the possibility of transferring CHO to city property with compensation for living space may be another proposal.

It should also be noted that the construction in historical areas according to town planning norms and existing requirements for historical buildings should correspond to the style and number of floors of the buildings that have been preserved or be background buildings that do not violate the general appearance of streets.

Conclusion

After a detailed study of the problem of preserving historic buildings, we concluded that it is necessary to preserve them. The aim of the work was to study the current situation in Tambov and to propose various options for solving this problem. We reviewed the majority of lost buildings, drew attention to existing objects that are in poor condition and buildings that have the properties of an object of cultural value.

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АКТУАЛЬНОСТЬ СОХРАНЕНИЯ ИСТОРИЧЕСКОЙ ЗАСТРОЙКИ НА ПРИМЕРЕ Г. ТАМБОВА

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Аннотация

В данной работе была изучена проблема сохранения объектов культурного наследия, рядовой исторической застройки и объектов, обладающих свойствами исторической застройки. В ходе исследования были собраны и проанализированы материалы по утраченным историческим зданиям и объектам культурного наследия, находящимся в неудовлетворительном состоянии. Целью данной работы было рассмотрение проблемы и предложение нескольких вариантов ее решения. Исследование было основано на литературном обзоре и анализе полученной информации.

Ключевые слова: историческая застройка, объект культурного наследия (ОКН), памятник архитектуры.

PROBLEMS OF ADAPTATION OF CULTURAL HERITAGE SITES TO MODERN REQUIREMENTS

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Abstract

The problem of preservation and use of architectural monuments is relevant. The problems of preserving and using architectural monuments are different and occupy a wide range of difficult issues - financial, legal, technical, moral. Nevertheless, efforts are being made to resolve them. There is an understanding that these complex problems can be solved only by the joint work of government bodies, business, the public and the professional community.

Keywords: adaptation, object of cultural heritage, problem of preservation, problem of adaptation, preservation, restoration.

Introduction

The problem of preservation and use of architectural monuments is currently relevant both at the federal and regional and municipal levels. After all, architectural monuments are an integral part of our rich historical and cultural heritage. The preservation and use of architectural monuments is a complex problem, the solution of which requires the joint work of government bodies, business, the public and the professional community.

Important problems of preservation and use of objects cultural heritage

Here the first question is the financing of this area. Due to the fact that for many years there was no systemic state policy regarding the preservation and use of architectural monuments, many of them have essentially collapsed, while others simply disappeared. Preservation and restoration of architectural monuments often imply enormous costs and the budget of not every region, and even more the city or village is able to withstand such financial costs. Therefore, public funding, public-private partnership as well as the participation of funds from non-governmental organizations and philanthropists, the general public is very important for the preservation of historical heritage.

Unfortunately, at the moment there are no studies dedicated to the problem of effective management of the financing of the protection, restoration and adaptation of cultural heritage to modern economic conditions. There are no methods for calculating the price of a cultural heritage object, which will not only cover all the costs of restoration and re-equipment, but will also bring profit to the investor, several times more than the profit from the construction of a new building.

There are still legal problems regarding the use of architectural monuments, despite attempts at legal regulation of this sphere, namely: the adoption of the Federal Law of June 25, 2002 N 73-FL "On the objects of cultural heritage (historical and cultural monuments) of the peoples of the Russian Federation".

Adaptation of cultural heritage for modern use is one of the ways to preserve it. The current legislation does not limit the nature of use of the cultural heritage object (with the exception of those uses that may harm the object). Despite the absence of limitations in the functional purpose of the cultural heritage object, it is important to correctly identify it, since the adaptation of cultural heritage objects influences the development of the city, the emotions of the citizens. At the moment, composite approaches have been formed that affect the quality of perception of the saved and changing parts of the monument.

But at the same time there is no clear understanding of the boundaries between the adaptation of an object of cultural heritage for modern use as a way to preserve it and an adaptation that contributes to the loss of value of an object. For example, the same object can be used in different ways, performing several functions. In the course of reconstruction, as a rule, industrial objects of historical value are subject to conversion. One of the popular trends of changing the original functionality of architectural monuments is their museumification. Palaces, manors, apartments, etc. are “museumized” (here, the Aseev Manor Museum Complex in Tambov, which became the branch of the world famous Peterhof, can serve as a vivid and successful example.)

All these, as well as other types of works on the use of architectural monuments are invariably associated with the problem of property. Take for instance the Aseev’s Manor Estate. The reconstruction of Aseev’s manor began after a big scandal. Being a monument of architecture of federal significance, it somehow got from the use of the Tambov Cardiology Sanatorium into the ownership of one commercial structure that put the building up for auction. It was planned that the building will open a pleasure institution or restaurant. It is hard to believe, but this could have happened quite legally and within the framework of the 73-FL edition at that time. As a result, the story of the sale of the estate reached the presidential administration, and the building was removed from the auction. And only after long bureaucratic procedures and thanks to the financing of the Ministry of Culture of the Russian Federation, co-financing from the regional and local budgets, the museum complex “Aseev’s Estate” is operating now. Thus, it is easy to imagine how relevant and significant the problems associated with the improvement of legal regulation of the use of architectural monuments and the resolution of property issues throughout the country are. Moreover, accounting, control, and state supervision on the part of the regulatory authorities remain extremely difficult. After all, objects of cultural heritage are currently free to alienate and move from one owner to another without their mandatory notification.

Often, the new owners of architectural monuments are not able to meet the requirements of the protection obligation due to insufficient knowledge of legal norms and requirements, while others try to minimize their expenses in order to make profits as soon as possible, looking for ways to circumvent the severe restrictions imposed by legislation on the protection of monuments.

As a rule, such an “indifferent” or “consumer” approach can lead to a serious damage to a valuable object. Solving this problem can only be rigorously monitored over the observance of security obligations by state and municipal authorities, the implementation of measures to improve the legal literacy of cultural heritage property owners, the introduction of new economic incentives for investors interested in the reconstruction of monuments and preservation of their historical appearance, as well as stricter legislation regarding unfair owners of architectural monuments.

As you can see, the privatization of the monument of architecture imposes serious obligations on the new owner. It is necessary to provide general access to the object, preserve the immutability of their appearance, etc., but with due regard to the requirements of the protection obligation.

Nevertheless, the privatization of architectural monuments by bona fide owners, permitted by Russian legislation, can solve the problem of their restoration and further use, and facilitate the financing of work entrusted to the state and local budgets.

Greater use should be made of the potential and resources of public-private partnerships. At the same time, a more thorough study of the legislative and economic basis governing this interaction is required for preservation and use of architectural

monuments. In this regard, an acute problem is the assessment of the cost of the monument of architecture, which has become the object of sale. A lot of material and non-material factors are superimposed here: the historical, memorial, artistic value of the building, the costs of restoration and repair, the degree of wear and tear, the commercial potential of the building, etc. Unfortunately, the issue of determining the objective price of immovable cultural heritage objects remains insufficiently fixed and clear, as there are no systematic methods for their evaluation.

Conclusion

Nevertheless, it is impossible not to note the success and recent efforts on the part of state, regional and municipal authorities to preserve and use cultural heritage, one of the types of which are architectural monuments. Finally, there is some understanding that they serve as the basis for the identity of each citizen and the nation as a whole, as a new economic and tourist resource. We cannot allow the loss of architectural monuments because it will mean that we can lose our historical roots, without which further development is impossible. In this regard, it is particularly important and timely that Tambov State Technical University offers a Master's course "Design and Research of Architectural Monuments" in the framework of the direction "Reconstruction and Restoration of Architectural Heritage", and will be able to train specialists for whom the professional duty will be the protection and preservation of monuments of architecture.

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ПРОБЛЕМЫ ПРИСПОСОБЛЕНИЯ ОБЪЕКТОВ КУЛЬТУРНОГО НАСЛЕДИЯ ПОД СОВРЕМЕННЫЕ ТРЕБОВАНИЯ

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Аннотация

Рассмотрена проблема сохранения и использования памятников архитектуры. В настоящее время при сохранении и использовании памятников архитектуры возникает много проблем различного уровня - финансовых, правовых, технических, моральных. Тем не менее для их решения предпринимаются усилия. Появляется понимание, что решить эти комплексные проблемы возможно только совместной работой органов государственной власти, бизнеса, общественности и профессионального сообщества.

Ключевые слова: адаптация, объект культурного наследия, проблема сохранения, проблема адаптации, сохранение, реставрация.

PECULIARITIES OF PROVINCIAL ARCHITECTURE IN THE LATE 19TH CENTURY IN G.K. LUKOMSKY'S MATERIALS

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Abstract

In the article the peculiarities of typical historical buildings of provincial Russia and small architectural forms are considered. The influence of Russian nationality on the prevailing architectural styles of the province is shown.

Keywords: typical styles of the province, variety of forms, characteristic elements.

G. K. Lukomsky was a scientist, critic, watercolorist, graphic artist, researcher of provinces of the Russian Empire for studying the types of development that have been formed. His detailed description of the monuments of Russian cities, various forms and architectural styles, sketches and photographs made a significant contribution to the collection of information on provincial architecture. The variety and number of types of construction that provincial Russia possesses is huge. [1, p. 13].

G. K. Lukomsky's research covers the period from the 17th century to the beginning of the 1850s. In this period the goal was to improve the architectural appearance of cities, using the experience of European city planners and architects as D. Trezzini, F.B. Rastrelli and others. Foreign architects were engaged in the construction of significant buildings not only in the capital cities, such as St. Petersburg and Moscow, but also in the province. Innovations changed the face of cities, in remote provinces of the Russian Empire they came with a delay of 30-40 years. All the innovations appearing in the metropolitan cities gradually adapted for provincial counties.

G. K. Lukomsky paid attention to the fact that each region had its own traditions and foundations - mentality, poor forms of buildings, cheap materials, but modest and elegant effects. G. K. Lukomsky believed that there were few preserved examples of civil buildings, public buildings, monasteries, palace buildings, estates.

In Rybinsk, the Transfiguration Cathedral of 1668 was demolished to the ground in order to erect a copy of the monferanian version of the St. Isaac's Cathedral - the destruction of one of the typical structures was accomplished by the merchant class [1]. The priests replaced the old icons under the pretense of decrepitude, believing that they were allegedly renovating the interior of the temple, they clogged the church with stamped banners and market works.

Very peculiar and good in their architecture hierarchical houses, officers' meetings, guardhouses, barracks and they are typical in a greater degree. Noble assemblies express essence and content by their architecture, but the exterior of the house of the Noble Assembly in Tambov does not correspond to its purpose. It could be a restaurant or premises of a credit company.

Educational institutions wanted and could build, creating something artistic and unusual. The simplicity of the long facades, adorned with a pair of columns, was

achieved with great difficulty, long seeking out the best proportions. There are harmoniously combined compositions of floors, the connection of smooth masses with openings of windows and the observance of a sense of proportion when using facade ornaments. Later, in the 1860s and 1870s, not a single building was built, even remotely approximating its external features to these samples [2].

Teachers' Institute in Tambov, the facades of the theological seminary (Fig. 1) and the institute of noble maidens were examples of almost monumental architecture.



Figure 1 - The building of the theological seminary, Tambov

An ionic warrant with columns of the buildings of the Provincial Zemstvo Administration of Tambov represents an artistic interest, although the large castle stones look more than strange. The low artistic value is most often owned by hotels, restaurants, banks, stock exchanges, consistories.



Figure 2 - Gostiny Dvor, Tambov

Living rooms, warehouses, barns are not deprived of “aesthetics” (perhaps because in small volumes it is easier to realize original ideas). In Gostiny Dvor the wholesale trade in such goods as haberdashery and groceries was conducted (Fig. 2). The original function of such structures was gradually lost as it was used not for its intended purpose (warehouse, granary), and a few years after construction it came to a dilapidated state. Gostiny Dvor was found everywhere in small towns and correlated with the concept of “provincialism” [3]. Sometimes in the best in style or in the most ancient buildings there were hospitals, shelters, orphanages, and almshouses.

Triumphal arches were built on special occasions as temporary structures, so without proper repair they were destroyed over 2 - 3 years. Some obelisks, pyramids, outposts

have survived to this day, from the era of the “flourishing” of Russian architecture, i.e., from the 17th century there were more samples than from the era of Anna Ioanovna or the Elizabethan period.

A charming type of provincial private house building with a rounded facade in the provincial towns of the late 17th century (on the corner of the house there is a semi-circle, it is framed by columns leading to the entire second floor). Somehow it was established that the house, facing the intersection of two streets, was decorated from both facades by a colonnade of 4, 6, 8 single or put in pairs columns that form a rotunda, or overlap the dome (Tambov - philistine house) [1]. Borrowing of metropolitan samples - houses with semi-arcs meet in such terrain conditions, not at the crossroads of two streets, and where there is no need to resort to semi-circles. The provincial baroque example is the style of Louis XVI, the house of Chastukhina in Pless, on the edge of a small town, in a remote province, not far from the Volga, surrounded by cabbage beds and vegetable gardens. Under the influence of traditional local trends, architectural forms and styles acquire a new sound. Typical pale green roofs, white rusts, yellow trim, characteristic of merchant luxury, the desire to decorate the exterior of the house richer, for example, the heads of lions.

G.K. Lukomsky mentioned the coach houses, barns, access canopies, stables, balcony grilles, fences, various outbuildings, a garden gate, interesting according to their architectural design. The wooden gate is an example of the most “quaint” architecture. In Vologda they consist of three arches (middle above the gates, lateral above the wickets). Curious gates, consisting of only two small arches, treated always very distinctly, albeit patterned for one this spike. The arches are equipped with threads of small scale and profile; cornice details entirely covered with carving, - here and bundles, and meanders and plants; on the edge they curiously curved and studded with iron, carved teeth. It turns out a structure with upward-rising edges, in any case, a specific northern one, reminiscent of a gang. The richest page in the description of art construction is the manor building [2]. In these features, G. K. Lukomsky saw certain moments on the basis of which “regional architecture” can be shaped.

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ОСОБЕННОСТИ ПРОВИНЦИАЛЬНОЙ АРХИТЕКТУРЫ КОНЦА XIX СТОЛЕТИЯ ПО МАТЕРИАЛАМ Г. К. ЛУКОМСКОГО

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Аннотация

Рассмотрены вопросы характерных, типичных, построек провинциальной России исторических зданий и малых архитектурных форм, а также влияние русской национальности на сложившиеся архитектурные стили провинции.

Ключевые слова: разнообразие форм; типичные стили провинции; характерные элементы.

ADAPTATION OF INDUSTRIAL BUILDINGS IN TAMBOV

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Abstract

This article describes adaptation of industrial buildings as public buildings and housing estates. The paper shows the analysis of industrial buildings adaptation in Tambov. The analysis of the adapted industrial facilities' facade is presented; the failure of successful adaptation to the modern urban environment is proved.

Keywords: adaptation, industrial buildings, Tambov architecture.

The shift from the industrial to the market economy and the financial crisis in 1998 had led to bankruptcy of the majority of the city-forming industrial enterprises in Tambov. Large areas of the town used by these enterprises have been abandoned for about 20 years and should be adapted. The lack of an integrated systematic problem-solving approach and the mismanaged investment raising had led to the partial adaptation of individual buildings and territories as shopping and entertainment buildings.

In 2005 an indoor kart circuit was opened on the place of the empty workshop of the Tambovpolymermash plant located in Sovetskaya Street. The track of a complex shape was laid in the plant workshop. At that time, it was the first kart circuit in the region. However, later it was closed due its unprofitability, and in 2006 the building was re-equipped as the retail area. "MVideo" and "Uyuterra" hypermarkets were opened there, with a sales area of 1900 m².

Currently, the architecture of the hypermarket, its facades in particular, is far from perfect. Looking at the building facade, it is not difficult to notice that most of it is used for outdoor advertisement. Comparing the surface area of the facade used for advertisement to the total surface area of facade (Fig. 1), it can be concluded that the advertisement takes 71% of the total facade area. This approach to the facade transformation did not solve the problem related to the common architecture of the workshops (the absence of any play of light and shadow on the facades due to the simple shape of the workshop) and had exacerbated it by eliminating all materiality, since the advertisement had almost completely covered the walls finish.

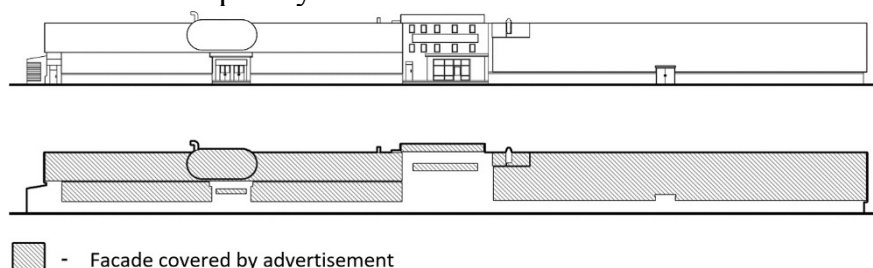


Figure 1- Analysis of the MVideo hypermarket facade

However, the main problem was the fact that the adaptation of Tambovpolimermash plant workshops in Sovetskaya Street as hypermarkets had started the transformation of

the industrial buildings into large trade enterprises in the period from 2007 to 2009. And that had ultimately led to an excessive amount of retail area in the city.

In 2007 two industrial buildings in Tambov were transformed into trade enterprises.

The Liniya hypermarket was built on the place of the factory warehouses premise at the intersection of Oktyabrskaya and Proletarskaya streets. The retail area of the building is 5.000 m².

Since the hypermarket was built according to the standard design, there was no space planning decision done, and its building facade completely merges with the shops nearby Revtrud plant. The hypermarket building can be distinguished from the industrial buildings only by the decorative mirror ball structure mounted on the roof and the big amount of outdoor advertisement on the facades (Fig.2).

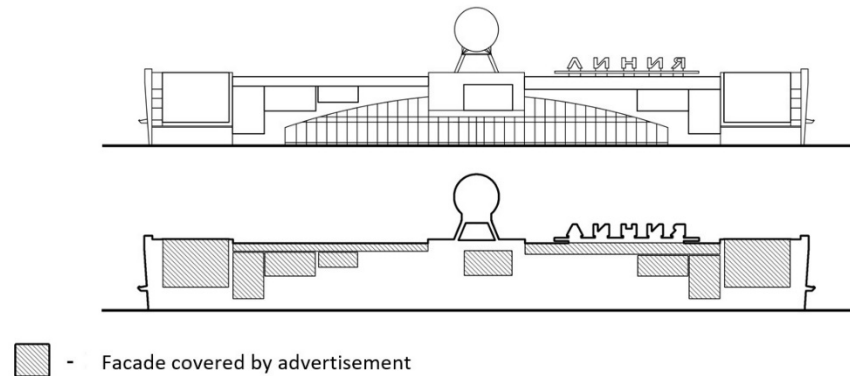


Figure2 - Analysis of the Liniya hypermarket facade

The Festival-Park retail and entertainment complex was opened in the former industrial zone of the Apparat plant located in Entuziastov Boulevard in 2007. The total area of the retail and entertainment complex is 21.000 m²; the retail area is 15.000 m². The Festival-Park is located in the former workshop of the defense plant and at that time it became the seventh major integrated trade enterprise in Tambov. The city has already had the following operating hypermarkets: Uley, 21 Vek, Detsky Mir, GUM, Tambov trade house and above-mentioned Liniya.

The lack of clear-obscure on flat facades common for the workshops was also not eliminated in the Festival-Park project due to the fact that the chosen means of architectural expression (metric series and color accents) are in the facade plane (Fig.3). The problem of continuance between the industrial building and the new complex remained unresolved.

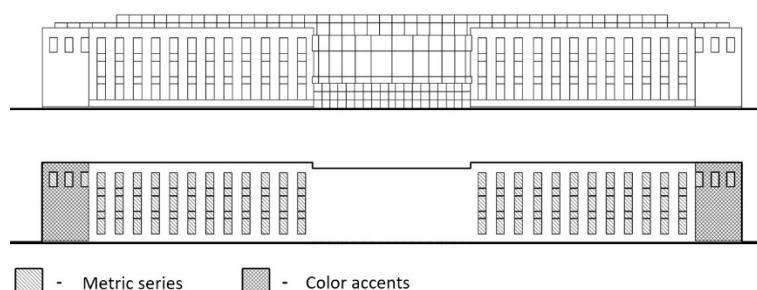


Figure 3 - Analysis of the Festival-Park retail and entertainment complex facade

The Real hypermarket (currently Auchan) was opened on the territory of the Tambovpolimermash plant in 2009. The hypermarket is located on the place of the repaired workshops, which were turned into the commercial premise.

The total area of the hypermarket is 18.000 m²; the area for lease is 16.000 m². Thus, the sales area of all hypermarkets in Tambov located in the adapted industrial buildings was already about 37.900 m² in the period from 2005 to 2009. Considering the fact that all mentioned hypermarkets are functioning at the time of writing this article and referring to the data of assessment of the resident population in urban districts and municipal districts of the Tambov region, we can conclude that there are 1.29 m² of the trade area per 10 residents, that was created by the adaptation of the industrial entities.

The architecture of *Auchan* hypermarket has the same problems as the previously built hypermarkets. The only difference is that they are exacerbated by the color scheme of the building. The building is made mostly in gray (Fig.4). Considering the color solutions of the facades of other hypermarkets (*Auchan* hypermarket in Barnaul, Perm, etc.), it can be concluded that the predominance of gray is not the style of the hypermarkets, but the choice of an architect. The typical gray workshop has become a typical gray hypermarket, that did not improve the architectural look of the street and the town.

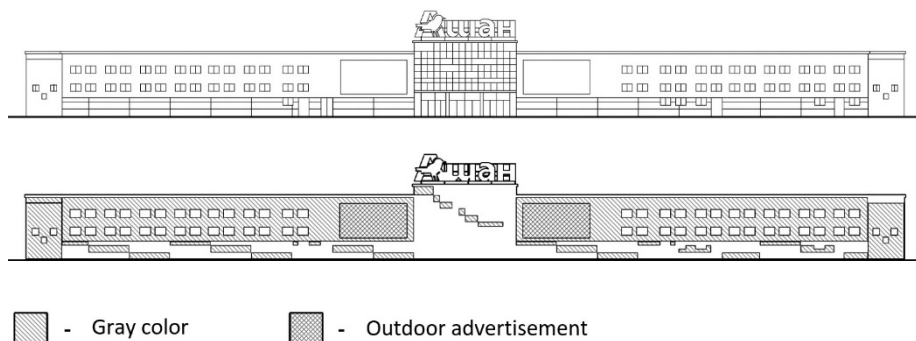


Figure 4 - Analysis of Auchan hypermarket facade

It is worth noting that some of industrial enterprises in Tambov were not adapted as trade enterprises. Vernadsky housing estate was opened on the territory of the Tambovpolymermash plant (a part of its territory is now occupied by the Auchan and MVideo shopping centers mentioned above) in 2018.

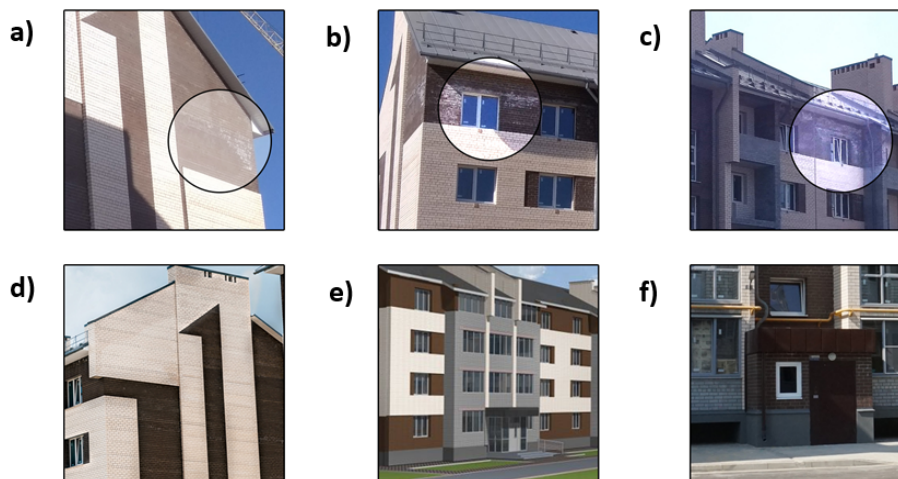


Figure 5 - Vernadsky housing estate

The housing estate is a residential neighborhood of twenty mid-rise apartment houses that make the estate different from most of high-rise housing estates built in Tambov. However, the quality of the housing estate architecture does not make the adaptation successful. The efflorescence appeared on the brickwork of the housing estate buildings

at the construction stage (Fig. 5 a, b, c) calls into question the quality of the mortar used in the construction. The blank metal doors were used instead of the all-glass entrance space shown in the project (Fig. 5 e, f). All houses of the estate are built with beige and brown bricks (Fig. 5 d). A similar color scheme was used in most housing estates built in Tambov. The parking is located in the precincts of the U-shaped houses of the estate, and it completely eliminated the advantages of the building configuration, in particular, wind and noise protection.

Summarizing the above, we can say in Tambov that there was not a single successful project on the adaptation of industrial enterprises to the modern conditions of the urban environment for the period from 2005 to 2018. It can be connected both to the desire to make construction as cheap as possible and to extract the maximum benefit from the operation of the building, that had led to the inexpressive architecture and had created the excessive amount of retail area.

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АДАПТАЦИЯ ПРОИЗВОДСТВЕННЫХ ЗДАНИЙ В Г.ТАМБОВЕ

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Аннотация

В данной статье приведён опыт адаптации промышленных образований города Тамбова под общественные здания и жилые комплексы. В работе приводится анализ реализованных проектов адаптации производственных зданий г. Тамбова. В статье выполнен анализ фасадов адаптированных производственных зданий и доказано отсутствие удачного опыта адаптации промышленных образований г. Тамбова к современным условиям городской среды.

Ключевые слова: адаптация, архитектура, производственные здания.

BASIC PRINCIPLES OF RECONSTRUCTION AND MODERNIZATION OF THE COMBINED HEAT AND POWER PLANT

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Abstract

The article focuses on the most effective ways of reconstruction of thermal power plants, the cases of the choice of reconstruction based on the actual conditions of operation and efficiency of the project, provides a visual representation of the production on the example of heat consumption

Keywords: consumption, fuel, reconstruction, turbine

Introduction

Recently, the development of the country's energy sector has been enhanced by the introduction of new steam turbine units with higher initial parameters and greater unit capacity. Increasing the initial parameters allowed improving the thermodynamic cycle and reducing the specific fuel consumption. The second factor in increasing efficiency was the widespread development of heating.

Here and further, the term heating is understood as power supply on the basis of combined, that is, the joint production of heat and electricity in one installation. The thermodynamic basis of heating is the useful use of spent steam in the steam power plant to release heat to external consumers (in this case, the heat of the vapor-to-liquid phase transition is used).

Combined heat generation is the main difference between heating and the so-called separate method of power supply, in which electric energy is produced by condensing thermal power plants (CTPP).

It is necessary to emphasize the role of heating for our country, located in the zone of severe climatic conditions, where the maintenance of life requires significant energy and heat. The average annual temperature in Russia — minus 5,5°C. development of heat in our country was mainly due to the introduction of powerful steam turbine units such as T-110-130 or t-250/300-240. However, since the 80s, the process of reducing the specific fuel consumption for electricity generation has almost stopped and even began on the contrary, the growth of specific fuel consumption (see figure 1). This is due to the fact that by that time the heat supply of almost all major consumers of heat (large cities and powerful industrial consumers) was carried out from powerful thermal power plants with steam turbine equipment such as T-110-130, PT-80-130, T-175-130, T-250-240.

Methods of reconstruction of combined heat and power plant

For gas-fueled stations, the most efficient method of reconstruction is the superstructure of the existing steam turbine part, gas turbines.

Such an add-on can be made in several ways [1, 3]:

- (1) add-in recovery boilers, of the binary type or a parallel circuit;
- (2) superstructure with the displacement of the regeneration system;
- (3) superstructure with gas discharge into the boiler.

The choice of the reconstruction option in each case should be determined based on the actual operating conditions and ensuring the economic efficiency of the project.

Reconstruction with the displacement of the regeneration system or with the discharge of gases into the boiler is less effective in terms of the electrical efficiency of the station (42-44 and 46-48, respectively). In this case, they are significantly inferior, ceteris paribus combined cycle recovery boilers, electrical efficiency which, in modern gas turbines, varies between 51% and above. As criteria of selection of the equipment for implementation of the above scheme it is possible to call the following:

- heat recovery boilers must produce sufficient steam
- gas parameters behind the gas turbine should provide the ability to generate steam with the necessary parameters throughout the year, without the use of afterburning;
- the use of steam turbines in the combined cycle gas turbine circuit involves the shutdown of regeneration selections (the entire cycle of heating the feed water is carried out in the recovery boiler). In this case, the power of steam turbines, while maintaining the level of thermal load and parameters of controlled selections, is reduced by about 20%.

As a result, the time of operation of combined heat and power plant units on the condensation cycle increased, which led to a decrease in the efficiency of the use of combined heat and power plant.

Conclusion

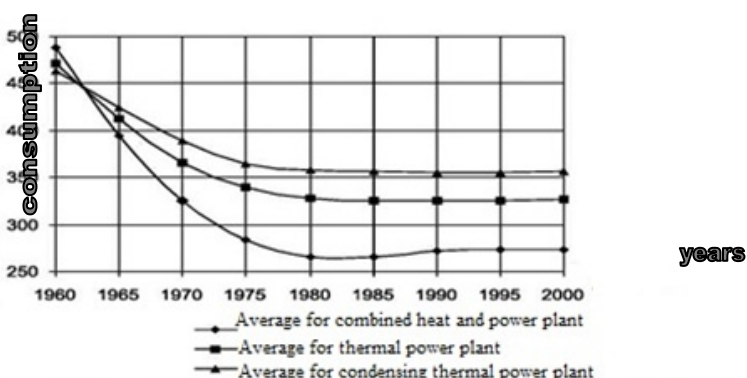


Figure 1. Dynamics of changes in specific fuel consumption at the thermal power plant of General use and on the basis of combined production

This is confirmed by the analysis of operating modes and operating conditions of the equipment TGC-9, TGC-5, TGC-6 (even in the heating period at the level of 60-70%). This is partly due to a decrease in the thermal load of industrial enterprises. The

utilization of the installed capacity of CHP in summer, is $k=0,3-0,4$ max for plants with steam parameters of $R_0=130 \text{ kg/cm}^2$ and $t_0=555^\circ\text{C}$, and the station with the steam parameters of $R_0=35 \text{ kg/cm}^2$ and $t_0=440^\circ\text{C}$, have the ratio of installed capacity utilization even lower $k=0,2-0,3$, as greatly inferior in efficiency in condensing mode powerful units with reheat.

One of the indicators that determine the efficiency of the equipment of the combined heat and power plant is the specific production of heat consumption.

Table 1.Changes in specific output indicators for different types of equipment.

№	type of equipment	steam options	the ratio of the specific production	specific consumption
1	T-250/300-240	240/540	0,73	325
2	T-110-130	130/555	0,628	380
3	ВПТ-25-90	90/510	0,54	413
4	T-6-35	35/440	0,44	460
5	steam-gas installation of binary type		1-1,2	241

As can be seen from Table 1, only t-250/300-240 type of turbines are able to compete in summer modes for condensing power units. Thus, the majority of combined heat and power plants with existing equipment are morally and physically obsolete and require reconstruction or modernization.

In general, the choice of the number and unit capacity of gas turbine units is a complex technical and economic task, having an iterative nature, taking into account the maximum and minimum level of required loads.

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ОСНОВНЫЕ ПРИНЦИПЫ РЕКОНСТРУКЦИИ И МОДЕРНИЗАЦИИ ТЭЦ

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Аннотация

Рассмотрены наиболее эффективные способы реконструкции установок ТЭЦ, рассматриваются случаи варианта выбора реконструкции исходя из реальных условий эксплуатации и эффективности проекта, приводится наглядное представление выработки на примере теплового потребления

Ключевые слова: расход, реконструкция, топливо, турбина

TYOLOGY OF COMMERCIAL BUILDINGS OF 19th-EARLY 20th CENTURIES

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Abstract

The article discusses the types of commercial buildings in Russia in the 19th and early 20th centuries. Descriptions of each type of building, their characteristics, as well as its current state and usage are given.

Keywords: fair houses; shopping arcade; trading houses; typology of commercial buildings.

Introduction

Trade has always been the main engine of the economy and determined its development, since the volume of trade turnover was the most important indicator of the development of the country's economy as a whole. With the development of the economy there is a need for commercial buildings of different comfort. The history of commercial buildings dates back to the late 18th century. In modern Russia, the following types of these buildings are distinguished: passages, where shops are placed in tiers on the sides of a wide passage-gallery; department stores - a multi-level space with a central well-lit space that serves as the main hall; malls - a collection of independent shops, service establishments and parking spaces. For small provincial towns until the beginning of the 20th century, other types of buildings were considered, which are discussed further.

Types of commercial buildings in provincial cities

Famous Russian art historian G.K. Lukomsky in his book "*Monuments of ancient architecture of Russia. Part 1. Russian province*" singled out the following commercial buildings in provincial cities, such as shopping arcades, trade houses and trading houses.

[1]

Gostiny courtyards are a complex of buildings providing services for the wholesale trade in goods and accommodation for visiting traders, which is one of the distinguishing features. Mostly they were located in provincial cities and most often in their central part. Gostiny courtyard is premises of perimeter building, inside of which there is an extensive yard used for unloading and storing goods. This building had one or more travel arches for passage into the yard of transport. The courtyard was surrounded around the perimeter of the two-story buildings, where, as a rule, the shops on the ground floor and the merchant's office on the second floor were located [2]. Merchants came to the courtyards with a large stock of goods and spent in them a long time needed to market the entire consignment of goods. The building itself was often two-storied in the style of classicism, as a rule. One example of this type of building is outstanding monument of Moscow architecture - GostinyDvor, built at the end of the 18th century. The complex is surrounded by high whitewashed walls with gates, above which an octagonal tower stood. During its existence, the building has undergone several renovations and was rebuilt as a trade fair complex, today it houses shops, restaurants, banks and office premises.

Another vivid example of a building of this type is the GostinyDvor in Tambov (see Fig. 1). Construction began in 1834. Merchants Pyotr Suvorov, Ivan Malin, Ivan Belyaev, Ivan Duplyankin, Nikolay Sorokin and others allocated money for the construction of GostinyDvor, and their names appeared in historical documents. Works went quickly, and by 1837 the new GostinyDvor was ready [3]. It was a two-story building in the classical style in the image of GostinyDvor in St. Petersburg. GostinyDvor was the main shopping center in Tambov until 1917. The building has undergone several significant reconstructions and rebuilding. Currently, only a part of the retail space is used for its intended purpose.

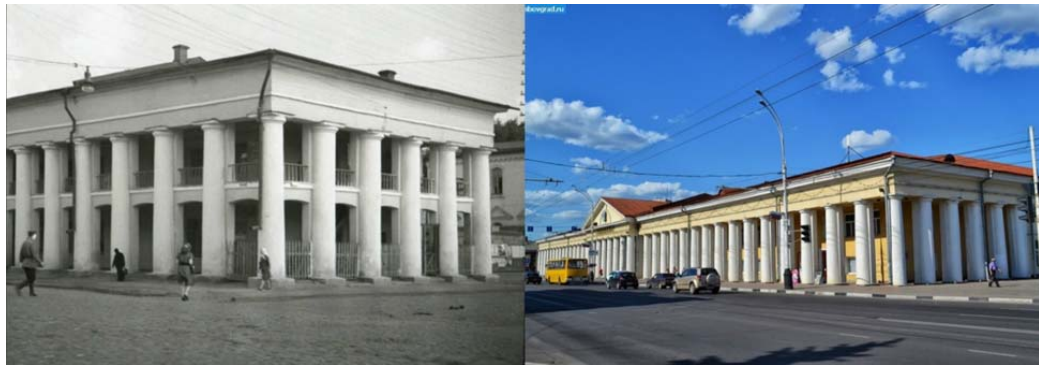


Figure 1 - GostinyDvor in Tambov: 1950s (left) and current state (right)

A unique form of trade was the fair that is, regularly arranged in one place and at one time a big bargaining, with amusements, entertainment. For it, it was necessary to have a permanent venue, so in places where the largest fairs were held in Russia, fair houses were built. One example is the Fair House in Vologda. During the fair in Vologda, all the trade areas of this building were leased to local and visiting traders; therefore the name of the Fair House was fixed to it. At the end of the bargaining period, the trade premises of the Fair House were leased to local merchants. Nowadays, the building has a shopping arcade and shops, but it is in a poor condition.

The next type of shopping center is the shopping arcade. They were intended solely for retail. These buildings were located on the market squares of provincial and small provincial towns. The malls are a traditional domestic type of architectural structure, representing two rows of shops, united by a common passage in the middle, which had no coverage [2]. The building also housed a warehouse area. The system of longitudinal and transverse aisles between the rows of shops is typical of the layout of the shopping arcade, which occupy large areas. They had one-story, as a rule. As an example, the Trading ranks in Kirsanov, Tambov region (Fig. 2). This is one of the oldest capital buildings of the city. According to documents, they were erected in 1838 - 1842. Initially, the trading rows were wooden, they became stone in 1839. Currently the building is in unsatisfactory condition. The purpose of the stone rows as a shopping center has not changed in our days. They are being reconstructed and will serve people for a long time.



Figure 2 - Shopping arcade in Kirsanov: 1950s (left) and current state (right)

Another vivid example is the “Big Kare” shopping arcade in the city of Tambov on the territory of the Central Market. Stone Great trading rows were built gradually, putting into operation in parts, from the 1790s to 1856. The construction of the four stone rows was completed by the end of the XVIII century. L-shaped in terms of the hull formed the "square". The buildings are made of clay brick, have arcades around the perimeter, basements under the entire area of the building, with vaulted brick overlapping. Currently, an architectural monument of federal significance is in disrepair.

The last type of shopping buildings is trading houses. Law-legal status of trading houses as a form of entrepreneurial activity was first received in the manifesto of 1807. One of the primary reasons for the popularity of this type of partnership was the simplified procedure for their establishment. With the development of trade in towns and villages of Tambov province numerous groups of professional traders appeared. The richest among them were merchants. However, the merchant title could be obtained only for big money. Therefore, there were relatively few merchants in Tambov province. Almost all of them lived in towns. The merchants built two- and sometimes three-storey mansions with large basements for goods. Many of these houses are still preserved in Tambov and Tambov region towns: for example, Tolmachyov’s house (Fig. 3) and Petin’s house in Tambov, V.I. Kaverin’s house and Semenov’s house in Morshansk, Mityaev’s house in Kirsanov. On the first floors of these buildings there were usually located shops, and on the second the owners lived. Some merchants had several houses, using them for delivery to stores for small merchants or for residential apartments [4]. Since the buildings are located in the central parts of towns, they are actively used as public buildings and they are in a satisfactory condition.

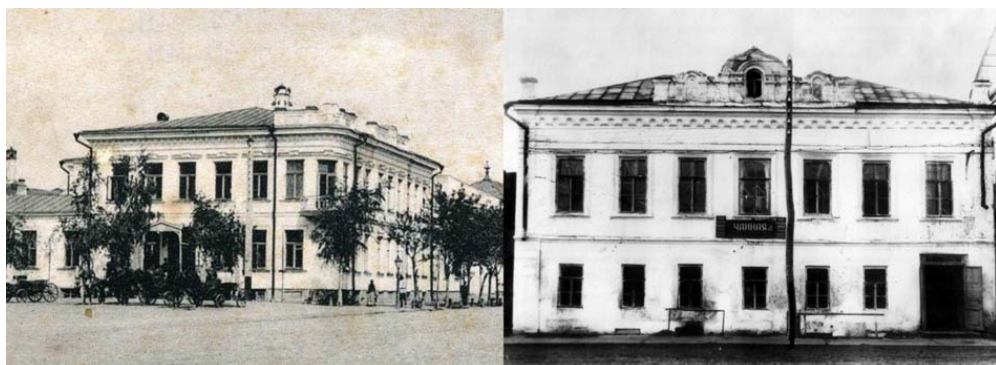


Figure 3 - The house of the merchant Tolmachyov in Tambov (left) and House of merchant Mityaev in Kirsanov (right)

Conclusion

The above types of commercial buildings are widespread in many provincial towns of Russia. The condition of these buildings is from emergency to satisfactory, modern use is diverse from commercial to administrative. The task of further research is to analyze the technical condition and nature of the modern use of historical commercial buildings and suggest options for their use depending on the location in the city.

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ТИПОЛОГИЯ ТОРГОВЫХ ЗДАНИЙ ПЕРИОДА XIX-НАЧАЛА XX ВВ

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Аннотация

В статье рассматриваются типы торговых зданий в России в XIX- начале XX вв. Приводятся описания каждого типа зданий, их характерные особенности, а также современное состояние и использование.

Ключевые слова: гостиные дворы; типология торговых зданий; торговые дома; торговые ряды; ярмарочные дома.

ARCHITECTURAL AND TOWN-PLANNING CONCEPT OF INDUSTRIAL PARK DESIGN

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Abstract

The concept of an industrial park is given. Design of industrial parks, their key zones and their connection with each other are shown using the example of Akademgorodok in Novosibirsk.

Keywords: design, industrial park,

Introduction

The term “innovation ecosystem” is used by modern research institutes, investment funds, production facilities, public and private enterprises, as well as universities participating in the development and implementation of new technologies. This concept includes infrastructure, mechanisms and communities. One of the important structural components of the innovation system is technology parks, research parks in higher education institutions.

The world experience has shown that the development of the economy is associated with the emergence of a small modern enterprise, which occurs in research institutes and universities next to them. Industrial parks are simultaneously preparing new technologies, provide platforms for running modern business, personnel for corporations, and can also be used for the development of specific industries and the fight against the lack of staff.

The mechanisms that are used for this include grants, tax benefits and inexpensive rental of premises. Industrial parks have special infrastructure (buildings, structures, telecommunications, which, along with certain tax benefits, are provided to new high-tech firms).

Industrial parks operate in the general field of the so-called “umbrella structures”. These structures (which also include business incubators, innovation centers, engineering centers, etc.) are called upon to serve not only start-up entrepreneurs, but also scientists, as well as developers, engineers, in order to ensure the rapid and direct implementation of developments and business plans. The specifics of the industrial park are scientific, design and technological developments related to high technologies.

The main activity of an industrial park is manufacturing. To solve the problems associated with the implementation of this activity, separate legal entities are created - small businesses and firms. These small enterprises, being isolated from each other, find themselves in a rather difficult situation, since they have very limited financial, technical, personnel and other opportunities. For this reason, small enterprises, as a rule, form associations, which are called a technology park or, in abbreviated form, an industrial park. Thus, an industrial park is an association of small firms in order to create a common system of economic and judicial services, technical maintenance, as well as a common system of investments and a common system of innovation activity on the basis of an institution. In other words, an industrial park is a friendly environment in which the high survival rate of small high-tech firms for high-tech production, as well as favorable conditions for their development, is ensured.

Functional zoning of the industrial park. Akademgorodok in Novosibirsk

The project of an industrial park is built around a research institute and a higher educational institution, which provide new technologies and highly skilled workers. Industrial parks will not be able to function only on grant funds from the state and research grants (although their share is important in financing), but the main capital is in the industrial park, business incubator, technopolis should be private. And it does not matter whether it will rely on large giant companies or an industrial park to be a platform for many small firms, only if there is private capital, not only the operation, but also the further development of both the industrial park and the city of science, on the basis of which the innovation zone is created.

In order to maintain the functioning and attract students, researchers, entrepreneurs, service personnel and just residents, you need to design housing. Depending on the area, the urban development plan, the settlement plan of the population and the plan for the development of a specific industrial park, the nature of the building should be chosen as housing. It can be as well low-rise private buildings as apartment buildings with varying degrees of number of storeys. Housing needs to be added communal storage area with the presence of the Fire station, parking garage, repair shops, buildings, housing department and home services. In a residential community, kindergartens and schools should be designed, not only for a certain number of residents, but also calculate areas so that with the development of a technology park and an increase in the number of inhabitants there would not be a shortage of pre-school educational institutions, as well as schools.

Socially important objects, as well as administrative buildings should be within walking distance of the residents of the technopolis. As a rule, technopolis is designed with emphasis on the preservation of the ecology and the maintenance of the environment, green spaces should be preserved wherever possible and for a better psycho-physical state of the population, park areas should be made as close as possible to housing and other areas of industrial parks. Ideally, in a modern area, it is necessary to minimize auto transport and design everything so that not only work areas, but social and cultural and leisure zones are located within walking distance (Amsterdam and Copenhagen, for example, in these cities there is a very low level of personal auto transport, residents walk on foot and use bicycle transport in large numbers, and when the distance is considerable, they use urban public transport).

The industrial zone in the industrial park occupies a key role, it must be closely connected with the research zone, as well as have the correct location relative to housing, you must immediately take into account how harmful production is, whether it is exposed to air emissions and whether it can harm the nearest settlement.

For example, Akademgorodok in Novosibirsk for a long time remained a phenomenon, an atypical city, surprising both foreigners and Soviet people. Today such non typical approach is balanced by a change in social relations by a different status of science and scientists in society. But, without any doubt, it can be said that this was the first technopolis of the Soviet Union, successful both in concept and in implementation.

From the point of view of the architectural and planning organization of Akademgorodok, the concept of maximum preservation of the natural landscape and its transformation into a full structural element of the urban environment was put. It was a novelty. For the first time, architects did not fight with nature and did not subordinate it to formal planning schemes, but interacted with the landscape, carefully preserving any forests. In fact, an experiment was carried out on the construction of an ecological city in

which residential quarters and research institutes were mixed with relict forest areas and birch groves. Another planning function was to create a message system that provides the shortest transport and pedestrian connections between and within zones. Transport and pedestrian flows were divided, and transit transport was removed from Akademgorodok. Footpaths for pedestrians are laid through the forest. There is a special network of tracks for cyclists.

The industrial park implements the most modern engineering system at the time of its creation. All motorway communications, with the exception of sewage, are laid into the general collection of a reinforced concrete collector through a passage from which galleries come to research institutes and residential neighborhoods. Functionally, the territory is divided into three zones: scientific (with an adjacent utility warehouse), residential and public zone. Zoning has retained existing forests and open green areas.

The zone of scientific institutes is located in the northeastern part and was originally designed to house fifteen research institutes. The institutes were grouped according to their scientific interrelations and the provision of territorial reserves for further development. The zone of scientific institutes was separated from residential areas by an extensive forest territory, which served as a sanitary protection zone.

Conclusion

When designing, industrial parks should be divided into the following areas: Research, Educational, Residential, Business Area, Communal Warehouse Area, Public Park, as well as the possibility of designing a specific area in each specific case upon request of the customer. Design is possible only with an integrated approach, affecting all spheres of life as researchers and students, as workers and ordinary people, taking into account their jobs and civilian life, the possibility of recreation and cultural pastime.

Further subject development should take into account the needs of all segments of the population, as well as the development of the technology park, to provide promising areas for various functions with further development.

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АРХИТЕКТУРНО-ГРАДОСТРОИТЕЛЬНАЯ КОНЦЕПЦИЯ ПРОЕКТИРОВАНИЯ ТЕХНОПАРКОВ

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Аннотация

Рассмотрено понятие «технопарк», а также особенности проектирования технопарков, выделения ключевых зоны технопарков и их связи между собой на примере Академгородка в г. Новосибирске.

Ключевые слова: проектирование технопарка, индустриальный парк, технопарк.

DEVELOPMENT OF A 3D MODEL OF THE BUS STATION BUILDING WITH A CROSS VAULT

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Abstract

The article considers the use of 3-D-modeling for the design of public buildings. The classification of the intersecting vaults is given. The model of a covering in the form of a cross vault for a modern bus station building is presented.

Keywords: building material, cross vault, classification, modern construction, requirements.

Introduction

In the next five years a unified digital state platform and its Building Information Modeling (BIM) should be used in the Russian construction industry at any stage of capital construction objects life cycle. “Digitalization of regulatory and technical documentation in order to create and maintain a fund of digital regulatory and technical documents used in construction” will start in 2021. The updated “Digital economy” state program, with a total budget of more than 3.5 trillion rubles, includes the “Digital construction” subprogram. On July 19, 2018 the Head of government received the instruction No. Pr-1235 “On Modernization of the Construction Industry and Improving the Quality of Construction” issued by the President of the Russian Federation. According to this document, the life cycle management of capital construction objects will be available after the introduction of BIM technologies. The “Digital construction” state project will start a new digital era of cities of the future. In accordance with the document, after implementation of the digital system, financial and time costs for the construction of facilities financed from the state budget will decrease by at least 20% in five years.

Use of large-span structures in the bus station building

The use of BIM has recently been massively used. It was used to design nine large-span stadium buildings for the 2018 World Cup. The Autodesk Revit program by the AECOM International Company designed the Otkrytie Arena stadium in Moscow. The “Design Institute of Oreon” company designed stadiums in Yekaterinburg, Samara, and Volgograd. The Sodis Lab has created BIM models and equipped seven stadiums with monitoring systems for structures in Yekaterinburg, Saransk, Samara, Nizhny Novgorod, Kaliningrad, Moscow (Luzhniki Stadium) and Sochi. The systems are a network of sensors that monitor the technical condition of the facility in online mode and software for equipment installed on the building.

The use of long-span structures optimizes the load-carrying properties of construction materials and therefore allows building light and inexpensive roofs. One of the main tasks of construction is reduction of structure weight from both economic and environmental points of view. Weight reduction decreases the amount of construction materials, including their production, processing, transportation, installation, and

subsequently recycling, and lessens energy consumption at each of the mentioned stages. Therefore, builders and architects are interested in new types of advanced structures, especially in long-span roofs.

The article studies the possibility of using a traditional groin vault in a modern public building. The groin vault is formed by the intersection of two barrel or elliptical vaults of the same height at a right angle. This type of vault was used in construction of square or rectangular planned rooms. The vault can rest on supports installed at the corners, and, therefore, dislocate pressure onto them.

Below are the examples of use in religious [2] and public buildings. In 1108, the Gate Church of the Kiev-Pechersk Lavra was built, in 1045–1050 - St. Sophia Cathedral in Veliky Novgorod, in 1160 - Assumption Cathedral of Vladimir-Volynsky [3], in 532–537 - Sofia Cathedral of Constantinople, in 590-604 - Georgian monastery Jvari (monastery of the Holy Cross) in Mtskheta, etc.

A groin and dome vault, used in construction of temples, is based on a three- or five-span post-and-arch system. Arch walls, supported by external walls and central columns, are the base for barrel vaults that create the cross, and the corner cells. A central light drum is located on central arch walls, dividing the vault into separate modules, and creating counter crossbars. Construction stiffness depends on following main elements: central columns, parts of the walls, gauged arches, ceilings, combined in a diaphragm, and spatial corner cells [4].

The use of a vault has several advantages: complete use of the total building volume; vault use with the smallest number of internal supports; smaller amount of material used in construction; better load-carrying properties.

A groin vault consists of load-carrying structures that withstand transmitted loads from the elements above, and a guarding part, that protects the vault from external phenomena.

A groin vault should meet the following requirements. It must withstand constant (from its own weight), and temporary loads (from snow, wind and loads during the use). The guarding part of vault (roof), used for protection of a building from precipitation, must be waterproof, moisture resistant, resistant to spray coating and corrosive chemicals contained in the air and falling as precipitation (rain, snow, etc.). It also should be protected from solar radiation and frost, i.e. from heat loss in winter and overheating in summer; buckling, bursting, or melting. Operational time of a vault must correspond to the class of a building, be efficient and should minimize operating costs. Industrial methods, used in construction of roofs, reduce labor costs at the site and improve the quality of construction and installation works [5].

Concrete, reinforced concrete, brick, wood, glass, and polymeric materials are used in constructions. Brick vaults are laid out on the brick formwork, which is supported by walls and centerings. Shotcrete can be used in concreting. In this method a fine-grained concrete mix is fed to a two-layered metal mesh laid along a welded metal structure of the vault by compressed air pressure [6].

Simple vaults can be made of light frame structures, and prefabricated vault structures with a span of up to 50 m can be assembled by a team without using a building crane.

A metal framework with siding reduces the weight of construction, making its installation and assembly more convenient and, therefore, increasing the constructability. Necessary elements are made at metal structures enterprises, assembled at the

construction site, sheathed on the ground, and then installed in the final position with a crane.

Wooden elements used for vaults construction should be protected from moisture, fire, and pests [7].

By section shape, groin vaults can be divided into two categories. Vaults with section along the generator are divided into barrel vaults with a rectilinear upper surface, and semi-barrel vaults. Vaults with cross-section can be of three types: rectangle-, triangle-, or trapezium-shaped [8].



Figure 1 - 3-D model building bus station from different angles

As a part of a research on cross vaults, we created a design for a modern public long-span bus station building, with the roof design features considered, and selected construction materials. The exterior design of the building is created using a modern approach. The project was carried out using 3D modeling and project visualization in ArchiCAD according to the design requirements given in the regulatory documents (Fig. 1, 2).

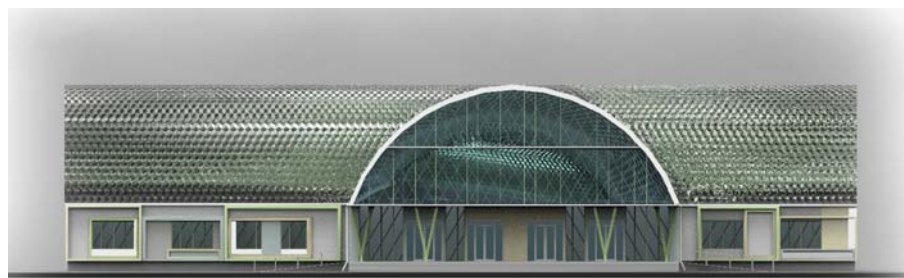


Figure 2 - Main facade of the bus station building

The main functional requirements for this type of building are comfortable and safe conditions for passengers waiting for buses inside the station and at platforms, fast and convenient ticket purchase, and optimal working environment for the staff.

It is necessary to provide different walking paths for the staff and passengers for easy use, operation, and maintenance of the bus station. Intersection of people moving in different directions at the entrances, exits, parking lots for passengers and staff, building's public utility sites and outgoing platforms for regular buses is not allowed.

The bus station is designed as a one-story cross-shaped building. The entrance space consists of a wind porch, which has four entrance doors. The wind porch leads a passenger into the waiting room - the main distribution point of the entire building that includes passengers and people who want to buy or return a ticket. There are two exits from the waiting room into the outdoor area - one is in the administration area and another is in the area for visitors. They also can be used as emergency exits. Passengers can get to the platform through three doors that first lead them to the wind porch, and then outside. Persons with limited mobility can get into the building using ramps installed on both sides of each entrance of the station. Ramps have handrails installed on two height levels: one is for the person in a wheelchair and another is for their assistant.

The bus station is divided into various functional units. The area of the premises was determined by the specific standardized area per person. The number of passengers or staff is given.

Conclusion

Summarizing the above, we can say, the location of administrative, economic and information-serving blocks are on the horizontal axis of the cross of the building plan, and the block for visitors – is on the vertical axis.

The use of vaults in modern construction refers to a promising direction. The development of large-span structures allow solving complex technical and artistic problems. And this is maximum use of the internal space of the building.

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РАЗРАБОТКА 3D-МОДЕЛИ ЗДАНИЯ АВТОВОКЗАЛА С ПОКРЫТИЕМ «КРЕСТОВЫЙ СВОД»

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Аннотация

Работа посвящена применению современных технологий 3-D-моделирования для проектирования общественных зданий. Приведена классификация крестовых сводов. Представлена модель покрытия в виде крестового свода для современного здания автовокзала.

Ключевые слова: крестовый свод, строительный материал, классификация, требования, современное строительство.

MAIN SQUARES

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Abstract

The lack of main squares in cities is always the main problem. The demand for a full-fledged main square of the city remains an urgent task of urban planning practice. Its openness to the people and at the same time, seclusion, creating a sense of calm, are inextricably linked attributes of the main urban space.

In Tambov, there is no full-fledged pedestrian area, which is not affected by motor vehicles. That is why it is proposed to create a whole enfilade overlooking the picturesque bank of the Tsna River, on the nature.

Keywords: architecture and authority, enfilade, main square, town planning.

Creating space in the current urban environment has always been a challenge. The formation of the new, on the basis of the old and the unprepared, created a conflict of interest. In the case of Tambov, the soil for such changes has been prepared for decades. And now, once again reviving the idea of creating a full-fledged main square, it was decided not just to form a public space, but to create a whole enfilade of such spaces, surpassing all previous reflections on this matter.

Architecture and authority are inextricably linked with each other throughout the history of mankind. As society develops, so does the management system of this society, and therefore the role of architecture and urban planning must increase.

Tambov is a regional center with almost 290 thousand people living in it. On weekends and holidays, the younger population rush to spend their time in the city center. Such places are squares and parks. But such events as rallies, parades, holidays May 1: Spring and Labor Day, May 9: Victory Day, June 12: City Day, December 31- January 8: New Year holidays require large open spaces.

Urban Square is an open area, architecturally organized framed by buildings and green spaces, a part of the urban space system. Important events take place here, such as presentations by representatives of the city administration, celebrations and others.

Even in ancient Rome, there were forums - city squares, where city life took place, deals were made, and important issues were resolved. These areas were huge and were an integral part of the city.

Tambov requires certain places in which such conditions as specially equipped recreational spaces, a park part with entertainment, spiritual saturation and rest zones, various performances, as well as parking and eating places are combined. The main condition is the location. It should be in the center of the city (Fig. 1).



Figure 1- Situational plan

This recreational space can be solved by a number of town-planning and architectural problems:

1. The lack of a system of urban areas. Tambov does not have decent large areas where it is possible to hold important events without cutting off part of the car traffic during the event.

2. Stopping traffic on the main streets causes partial collapse of the central part of the town and the formation of large congestion on secondary streets due to their congestion. Small areas of squares, such as Lenin Square, a part of the square near the Kristall Palace of Sports, and the musical square on Naberezhnaya Street, unfortunately, do not satisfy the town planning needs as the main squares that could meet all the requirements.

3. The absence of a properly space for the patriotic and spiritual zone. In Tambov, on Sovetskaya Street, there is Zoya Kosmodemyanskaya Park, behind which is the religious part. During the parade on May 9, dedicated to the Victory Day, a passage is organized at the monument to lay flowers and commemorate the victims. The traffic stops along the main artery of the city - Sovetskaya Street. Thus, there is a lack of rationally-related spaces - Lenin Square and Zoya Kosmodemyanskaya Square.

The project is a suite of squares connected by a general concept of the development of pedestrian infrastructure, as well as the creation of a connection between the buildings of authority. The composition of the squares is read from west to east along the city's planning artery, Internatsionalnaya Street, and closes the track in the over-river part of

the city, to the right bank, with access to the picturesque Tsninsky quay. On the squares new spaces are formed. A lower level with an amphitheater appears on Lenin Square, a spiritual memorial zone with a large number of greenery stands on Zoya Kosmodemyanskaya Square, and a square crowning the ensemble with an administrative complex and a park on Red Square. In the newly created ensemble of squares, it is vital to place buildings that will lead the central composition and complement the existing.

At the moment, the existing buildings of municipalities are adapted and do not have the necessary infrastructure for full autonomous functioning. To solve this problem, the main buildings on each square have been designed, providing all the necessary city authorities. An administrative and business complex is being set up on Lenin Square, a palace of justice is being set up on Zoya Kosmodemyanskaya Square, and an administrative-representative complex, where all city authorities are concentrated, on Red Square.

A space that will expand the boundaries of pedestrian links and squares should be designed. The projected volumes meet all the aesthetic, architectural, city-planning, environmental, structural, engineering, economic and technological requirements.

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ГЛАВНЫЕ ПЛОЩАДИ

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Аннотация

Отсутствие главных площадей в городах всегда является главной проблемой. Востребованность полноценной главной площади города остаётся актуальной задачей градостроительной практики. Её открытость для народа и в то же время камерность, создающая чувство спокойствия, являются неразрывно связанными атрибутами главного городского пространства. В Тамбове отсутствует полноценная пешеходная площадь, которую не затрагивает автотранспорт. Именно поэтому предлагается создать целую анфиладу, выходящую на живописный берег реки Цны, на природу.

Ключевые слова: анфилада, архитектура и власть, главная площадь, градостроительство.

THE CONCEPT OF CREATING A YOUTH CULTURAL CENTER IN TAMBOV

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Abstract

The article addresses the issues of creating a cultural center in a big town, using the example of Tambov. The existing situation is analyzed and ways of its improvement from the perspective of architecture is proposed. Also, the necessity and possibility of creating the architectural space for youth leisure in Tambov are identified.

Keywords: architectural analysis; leisure; multifunctional complex; youth.

Introduction

In modern life, the issue of organizing the leisure of young people is very important because a culturally and mentally rich young nation is essential for an educated and healthy society.

Today, more than 80 thousand motivated and active young people live, study and work in Tambov. Moreover, the direction of creative education is developed in the city successfully. There are two universities that have faculties related to culture and art, as well as two art schools. All this suggests the presence of productive ground for the education of creatively active professionals. The only question is whether there is a place for entertainment and talent development.

To answer this question, the analysis of the availability of the city with cultural and recreational facilities was made. The places with a similar function in Tambov include the leisure center “Dom molodezhi”, the cultural and leisure center “Mir”, the Tambov Youth Theater. Also, there are several large shopping centers, which perform a spectacular and entertaining function. At first glance, there are many places; however, further analysis revealed a number of their negative features:

- they are concentrated mainly in the historical center or too far from the habitual places of entertainment of young people in Tambov;
- they include a small number of functions and have an poorly designed format;
- they are located mainly in historic buildings;
- their appearance does not match the youth format.

The next stage of the study was to conduct a survey of young people aged 13 to 23 years. The survey made it possible to find out that among the forms of leisure of young people in Tambov, unfortunately, young people do not get involved in active leisure.

Thus, the conclusion was made about the imperfect organization of leisure activities for Tambov youth, as well as the need to create a cultural center in the city. The objectives of the center include:

- ensuring the synthesis of cultural education and entertainment;
- ensuring comprehensive personal development;
- providing opportunities for the development of their talents, helping in self-realization;
- providing places for communication and new acquaintances.

Town planning

As a result of the analysis of the location of all places in the city with leisure functions, it was decided to locate a new facility in the northern part of the city owing to the fact that this area is not represented here at all. This part of the city is in the process of active development, which means the growth of the younger generation.

For further research, a site at the intersection of Michurinskaya Street and Magistralnaya Street was chosen. The area of up to 5 hectares is available at the site for further building. This site is bounded on the north-west side by the roadway, on the south-west side - by the abandoned territory of the Studenets River, on the north-east and southeast sides - by residential buildings. The site is located on the border of two large residential planning areas.

The benefits of the site include:

- the presence of public transport nearby;
- large highway junction;
- the presence of university and schools;
- the uniqueness of a similar structures in the area.

However, the site has a complex terrain and it has 600 garages. The garages are too close to the roadway, to the Studenets River and to children's playgrounds. This is contrary to sanitary and hygienic requirements.

To implement the planned project it is necessary to remove all the garages. Moreover, according to the administrative document, this territory is intended for public and business development.

Architecture

The next step is to consider the architectural design of the facility.

According to the level of socio-economic development, the number of residents, administrative status and the level of cultural development of the city, a "public profile recreation center" is proposed for further design. It consists of the entertainment area and the club. The club consists of rooms for recreation and entertainment, lecture and information and studios.

After determining the blocks of the future youth center, it is necessary to calculate its capacity. The calculation was made based on the "social passport" of the city of Tambov, the norms of designing such buildings, the standards of urban planning of the city of Tambov, as well as the institutionalized notion of "youth". As a result, the cultural center needs to be designed with a total capacity of 2100 people, of which 1000 are in the entertainment area and 1,100 are in the club.

The main target audience of the center is young creative and active people and that is why its concept should be appropriate. It means that it is necessary:

- to design multifunctional spaces in it;
- to use concrete, glass and metal as the main building material;
- to use simple geometric forms;

Space and layout design

The building may consist of several large blocks that are united by the atrium, having:

- the entrance;
- the multifunctional auditorium;
- studios, lecture and information rooms;
- a catering unit with a restaurant for 75 seats and a coffee shop for 25 seats.

The entrance contains a ticket hall, a lobby and a cloakroom. From here visitors can get into the foyer of the auditorium and into the atrium.

The atrium on the ground floor is a multifunctional space for organizing exhibitions and various events. The gallery part allows visitors to get to the restaurant and studio unit.

In the studio on the ground floor, there is the administration of the building, the entrance and the lecture hall.

For the entertainment area in the designed center, a multifunctional auditorium was chosen. It was made to interest visitors in different formats of events: theatrical performances, musical performances, film screenings. The auditorium is located on the relief and has a main entrance from the first floor, from where viewers enter the balcony and descend to the orchestra and amphitheater. In one level with the stage are the premises for its maintenance. At the same level, but already in the underground part of the building, the necessary technical premises for engineering systems and equipment are located. On the second floor of the atrium in the galleries there is an entertainment area, a fairground, a coffee shop and administration.

Various workshops and studios are on the second and third floor of the studio. In the block there is recreation space. They can be used for exhibitions.

There is a parking lot for 99 cars on the underground floor.

At the site it is necessary to develop a system of walking paths, to organize communication with residential buildings. Provide separate entrances for different functional units, the required number of parking spaces for visitors and staff.

Thus, it is necessary to create a functional, comfortable and exciting space for the young people of our city. It can become their favorite recreation area and will help in creative self-realization.

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КОНЦЕПЦИЯ СОЗДАНИЯ МОЛОДЁЖНОГО КУЛЬТУРНОГО КОМПЛЕКСА В Г. ТАМБОВЕ

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Аннотация

В статье рассматриваются актуальные проблемы создания молодежного культурного комплекса в крупном городе на примере г. Тамбова. Проведён анализ существующего положения, и предложен путь решения данной проблемы с точки зрения архитектуры. Выявлена необходимость и возможность создания системы архитектурных пространств для досуга молодежи в г. Тамбове.

Ключевые слова: архитектурный анализ, досуг, многофункциональный комплекс, молодёжь.

MODERN PRINCIPLE OF EDUCATIONAL INSTITUTIONS DESIGN ON THE EXAMPLE OF SKOLKOVO-TAMBOV SCHOOL

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Abstract

The article discusses the modern approach to designing buildings of educational institutions in the context of the implementation of the national priority projects. The modern educational institution is a set of architectural, planning, spatial solutions that provide the opportunity to implement a variety of educational programs, preserve the health and development of students, and create conditions for security and computerization of the educational process.

Keywords: educational complex, educational infrastructure, educational institution, integrated approach, school.

Introduction

School No 1 “Skolkovo-Tambov School” is the newest educational complex, based on innovative developments in the technology of training and education, focused on the requirements of modern society. In this largest educational complex in Tambov, the national technology initiative and the priority project “Modern educational environment for schoolchildren” are implemented, taking into account not only the conditions and processes directly affecting on the training and education, but also an integrated approach to the formation of the educational institution space, combining architectural planning solutions, convenient spatial communications, security system and multimedia equipment.

The concept of the “Skolkovo-Tambov School” was created in 2011 and became the winner of an international competition, organized by the Skolkovo Foundation and the Ministry of Education and Science of the Russian Federation. The project was implemented thanks to the Tambov region participation in the program “Assistance to the creation of new places in the general education organizations in the constituent entities of the Russian Federation” for 2016-2025. The complex “Skolkovo-Tambov School” was planned to be built in 13 months, but this period was reduced, and the school was built in 8 months. The opening of the complex took place on September 1, 2017.

Social and economic efficiency of the project implementation

The complex was built in the rapidly developing northern part of Tambov, where modern microdistricts are located. Rapid growth of population in this part of the town has provoked a shortage of places in educational institutions. To provide the population with objects of social infrastructure, along with the construction of new kindergartens, it became necessary to build a new general education center, thanks to which it became possible to eliminate the third shift in schools in the northern part of the city.

Technical and economic indicators

- land area is 11233 m²;
- total area of the building is 33770 m²; useful area is 24418 m²; the cost of the project is 1,800.0 million rubles, 80% of which was spent on construction and installation work, 20% was spent on the equipment.

The complex of the educational institution is designed for 2425 places, including: for students of primary classes (grades 1-4) - 1000 places; for students of middle classes (grades 5-7) - 625 places; for high school students (8-11 classes) - 800 places.

In addition to providing children of nearby neighborhoods with necessary and geographically accessible school education, the school is solving another important task - providing the population with job. The school created about 179 workplaces: 149 teachers, 19 employees of the administrative and economic and educational support staff, as well as 11 people are administrative and managerial.

The school is designed for simultaneous training of 97 classes engaged in one shift. At the present time 90 classes are being formed and are being educated at school.

Space-planning solution

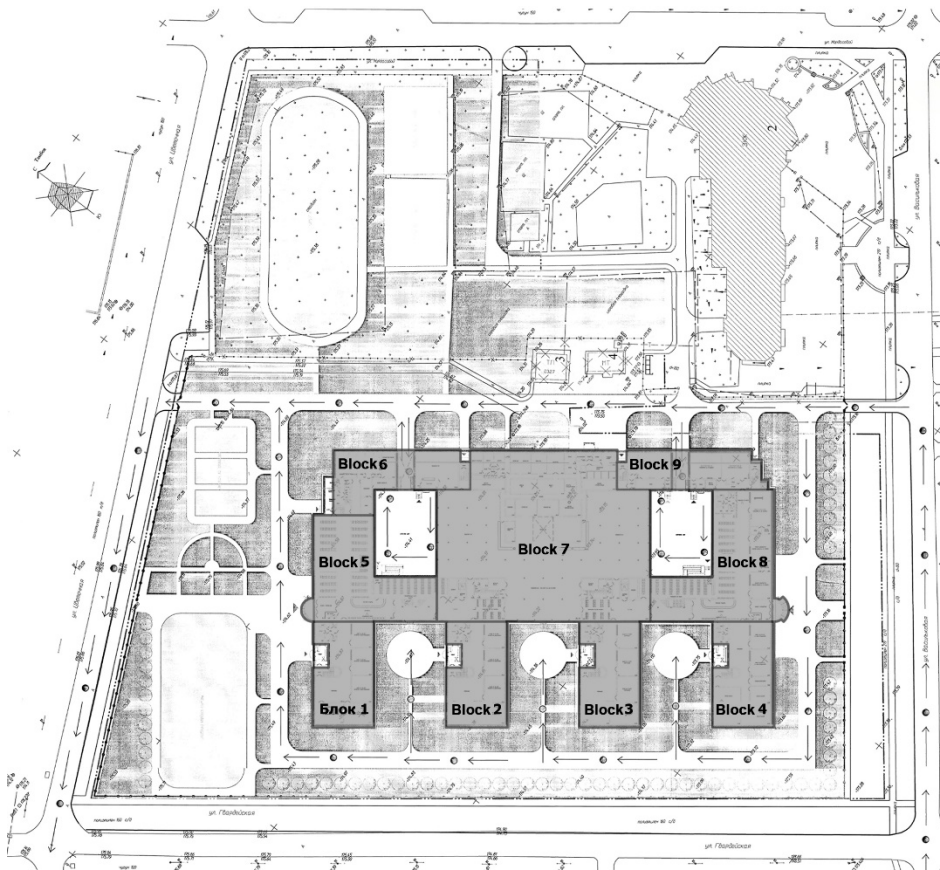


Figure 1 - School building block diagram with master plan

The building consists of 9 fragments creating a space-planning structure and united by a single compositional concept. Functionally, the building is divided into 4 three-storey fragments of educational modules, so when they locked with fragments 5,7,8, 3 court of honor is created, allowing to provide the best orientation of classes on the

cardinal points, reducing noise influence from the surrounding buildings, organizing well insulated and aerated spaces for games on the fresh air. Fragments 6 and 9 are solved in a four-storey version, blocking with fragments 5, 7, 8 of the central part. They form two closed courtyards with an area of 600 square meters each. These courtyards are connected to the school territory by fire passes with a height of 4.5 meters. Such solution made it possible to reduce communication links between the premises, to make the object more compact and provide functional zoning of educational modules and general school premises. The building has a basement, the most part of which is used to place engineering communications. A smaller part is occupied by technical premises. Communication with the basement part, according to fire safety requirements, is carried out only through the street space.

Educational infrastructure

The school building consists of 9 blocks. Here a developed educational infrastructure has been created, which includes 13 educational centers: a center for social sciences, a center for foreign and domestic linguistics, a center for natural science education, a center of floristics and landscape design, an information library center, a center for safety and physical health, an academy for children, a center for applied technologies, multimedia center, art center, center of professional competence development, center of IT-technologies, robotics equipment, modeling, center of design and technologies of service, as well as the Museum of entertaining science and internet cafe.

The organization of the educational process at school is developed on the basis of individual educational programs for each student, including especially gifted children and children with limited opportunities of health.

The main role is relegated to the integration of computer and nature world study, provided with modern teaching aids. It is considered that such approach is one of the determining factors in the formation of the modern man's worldview. A new material learning tools and education tools using is being widely introduced into the educational process. Due to this integration in the educational school space such placements appeared as school laboratories equipped with modern research equipment, including: physical laboratories (nano-laboratory and laboratory of surface physics, laboratories of mechanics, optics, electricity and magnetism); computer centers: "parallel computing center", "center of robotics"; bioecocenter, chemical laboratory, "space research laboratory", which includes a planetarium, telescopes and a system for receiving data from a satellite, etc.; center for Journalism and School Printing; school telecentre, video, photo, sound recording and editing studios, etc.

Modern approaches to the design implemented in the project

Nutrition has a great importance in school day mode. The nutritional system for students is constructed on the basis of scientific approaches and modern food cooking technologies developed during the implementation of the federal pilot project for school food modernization in the region from 2008 to 2011. The canteen is designed in such way, that than children enter the dining room they move through the washroom, thus requiring students to follow the hygiene rules before eating. Payment for meals is possible using cashless payment system "Ladoshki" based on biometrics technology. Through the use of biometric technology, schoolchildren will not be left without lunch,

because of lost or forgotten money at home, because all the money is always with them - "on the palm". For students of middle and high schools the system of "buffet lunch" is organized.

Special attention at school is given to the health of children. For this purpose the Skolkovo-Tambov School complex has a "school center of safety and physical health", which includes a modern gym, two sports halls, a multifunctional sports zone as well as a hockey rink.

Safety in the schoolhouse is provided by such types of safety as: anti-terrorism security, fire safety, information security, prevention of child and industrial injuries, prevention of measures safety violations, and the danger connected with the technical condition of the environment. Antiterrorist security at school is provided by an access of control system. This system includes point of protection with video monitoring on entrances, the "Ladoshki" access control system, turnstiles, a system of automated inspection of hand luggage, as well as a radio and telephone installation system.

The school building and the territory of the whole educational complex provides barrier-free movement for all people with limited mobility. Thus, the implementation of the state program "Accessible Environment" for 2011–2025 is provided: the necessary inclines of ramps and sidewalks paths are observed, the necessary dimensions of doorways are provided, there are additional handrails on the stairwells, the barrier-free vertical movement by elevators, etc. There are healthy children, children with limited abilities of health and disabled children at school.

To monitor the students' health at the school a multifunctional wellness center is provided, which uses modern computer technology. The school uses the diagnostic complexes "Healthy Child" developed by Tambov scientists in cooperation with regional medical equipment manufacturers. Monitoring of students' health is conducted twice a year according to the plan. The monitoring program includes the determination of the morph functional characteristics conformity of school students of different ages to the standards. The project provides dental, vaccination and massage rooms, inhalation, and a phyto-bar.

Conclusion

According all these, it can be concluded that the new educational complex "Skolkovo-Tambov School" has successfully implemented the principles of the modern educational environment in the learning process. According to the results of the institution for the year, it can be concluded that in the school the necessary conditions for learning individualization were created using distance learning technologies, modular education, building an individual trajectory of students extracurricular individual activities (trajectory of extracurricular activities of students), and continuous interaction of participants of educational relations.

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СОВРЕМЕННЫЙ ПРИНЦИП ПРОЕКТИРОВАНИЯ ОБРАЗОВАТЕЛЬНЫХ УЧРЕЖДЕНИЙ НА ПРИМЕРЕ ШКОЛЫ СКОЛКОВО – ТАМБОВ

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Аннотация

В статье рассматривается современный подход к проектированию общеобразовательных учреждений в условиях реализации приоритетных национальных проектов. Рассматриваемое образовательное учреждение представляет собой комплекс архитектурно-планировочных, пространственных решений, обеспечивающих возможность реализации разнообразных образовательных программ, сохранения здоровья и развития учащихся, создания условий безопасности и компьютеризации образовательного процесса.

Ключевые слова: комплексный подход, образовательный комплекс, образовательная инфраструктура, школа, учебное заведение.

IMPROVING THE ENERGY EFFICIENCY OF THE SPORTS COMPLEX

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Abstract

The article deals with the problems of improving the energy efficiency of a sports complex. Examples of improving the energy efficiency of the complex are given. The most significant parameters affecting energy efficiency are given.

Keywords: energy efficiency, sports complex.

September 1, 2016 №1853-p the government approved a "road map" to improve the energy performance of buildings. According to government directives, 30% of buildings in Russia should have the highest energy efficiency class by 2025.

The main requirements for the design of energy-efficient sports complexes are set out in [1]. [2] establishes the same basic requirements for specific loads on heating and ventilation for all categories of public buildings. To assess the energy efficiency of libraries, schools, cinemas, shopping centers, sports complexes for the basic requirements it is proposed to take the same indicators, although the energy intensity of these categories of buildings differs several times.

The buildings of sports complexes are large energy consumers, and the energy is used by a variety of systems and installations supporting the functional process of such institutions. In addition, most of the sports complexes are unique in size and purpose, space-planning and design solution, functional process.

When designing sports complexes, the priority is to ensure the required parameters of the indoor microclimate, depending on its purpose. The main consumers of electricity in sports complexes are ventilation systems, lighting, heating and hot water. In regions with a cold climate, a greater amount of energy consumption of the building falls on heating and hot water.

Increasing the energy efficiency of a building can be achieved by:

- simple energy-saving measures that do not require significant capital expenditures: turning off unused lighting devices, ventilation systems, other equipment that is not used at a particular point in time, as well as reducing the illumination or air exchange to the minimum acceptable. Energy savings can be up to 10%;

- regular maintenance of equipment and instruments (replacement of air filters, cleaning of lighting devices, control and timely replacement of seals in pipelines, check of thermostatic valves, etc.);

- effective constructive and space-planning decisions of the building, timely effective overhaul, which significantly reduces energy consumption;

It is important during operation to monitor the definition of basic energy consumption of sports complexes. In addition to the main determining parameters adopted for residential buildings, it is necessary to take into account the following important factors:

- the mode of operation of buildings (the number of working hours per week with different loads);
- density of staff and visitors;
- functional purpose of the premises (internal technological heat generation, illumination level), etc.

Analyzing the variety of parameters affecting the energy consumption of the sports complex in use, we can identify the most significant ones:

- estimated area per employee (visitor);
- estimated daily average internal heat generation;
- mode of operation (the number of actual working hours per week);
- the duration of each mode of operation on average per year (if there are different modes of operation of premises);
- the level of illumination of the main premises and zones;
- air exchange level in each of the rooms.

Due to all the above, it should be noted the difficulty of achieving efficient energy consumption of such buildings without the use of modern innovative technologies, such as “smart building”.

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ПОВЫШЕНИЕ ЭНЕРГОЭФФЕКТИВНОСТИ СПОРТИВНОГО КОМПЛЕКСА

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Аннотация

В статье рассматриваются проблемы повышения энергоэффективности спортивного комплекса. Приведены примеры повышения энергоэффективности комплекса. Даны наиболее значимые параметры, влияющие на энергоэффективность.

Ключевые слова: спортивный комплекс, энергоэффективность.

ADAPTATION OF CULTURAL HERITAGE OBJECTS FOR MODERN USE

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Abstract

This article is devoted to the problem of adapting cultural heritage objects for modern use. The article describes the main requirements that must be met with this type of restoration works.

Keywords: adaptation for modern use, cultural heritage objects, feasibility evaluation of adapting for modern use.

Introduction

Currently, the problem of conservation and operation of buildings of historical, architectural and cultural value is relevant. It becomes impossible to preserve the functional purpose of historical buildings in modern conditions due to tightening of regulatory requirements. As a result, restoration of cultural heritage objects is reduced to the development of building adaptation projects for modern use.

Adaptation of cultural heritage objects for modern use

Adaptation of historical buildings for modern use is one of the ways to ensure their preservation. Object of cultural heritage can fall into 3 categories:

(1) Objects of state significance that cannot be changed. They can accommodate a museum and the cultural heritage object itself can be presented as a museum.

(2) Objects of national significance, which are used for practical purposes and it needs adaptation to modern conditions. These include the cultural heritage objects of federal and regional significance. Such objects are subjects of adaptation for various functions without losing of protection monument things;

(3) Objects of local significance which are objects of adaptation because they may disappear. Such objects include the real estate buildings, the status of which is not obvious and there are mixed opinions of professional and local communities about it. The change in volume and constructive decision is allowed to provide new functions while maintaining the subject of protection [1].

It is necessary to choose the functional purpose of buildings while they are adapted. The following types of functions exist in practice:

(1) The function of museum. This function is used for the cultural heritage of the first category, and can also be used for objects in which famous people lived;

(2) The new function that matches or is similar to the previous function

(3) A new function. It is necessary to select a function that does not require of changes in space-planning and constructive decisions, corresponds to the capabilities of the monument and contributes to its further preservation, while using the rooms in this case. Such function is assigned to the cultural heritage objects of the third category.

It is necessary to take into account the features of the object while adapting it as much as possible. The main condition is to preserve the characteristics that are the subject of protection, while adapting to modern use. The use of dissonant space-spatial and architectural solutions for silhouette and color, including the use of bright colors in facing

of facades, roofing, siding and other artificial materials in facing of facades, the use of building technologies that create dynamic loads, excavation without archaeological research is prohibited [1]. The historical buildings are supplied with the necessary engineering equipment, which should provide a comfortable environment. The violation of the aesthetic and design integrity of the building should be reduced to a minimum by engineering networks. The more flexible approach is required to the task and the non-standard decisions have to be made often. The significant restrictions are put into on punching and peeling walls, arches, ceilings. If valuable stucco, frescoes are available in the object, then optimal temperature and humidity parameters are created to ensure their preservation.

There are 20 of cultural heritage objects of federal significance, 451 objects of regional significance and 5 objects of local significance as of the end of 2018 in the Unified State Registrar of Historical and Cultural Monuments in Tambov Region [2]. One of the cultural heritage objects of regional significance is the “Ensemble of provincial zemsky hospital. Infectious housing in Tambov”. Fig.1 shows the facades of the building.



Figure 1 – The main facades of cultural heritage objects of regional significance of the “Ensemble of provincial zemsky hospital. The infectious housing” in Tambov

One can encounter with certain difficulties in adapting buildings for modern use. This is due to the fact that the restoration works in the conditions of the existing building. Over time, regulatory requirements become tougher, so it is not always possible to provide their fulfillment in the prevailing conditions.

We consider this problem using the example of the infectious housing building, which is a part of cultural heritage objects of regional significance the “Ensemble of provincial zemsky hospital”. The building was constructed at the beginning of the 20th century. Despite the fact that modern style prevailed at that time in Tambov, the infectious housing continues the stylistic line of the end of the XIX century. This is a red brick building with a large-scale decor. Its elements are borrowed from such architectural periods as classicism, gothic, and romance. The building has risalits that allow dismembering the extended facades visually. The main accents that attract attention are the dome and gables.

Since 1948 the building of infectious housing has been used as a medical institution. Currently, it is in unsatisfactory condition and requires restoration works. During restoration it is necessary for the building to meet all modern requirements, and this is difficult already due to the tightening of regulatory requirements for such institutions.

Therefore, the question arises whether to leave the old function of infectious hospital. The length of the evacuation routes exceeds the standard for modern fire prevention requirements. It is impossible to reduce their length, since it is prohibited to arrange external escape stairs due to the deterioration of facades appearance. Also, the requirements changed for the planning parameters. In this regard, the number of beds will be reduced, which cannot be considered profitable during the restoration work.

Conclusion

It is necessary to assess the feasibility of using the building with the same functional purpose and the use of the building with the appointment of a new function with less stringent requirements for the rational use and preservation of cultural heritage objects before carrying out restoration work. It might be better to adapt this building for modern use, and, if possible, to build a new high-grade building that will meet all regulatory requirements as close as possible.

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АДАПТАЦИЯ ОБЪЕКТОВ КУЛЬТУРНОГО НАСЛЕДИЯ ДЛЯ СОВРЕМЕННОГО ИСПОЛЬЗОВАНИЯ

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Аннотация

Рассмотрена проблема адаптации объектов культурного наследия для современного использования. Описаны основные требования к проведению реставрационных работ объектов культурного наследия.

Ключевые слова: объекты культурного наследия, оценка целесообразности приспособления под современное использование, приспособление под современное использование.

PROTECTIVE WAYS OF WALLS OF HISTORICAL BUILDINGS FROM CAPILLARY RISE OF MOISTURE

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Abstract

One of the most important factors influencing the destruction of historic buildings is the capillary rise of moisture through the material of foundations and walls with the formation of efflorescence on their surface. This is due to the absence or damage to the waterproofing protection of buildings of historical value. This article provides ways to protect walls from capillary moisture, used in Russia at the end of the 18th - beginning of the 20th centuries.

Keywords: building restoration, capillary moisture, historical buildings, waterproofing, ways to protect walls.

Introduction

Capillary rise of moisture occurs in the walls of buildings due to the absence or damage to waterproofing. This phenomenon is accompanied by such processes as the crystallization of salts within the wall material, the formation of efflorescence on the surface of the walls, the destruction of the brickwork and plaster layer. Thus, the lack of waterproofing or its poor-quality leads to a decrease in the reliability of the walls. This is of particular importance for historic buildings, in which there is a significant destruction of the basement of the walls as a result of prolonged exposure to capillary moisture.

Ways to protect walls from capillary moisture used at the end of the beginning of 18thI-20th centuries

People started thinking about the ways to protect the walls from moisture penetration three thousand years ago. In ancient Egypt, pharaoh's warehouses for storing grain were lined with natural asphalt from the inside. The grains found in such barns are well preserved to this day.

In Russia, the educational part of the construction charter, which contains mandatory requirements for the protection of foundations from the action of water, was published in St. Petersburg by A. Krasovsky in 1851[1].

At the end of the 18th - beginning of the 19th centuries, the following ways were used to protect the walls from moisture penetration.

An impermeable membrane was used for horizontal waterproofing. It consisted of lead or zinc sheets, or of two or three rows of brick, impregnated with resin and laid on a resinous solution. Also, the membrane consisted of a layer of birch bark stacked on top of each other in simpler buildings. This insulating layer was arranged continuously throughout the entire width of the wall. If the base was less than one arshin, the membrane was placed in the plane separating the base from the wall, above the ground level. At high bases, the membrane was laid at a height of one arshin from the surface of the earth [1].

For vertical waterproofing clay lock was used. The first technology of the clay lock involved coating the foundation built of brick or rubble on a lime mortar with a layer of

greasy clay. Then the clay was covered with a natural mat. At the bottom a layer of brick rubble was used as drainage. Because of a significant moistening of the soil drainage pipes were laid. According to the second technology, clay locks were constructed by the dry or wet methods. In the dry method, oily clay with natural moisture was rammed and laid in layers 3-4 inches thick. Then the clay was rammed with threshing chains until traces of chain impacts appeared. At the same time, clay was irrigated with bovine blood or swamp water. [2]. The ramming was repeated every day until cracks appeared on the surface of the clay castle. The wet method was different in that the wet clay was put on the first dry layer of clay, which penetrated into the underlying layer during tamping.

At the end of the 19th-beginning of the 20th centuries, basement waterproofing was carried out mainly from natural asphalt.[3]. It represented a mixture of asphalt mastic and tar with the addition of sand or gravel. The main types of asphalt waterproofing are shown in Fig.1. The location of the waterproofing was determined by the design of the basement walls. If the basement walls were made of brick, then a vertical layer of asphalt waterproofing was arranged on the outer surface of the wall, and the horizontal layer was arranged at the level of the brick basement floor. If the basement walls were made of rubble or cobble masonry, the vertical waterproofing was carried out on the inner surface of the outer walls, and horizontal at a height of 1.5 inches above the ground. In some cases, a layer of cast asphalt was located inside a brick wall. For the perception of groundwater pressure from below, the basement floor was made in the form of return vaults of concrete or iron ore on cement mortar with a thickness of brick or half a brick.

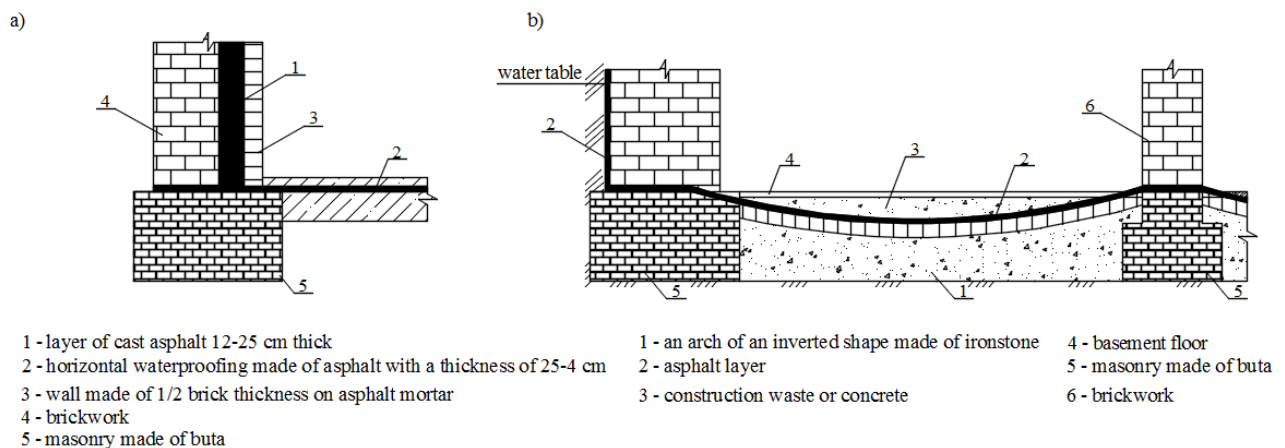


Figure 1 – Asphalt waterproofing of old buildings built in the late XIX-early XX centuries. a) A layer of cast asphalt inside the brickwork. b) The floor is in the form of an inverted arch

In addition to natural asphalt, an insulating layer was laid between the basement and the walls, which could consist of 2-3 rows of iron ore on cement mortar, glass or lead sheets, of artificial asphalt [4]. Artificial asphalt consisted of a mixture of clay, marl and a pitch of coal tar, wood tar. It was used less frequently because it was inferior in quality to natural asphalt [2].

Conclusion

Despite the requirements for buildings at the end of the eighteenth and early twentieth centuries, waterproofing protection in most cases was not fulfilled. In this regard, at present there are buildings of historical value, which as a result of prolonged exposure to capillary moisture, lose their operational reliability. To preserve these objects, it is necessary to develop modern measures for the construction and restoration

of waterproofing as part of the restoration work, taking into account the design features of the buildings.

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СПОСОБЫ ЗАЩИТЫ СТЕН ИСТОРИЧЕСКИХ ЗДАНИЙ ОТ КАПИЛЛЯРНОГО ПОДЪЕМА ВЛАГИ

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Аннотация

Одним из наиболее важных факторов, влияющих на разрушение исторических зданий, является капиллярное поднятие влаги по материалу фундаментов и стен с образованием высолов на их поверхности. Это происходит из-за отсутствия или повреждения гидроизоляционной защиты у зданий, представляющих историческую ценность. В данной статье приведены способы защиты стен от капиллярной влаги, применяемые в России в конце XVIII-начале XX веков.

Ключевые слова: гидроизоляция, исторические здания, капиллярная влага, реставрация зданий, способы защиты стен.

THE PROBLEMS OF PRESERVATION OF WOODEN ARCHITECTURE MONUMENTS

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Abstract

The historical and cultural value of wooden architecture and the necessity and expediency of its preservation have been discussed. The reasons of unsatisfactory actual condition of the majority of wooden houses and modern problems of preservation are analyzed. The possibility to improve wooden structures is considered and some ways to solve me problem are offered. It was argued here that identification and understanding of values and significance of wooden heritage is a necessary process to start a sustainable preservation programme of it, to solve the existing problems and to give possible proposals in preservation of this heritage.

Key words: cultural heritage, destructor reasons, longevity of wooden structures, problems of preservation, wooden architecture.

Introduction

It is unique and specific that wooden architecture is still used nowadays. Many cities preserved wooden structures in their old parts. The layers of centuries here are more colorful and more expressive than on the outskirts - wooden buildings and low-rise stone houses disappeared there because of rapidly growing industry. This specificity of towns is one of urban values, broadening the information field of the town. Wooden houses are much younger, compared to the centre or the old town. They fell into outskirts both in geographic and heritage preservation sense. They also fell into margins literally as they were pushed out into the suburbs and also figuratively as they took lower rank of cultural values in the hierarchy of heritage. Wooden architecture heritage of the central part presents the traditional forms of vernacular wooden architecture or reproduce the forms of professional architecture.

It is essential to underline the unity of wooden architecture and its environment whereas there is a threat to tend to protect a single object and to ignore its neighboring. Thus the following questions arise: why is this cultural heritage doomed to vanish? What are the threats which define the disappearance of this heritage? What are the main reasons of this indifference and disregard in respect of this heritage? What should be done for the preservation of wooden heritage?

The problems and factors of risk

The strongest risk factor for wooden architecture is a shift of way of life and building technologies. Three groups of risk factors are subdivided in the preservation strategy programme regarding wooden architecture: socio-economic, ideological and legal.

Socio-economic factors include:

- differentiation processes of the society; lower social groups which own wooden houses often and usually are indifferent in regard of this heritage, condition the decline of wooden architecture.

- extremely high price of the land; the prices of land are growing rapidly and becoming attractive just for large investments. Large investments always determine the high-rise thus profitable buildings.

- high price of restoration and repair of wooden buildings; the low professional standard dominates in the field of wood conservation. There is a lack of specialists of wood restoration, joiners and carpenters. It is especially difficult to restore or reconstruct lost decoration details of the houses.

Ideological risk factors include:

- unconsciousness towards significance and values of wooden heritage;
- a wooden building is considered to be not stable and durable enough;
- the quality of daily and prestigious life is associated with modern stone architecture.

The quality of life depends on progressive technologies and their orientation to global industry. The utilization of modern technologies in wooden architecture is often expensive and inappropriate for specificity of wooden buildings. The ideological factors destined the destruction of wooden houses during the reconstruction works: they were rebuilt, covered with brick, plastic planks and plastic windows. Very few houses were reconstructed properly, preserving their structure, old plan, details and materials.

Legal factors are:

- the imperfection of laws of conservation of cultural heritage;
- financial responsibility of stakeholders is not validated by laws.

Conclusion

One of the most important aims in the preservation of wooden architecture is the identification of valuable objects thus understanding their values, and listing procedure. Therefore a detailed historical and architectural exploration of these objects is a necessary condition of the sustainable preservation and development policy.

It is essential requisite to initiate the legislation of law acts and other legal instruments beneficial to the preservation of wooden architecture. Legal means should also begin the development and legalization of method of revitalization, repair (restoration, liquidation of emergency conditions) and use.

The preservation of wooden architecture is possible only with multi-channel financing and with the combined efforts of the government, public organizations, residents and businesses.

The further development of training programmes on the protection, conservation and preservation of wooden architecture should be encouraged. The programmes should address all competent professions involved in such work, in particular, conservators, architects, engineers and craftsmen.

Education means should also change the negative attitude of the society towards wooden architecture and help to understand and perceive its significance. The inhabitants should be involved in possible educative activities. Education means should influence the ideological risk factors.

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ПРОБЛЕМЫ СОХРАНЕНИЯ ПАМЯТНИКОВ ДЕРЕВЯННОГО ЗОДЧЕСТВА

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Аннотация

Обсуждается историко-культурная ценность деревянного зодчества, необходимость и целесообразность его сохранения. Проанализированы причины неудовлетворительного фактического состояния большинства деревянных домов и современные проблемы сохранения. Рассмотрена возможность улучшения деревянных конструкций и предложены пути решения поставленной задачи. Утверждалось, что выявление и понимание ценностей и значения деревянного наследия является необходимым процессом для начала устойчивой программы его сохранения, решения существующих проблем и выработки возможных предложений по сохранению этого наследия.

Ключевые слова: деревянное зодчество, долговечность деревянных домов, культурное наследие, причины разрушения, проблемы сохранения.

DESIGN AND CONSTRUCTION OF BUILDINGS WITH INCREASED NUMBER OF STOREYS IN DENSE URBAN AREAS

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Abstract

Ways of strengthening of the bases and foundations existing buildings are considered in the paper. Classification of ways is presented and their advantages are considered.

Keywords: building construction, building density, "wall in soil" method.

Introduction

Construction of high-rise buildings in the conditions of dense urban building construction is a common phenomenon in the modern world. Such conditions of construction of buildings and structures have a number of difficulties for construction connected with the limited area of the building site, also new objects often make an adverse effect on the operation of nearby buildings and structures.

For the maintaining of the exploitative qualities of the existing buildings, a complex of actions is performed. Before excavation works, it is necessary to strengthen the bases and foundations of existing structures that are located near the building site. Strengthening of the base and foundation of constructions has to provide a static balance of the buildings for the ditch-opening period up to the construction of the supporting structures of the underground part of the new building [1].

Ways of strengthening bases and foundations

According to the actions of efforts on the supporting framework of the building and the base, the ways of strengthening the bases and foundations of the existing buildings are divided into constant and temporary ones. Constant measures are: bored piles, cementation of soil under the foundation, the "wall in soil" method. The temporary solutions include the creation of metal or natural buttresses, the strengthening of foundations and walls of cellar with metal confining elements, freezing of the soil in the place of the future building on the foundation of the existing one, the construction of pile walls.

In areas where the building site is close to the existing structures and buildings, it is necessary to take measures on strengthening of their underground structures. A drilling rig is installed at the distance of 1-3 m. from the axis of the strengthened base with the help of drilling piles are installed. The use of these piles allows increasing the bearing capacity of the base. The principle of this method is in boreholes passing through the body of existing concrete and their subsequent filling under concrete pressure [1].

The "wall in soil" method is intended for the construction of buried in the ground structures for various purposes. It means that the walls of buried constructions are constructed in narrow and deep trenches, the vertical boards of which are kept from collapse with the help of clay suspension which creates excessive hydrostatic pressure on the ground and serves for fixing the trench. After the digging of the trenches of the necessary sizes, they are filled with monolithic reinforced concrete, precast ferroconcrete

elements or clay-soil materials. As a result, load-bearing walls of structures or anti-filtration diaphragms are formed in the soil.

Clay solution is a diluted suspension of bentonite clay, where some additives are used (crushed minerals – barite, hematite, and magnesite). This suspension has high stability and thixotropic properties, i.e. the particles of clay mineral montmorillonite, which is the main component of the bentonite clay, do not precipitate but remain suspended for a long time.

The wall in the soil can be constructed up to 40m., and when using special equipment up to 60 meters, the width of the trench can be very narrow – from 0.4 to 1.2 m. The wall becomes an enclosing structure and besides it can serve as a bearing element of underground structures. This method can be used in almost any non-rock soils, except loose bulk, fluid and quick sand. The most effective use of this method is in complex hydrogeological conditions with rather shallow occurrence of water-resistant soils, and near other buildings and their bases.

The method of “wall in soil” allows carrying out construction: very close to the existing buildings and structures; with the significant depth of construction; at the big sizes in plan and the complex form of a construction; at the high level of underground waters.

The “walls in soil” are classified in the following way:

- for the purpose: bearing, enclosing and anti-filtration;
- for the material: reinforced concrete, concrete, soil cement, clay, combined;
- according to the method of manufacture: monolithic, precast-monolithic.

The technology of “wall in soil” can be divided into several subcategories: trench and pile. The first is in the use of monolithic concrete and reinforced concrete sections that form a single wall. The pile method involves the installation of bored supports, which are arranged in a unbroken row. They allow forming a strong enclosing structure.

Conclusion

Construction in dense urban conditions should provide not only the quality and durability of the constructed buildings and structures but also meet a number of conditions to ensure a stable balance and save operational properties of the nearby buildings, and also maintain the convenience of living for residents of the existing buildings and structures.

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ПРОЕКТИРОВАНИЕ И СТРОИТЕЛЬСТВО ЗДАНИЙ ПОВЫШЕННОЙ ЭТАЖНОСТИ В УСЛОВИЯХ ПЛОТНОЙ ГОРОДСКОЙ ЗАСТРОЙКИ

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Аннотация

В статье рассматриваются способы укрепления оснований и фундаментов существующих зданий. Представлена классификация способов и рассмотрены их преимущества.

Ключевые слова: строительство, плотная городская застройка, метод «стена в грунте».

THE ANALYSIS OF EDUCATIONAL CLASSES IN A FOREIGN LANGUAGE

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Abstract

This article is devoted to the consideration of objective criteria for the analysis and evaluation of the main link of the educational process – the lesson. The requirements for a foreign language lesson help in preparing the teacher for the lesson and also serve as a starting point for the analysis of lessons. The correspondence of the lesson to psychological-pedagogical, linguistic-didactic, structural-organizational criteria requires the teacher to have an extremely high level of ideological-political, psychological-pedagogical and methodological training, because the effectiveness of the lesson largely depends on the personal qualities of the teacher. The proposed categories will help the teacher to improve the effectiveness of the lesson, and this, in turn, will help to improve the efficiency of the process of learning a foreign language.

Keywords: educational process, evaluation of the lesson, to analyze, the learning process, expediency, effectiveness, criteria.

The lesson plays a huge role in the professional activity of the teacher, as it is the main part of the educational process, in which the teacher is engaged in daily education, upbringing, and comprehensive development of students' personality. Lesson, being an independent unit of the learning process is a link in the chain of lessons. What was the purpose of the previous lesson becomes a means of the subsequent, which causes a close connection of lessons, natural variability of repetition from lesson to lesson, providing progressive movement to the final educational goals. A foreign language lesson should be a relatively complete work, built in accordance with certain requirements arising from the goals, content and technology of training. These requirements determine the strategy and tactics of the teacher in conducting the lesson [4, p. 26].

At the same time, the content, structure, main stages and forms of educational activity and the system of training organized by the teacher are constantly changing in accordance with the requirements of modernity.

The main criteria for the analysis and evaluation of the lesson as a unit of the learning process are:

1. Compulsory communicative orientation of the lesson as a whole.
2. The lesson is not so much an explanation of linguistic phenomena, as the introduction of new language material in the speech practice of students. Establishing a link between known and newly introduced materials is one of the tasks that the teacher sets for himself and the students, introducing them to new language material, forming a skill or developing the ability to use this material in speaking, listening, reading and writing.
3. The unity of methods over the already mastered and new language material during the lesson, which is manifested in the organic inclusion of new language material in the tasks performed in the lesson.

4. The unity of the teaching and controlling functions of the lesson. This provides for the control of tasks, skills and abilities at each lesson, which gives the teacher the opportunity to analyze their activities and the activities of students in a timely manner to notice omissions, to plan ways to eliminate them, to plan individual work. Forms and content of control should be aimed at identifying the level of training of students speaking, listening, reading, writing, which is also one of the indicators of methodical validity of the lesson and its effectiveness.

5. An important characteristic is the following organization of work with educational material: the development of new material is planned for the first half of the lesson, work with the material, the perception of which does not require much effort, completes the lesson.

6. Obligatory general pedagogical characteristic of the lesson is to ensure interest in it. This characteristic must be reflected in the content, structure and methods of work at each individual lesson and in the system of lessons as a whole.

7. As the main form of organization of the educational process, the lesson is the unity of many components of educational and structural - organizational plan.

In accordance with the above, the criteria for the analysis and evaluation of the lesson should be divided into several groups: psychological, pedagogical and structural and organizational. This division is conditional and, in each case, the criteria need to be considered together. Taking into account all the criteria in relation to each lesson is optional. In the analysis and evaluation of a lesson, all groups of criteria should be updated, not always focusing on each of them within a given group.

Of all these groups of criteria for the analysis and evaluation of the lesson psychological and pedagogical criteria primarily reflect the new, higher requirements for the modern lesson, which necessitate a slightly different approach to determining its effectiveness.

Analyzing the lesson, it is necessary to seek to find out how the teacher implements the practical, educational, educational and developmental goals, how he managed to choose the appropriate content, why he chose such a combination of methods, how he managed to plan and apply a differentiated approach to students. With the help of psychological and pedagogical criteria, the following parameters of the lesson are determined:

1. The educational value of the lesson, which is characterized by the educational content of all educational material used in the lesson; attention to the content of the examples given by the teacher and students, the identification of these examples of educational potential; organizational clarity and business saturation of the lesson; conscious discipline during the lesson, thoughtful attitude of students to work, the ability of the teacher to combine collective and individual forms of work, to pay attention to each student, to take into account individual characteristics, the ability of the teacher to stay, to serve as an example for students of efficiency, organization, care, etc.

2. Developing value of the lesson, the development of students' activity and independence in the learning process; attention to what techniques the teacher uses in the conduct of the lesson, what tasks and exercises he uses and how these techniques and tasks and exercises contribute to the development of personality and mental potential of the student.

3. Practical and educational value of the lesson, determined by its results, and above all the level of training of students to the appropriate type (types) of speech activity, achieved as a result of joint work of the teacher and the student in the classroom [2, p. 56].

Linguo-didactic criteria for the analysis and evaluation of the lesson suggest:

1. Compulsory communicative orientation of the learning process practicing any material in the classroom;

2. Compliance of the teacher's chosen methods of work and ways of working with the specifics of the methodology of teaching a non-native language, in particular, the observance of the unity of training and creativity, an integrated approach to language material, etc.

3. The correctness of the teacher's speech, the inadmissibility of grammatical, stylistic, phonetic and other errors in his speech.

Psychological and hygienic criteria for the analysis and evaluation of the lesson determine:

(1) the organization of work with educational material in the classroom in accordance with the phases reflecting the change in the level of performance of students.

(2) the level of saturation of the period of optimal performance of such types of educational activities that contribute to the most successful mastery of language material and stimulate its motivated speech.

(3) the compliance of time and methods of use of technical means of training to psychological and hygienic standards.

Finally, the structural and organizational criteria for lesson analysis and assessment include:

(1) compliance of methods and techniques of the planned tasks of the lesson; every moment of the lesson, every exercise, and every kind of work - everything should be subject to a specific task. The objectives of the lesson should be clear not only to the teacher, but also to students. It is the tasks of the lesson that determine its structure and the choice of specific types of work at each stage. Do not mix the concepts of the lesson task with the purpose of learning, although these concepts are closely related. The specific objectives of the lesson due to the possibility of their implementation, therefore, cannot be considered real one or even a few lessons in the formation of, for example, the skills of speaking, listening, etc. At the same time, each lesson represents a step in the formation of these skills, and they are formed for a specific linguistic material, because the lesson is not a random selection of more or less interesting material. A lesson is a sequence of interrelated actions that contribute to the mastery of the material.

(2) methodically reasonable determination of the lesson place in the system of lessons on this topic; being an independent and integral part of the educational process, each lesson at the same time should be a continuation of the previous lesson and preparation for the next;

(3) structural clarity of the lesson, the correspondence of its structure to the tasks; the expediency of the choice and location of the individual stages of the lesson, as well as the choice and location of certain types of work;

(4) correct and appropriate use of the textbook during the lesson (exercises) under the guidance of a teacher;

(5) the use of verbal and visual tools in the classroom; correct and appropriate use of innovative technologies and multimedia tools, including language laboratory equipment; writing on the board;

(6) expediency and variety of forms of current and final control chosen by the teacher;

(7) the power of homework, the clarity of its explanation;

(8) logical completeness of the lesson;

These criteria for the analysis and evaluation of the lesson suggest a thorough and well-thought-out preparation of the teacher for each lesson [1].

It is obvious that the compliance of the lesson with all the above criteria requires an extremely high level of ideological, political, psychological, pedagogical and methodological training from the teacher, because the effectiveness of the lesson largely depends on the personal qualities of the teacher. High morality and culture, the way to speak, demand, encourage, treat students, the style of the teacher, his own discipline - all these are organic, integral elements of the requirements that apply to the actions of the teacher in each lesson. The proposed categories will help the teacher to improve the effectiveness of the lesson, and this, in turn, will help to improve the efficiency of the process of learning a foreign language [3, p.130].

The analysis of the lesson reveals the degree of preparedness of the teacher to the lesson and the level of his methodological education, the level of methodological competence. The skill of the teacher is to make the best use of their personal qualities and pedagogical abilities in the planning and implementation of the lesson plan.

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К ВОПРОСУ ОБ АНАЛИЗЕ УЧЕБНОГО ЗАНЯТИЯ ПО ИНОСТРАННОМУ ЯЗЫКУ

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Аннотация

Статья посвящена рассмотрению объективных критериев анализа и оценки главного звена учебного процесса – урока. Требования к уроку иностранного языка помогают в подготовке учителя к уроку и служат также отправным моментом для анализа уроков. Соответствие урока психолого-педагогическим, лингводидактическим, структурно-организационным критериям требует от преподавателя чрезвычайно высокого уровня идейно- политической, психолого-педагогической и методической подготовки, ибо эффективность урока во многом зависит от личностных качеств педагога. Предложенные категории помогут преподавателю повысить эффективность урока, а это, в свою очередь, будет способствовать повышению эффективности процесса обучения иностранному языку.

Ключевые слова: образовательный процесс, оценка урока, анализ, обучающий процесс, целесообразность, эффективность, критерии.

ENHANCING STUDENTS' VOCABULARY IN THE COURSE OF ENGLISH FOR PROFESSIONAL COMMUNICATION

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Abstract

The article describes the lexical approach to teaching the language for professional purposes. The importance of teaching professional terminology to future specialists is discussed. The possibility of using the lexical approach in English for Professional Communication course delivered to students majoring in Economics and Finance is considered. Some of the teaching tools, practical tasks and assignments to enhance learners' communicative competence and boost their professional vocabulary are given.

Keywords: lexical approach, general scientific terms, lexical competence, economics; economic terms; teaching, vocabulary, lexis.

Introduction

Teaching English for specific purposes at tertiary level involves setting learning objectives and learning outcomes. Most of these are aimed at developing students' communicative competence, which comprises linguistic competence, sociolinguistic competence, discourse competence and strategic competence (Hymes, Dell H., 1972). The communicative teaching method emphasizes the development of discursive, pragmatic, strategic and socio-cultural components of the communicative competence, while the importance of the linguistic competence is underestimated.

The linguistic competence is understood as knowledge associated with recognition and usage of language units, and the ability to use them to produce grammatically and lexically correct utterances. It is obvious that for professional communication a sufficient amount of vocabulary relevant for different communicative situations is required. Thus, focus on lexis in the context of preparing students for future professional work remains relevant. When teaching vocabulary for professional communication, it is necessary to:

- (1) determine the nature and structure of terminological vocabulary;
- (2) identify the differences between terms and professionalisms;
- (3) describe the specifics of professional vocabulary;
- (4) compare the features of professional vocabulary in the English and Russian languages;
- (5) expand the vocabulary required to read and understand texts for professional purposes;
- (6) teach students about the form, meaning and usage of lexical units in the English texts for professional purposes;
- (7) develop skills to produce oral and written utterances in economic context.

One of the ways of achieving these objectives is to use the lexical approach to teach the language for professional communication.

What is a Lexical Approach?

For the first time the term "lexical approach" was introduced by Michael Lewis (1993) in the eponymous book, where he made a strong and convincing case for the primacy of meaning in language teaching. In fact, this approach is welcomed by many teachers who put an emphasis on lexical and semantic knowledge in their teaching and

who put successful communication above grammatical drilling and accuracy. The lexical approach is based on the idea that “language consists of grammaticalized lexis not lexicalized grammar” (Lewis, 1993, p.vi). In other words, we should perceive the language system as a collection of lexical units (chunks, collocations prefabricated phrases, lexical phrases, formulaic language, etc. In “The Lexical Approach” (1993), Lewis stressed that the way vocabulary is taught does not meet the needs of language learners, and we should concentrate on certain aspects of lexis and focus on giving students chunks of language with real communicative functions.

Lewis’ classification of lexis included words (e.g. *bicycle, chair*, etc.), polywords (e.g. *by the way, a cup of tea*, etc.), institutionalized phrases (e.g. *What a buzz! I see what you mean...*, etc.), collocations (e.g. *do homework, make a decision*, etc.), fixed and semi-fixed expressions (e.g. *I’ll see you soon...* etc.). The main idea behind the lexical approach is that the language should be taught in chunks rather than separate words. It means that it is necessary to focus on the collocations that learners can use to produce meaningful utterances. It is especially relevant for Business English in which collocations and lexical chunks are in abundance.

Another important consideration is that in the lexical approach communication rather is more important than accuracy. This means that grammatical errors are acceptable and they can be naturally eliminated with practice. Overcorrection can lead to negative effects and put learners off the language, causing stress and anxiety. Instead of excessive attention to grammatical accuracy, learners should focus on conveying the meaning successfully. One way of doing it is to teach students to pay attention to chunking and collocations.

Understanding the specifics of vocabulary for economics and business purposes makes teaching and learning of the language more effective.

Lexis for Economics

The vocabulary of professional communication in economic context is far from being uniform. It consists of three layers: (1) general (neutral) vocabulary; (2) terminology; (3) professionalisms.

(1) General vocabulary includes the most common words used regardless of the style of speech. It can be found in all types of oral and written utterances. It comprises the nouns (*conflict, resource, world, life, progress*), adjectives (*right, general, potential, present*), verbs (*make, mean, read*), all numerals and pronouns, most adverbs, prepositions and conjunctions.

(2) Terminological vocabulary includes words or phrases that nominate special concepts in different spheres of science and manufacture. Any term is based on the definition of the reality designated by it, therefore a term is an accurate and at the same time concise description of an object or phenomenon. Every branch of knowledge operates its own terms, which make up the terminological system of this science. Terminological vocabulary is in its turn subdivided into several layers: a) first of all, these are general scientific terms that are used in various fields of knowledge and belong to scientific style of speech in general, e.g.: *analyze, function, identify, significant*. These terms form a common conceptual basis which various sciences share and have the highest frequency of use; b) specialized terms that are assigned to specific scientific disciplines, sectors of manufacture and technology, for example in the economics: *equilibrium price, quantity demanded, frictional unemployment, entity*. These terms form the essence of every science.

(3) Professionalisms are words and expressions peculiar to the speech of a professional group. Unlike terms, they do not form a system, since a professional name is

often either conditional or built on a metaphor. In contrast to professionalisms, terms tend to reveal the essence of the concept.

Economic vocabulary includes names of phenomena and concepts of socio-economic and political spheres. As such, it is an actual part of the lexical system of any language. Developing and changing alongside with society, economic terms reflect the history of economic forms and ideas. The economic system of the country is closely linked to its social and political life. As a consequence, socio-political terms tend to penetrate into economic terminology, e.g.: *strike, full employment, privatization, price denationalization, public ownership, redistribution of income*. On the other hand, economic terms, in their turn, are included in the field of social and political terminology.

Among economic terms one can find both the terms that are not familiar to a wide range of speakers, e.g.: *futures, warrant, dispatch, factoring*, and the terms that are well known to the vast majority of the speakers, e.g.: *market, demand, employment, tax, interest rate, debt*.

As can be seen from the classification above, lexis for economics is a combination of general and specialized vocabulary, with the latter comprising terms and professional jargon. An interesting feature is that this vocabulary includes both separate words and collocations.

The Lexical Approach to Teaching Vocabulary for Economics

With the aim of teaching and learning vocabulary necessary for successful communication in professional economic setting, a wide variety of tasks concerned with the *introduction, activation and communicative use* of general and highly specialized vocabulary of the English economic language can be used. The specifics of the lexical approach lie in the use of collocations, fixed and semi-fixed expressions rather than single terms. Instead of teaching single words it looks more promising to introduce learners to lexical chunks, which they can use for professional communication. Some of the practical techniques are as follows:

- (1) Identification of the forms and meanings of a lexical unit. The study of the form of lexical units is based on the derivation models. Students, for example, are asked to fill the gaps in the sentences by choosing one of the cognate words (*economy, economics, economic, uneconomic, economical, economically, economist, economize*), or to fill a gap in the text, by changing the morphological form of the suggested word.
- (2) Matching a word to a definition, synonym, antonym, description, translation equivalent, replacing the narrow concepts by more general concepts. For example, *market surplus – the amount by which the quantity supplied exceeds the quantity demanded at a given price* (the dictionary definition); *poverty – the situation facing those in society whose material needs are least satisfied. Poverty can be defined by some absolute measure... or in relative terms... In either case it is necessarily an arbitrarily defined concept* (description); *land, capital, labour – economic resources* (enumeration, which allows understanding the more generalized meaning).
- (3) Identifying the term which does not belong to the list of words of the same conceptual category, on the basis of which the sorting of words can be performed by students. For example, in the chain of economic terms: *social security, income tax, unemployment benefits*, the concept *income tax* is the “odd one out”, as it does not refer to the concepts that designate a government transfer.
- (4) filling the gaps to reconstruct a coherent text. For example, students have to select the appropriate phrases and complete the text, or complete a sentence with the word or phrase from the text being read / listened.

- (5) the creation of a semantic field or a mind-map on the basis of semantic associations: students are encouraged to organize and logically link basic concepts of the discussed problem in the form of a map, in the centre of which they place the main concept. For example, the keyword *market structure* may lead by association to the generation of a semantic field, including concepts like *monopoly*, *duopoly*, *oligopoly*, *monopolistic competition*, *perfect competition*. This field may be disordered as a result of brainstorming or organized in a logical-semantic map based on the criterion of increasing / decreasing market power;
- (6) paraphrasing, i.e. students are asked to convey concepts, ideas and thoughts through other language means;
- (7) reconstructing the logical order in a sentence or coherent text;
- (8) ranking, i.e. students are asked to evaluate information contained in a list of words (phrases, sentences) and distribute it according to some criteria, for example, terminological phrases *frictional unemployment*, *cyclical unemployment*, *structural unemployment* can be ranked by the degree of the plight of the unemployed;
- (9) defining true/false statements, when students make a meaningful by referring judgments to the content of the text;
- (10) translation of texts into native language;

All these activities are aimed at the recognizing forms, meanings and potential use of lexical units, as well as further development of lexical competence of students. While doing communicative tasks students use lexical units actively and independently, which results in acquisition of lexical material.

Building-up vocabulary is crucial for language learning. In teaching English for specific purposes it is necessary to focus on the appropriate understanding and use of professional vocabulary. To achieve this, teachers have to design activities which enhance language acquisition and make learning more productive.

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РАЗВИТИЕ ЛЕКСИЧЕСКИХ НАВЫКОВ ПРИ ИЗУЧЕНИИ КУРСА «АНГЛИЙСКИЙ ЯЗЫК ДЛЯ ПРОФЕССИОНАЛЬНОЙ КОММУНИКАЦИИ»

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Аннотация

Рассматривается возможность использования лексического подхода при изучении дисциплины «Английский язык для профессиональной коммуникации». Перечислены особенности лексического подхода в обучении иностранному языку; в качестве иллюстрации приведены различные виды практических заданий для формирования коммуникативной компетенции студентов и расширения словарного запаса.

Ключевые слова: лексический подход, общенаучные термины, лексическая компетенция; экономика; экономические условия; обучение, лексика, лексика.

USING MOOCS IN TEACHING ESP

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Abstract

MOOCs can also be considered as a tool in teaching ESP. Any MOOC dedicated to the study of topics in specialized disciplines can serve a powerful motivating factor in learning English, as is currently the most of these courses offer high quality content lectures in English from the world's best universities for free to anyone with a computer and an Internet connection.

Keywords: MOOCs, ESP, learner-centered approach.

Massive Open Online Courses (MOOCs) were developed from the traditions of distance and self-access learning, and are growing in popularity. As a new and exciting area of education, the potential of MOOCs to transform education by allowing free access to courses for anyone with the access to technology and the internet has potential for faculty and learners to benefit from the courses offered. MOOCs, deliver high quality content from some of the world's best universities for free to anyone with a computer and an Internet connection.

The creation of MOOC platforms such as Coursera, Udacity, EdX and Future Learn has enabled mass participation. For example, as of July 25, 2014, Coursera.org reported hosting 571 courses, with 22,232,448 total participants from 190 different countries [1]. MOOCs can therefore potentially have a greater impact on more students in one cycle of classes than the same professor teaching an entire career could hope to achieve.

MOOCs can also be considered as an additional tool in teaching ESP. Any MOOC dedicated to the study of topics in specialized disciplines can serve a powerful motivating factor in learning English, as is currently the most of these courses offer lectures in English with English subtitles. Participation of students in these courses is not limited to the perceptual component; interactive open structure allows students to participate in forums, discussions, peer-review in the target language.

One of the major reasons for integrating MOOCs in Kazakhstan is the State Program "Digital Kazakhstan" currently being implemented, which is based on the program of "Strategic Development of Kazakhstan until 2020" initiated in 2010. The program aims to improve the quality of people's lives and competitiveness of the country through the innovative development of digital systems. The State Program "Informational Kazakhstan 2020" is also a fundamental feature of digitalization and internationalization of the educational sphere. This program aims to provide all people with an opportunity to acquire necessary professional skills with the assistance of online education. Both programs may lead the system of higher education to be integrated through online platforms [2]. Higher education institutions will be able to promote Kazakhstani educational programs, which are taught online by locally experienced professors to

students around the country. The country's first online university Open University Kazakhstan (OpenU), is using MOOCs to foster internationalization within the "Digital Kazakhstan" policy initiative and integrate them for all of Kazakhstani students.

OpenU collaborates with Kazakhstan's leading and internationally well-known universities such as Kazakh National Technical University, Kazakh-British Technical University (KBTU), Almaty Management University (AlmaU), the Institute of Mathematics and Mathematical Modelling and SuleymanDemirel University (SDU).

At Karaganda State Technical University, the Department of Foreign Languages follows the modern tendencies. MOOCs can create a great level of students' autonomy in acquiring knowledge and skills they need. The role of the teacher is extremely important in the organization of work with MOOC, especially at the initial stage. This can be considered as a positive impact on learner-centred classes, where faculty just explain the instructions, give guidance on how to do assignments and finally grade their students based on their overall performance on the course. The faculty selects an interesting and useful course for students, evaluates it from a methodical and the content side, and then carries out monitoring the learning process. Before starting working with students, the faculty independently goes through training in any course, and even better in several courses, to obtain from the perspective of a student, in order to understand how the course is functioning, what elements it may have, how is it evaluated.

English faculty can work more closely with subject specialists to provide relevant, authentic materials. They may even work together to teach, evaluate, and make the ESP course better with the help of MOOCs.

Successful ESP courses imply that course-book authors provide for future real-life needs of learners, especially in the case of pre-experienced adult students, who may not fully realize what language competence their future job will require of them. Target situations, in which they will have to communicate effectively, have to be examined (as part of needs analysis) and considered when designing a course.

A learner-centered approach adapted in ESP courses has allowed for the following developments in language teaching:

- inclusion of materials into a syllabus is based on the learners' reasons for learning;
- courses are more intensive;
- learners want to achieve good language competence in the shortest time possible;
- learners can negotiate the syllabus;
- learning is understood as an active construction of meaning;
- teaching is perceived as guiding, scaffolding, and facilitating learning;
- real-life tasks are prioritized;
- meaningful and purposeful interaction can be created through language;
- tasks are cognitively more challenging; learners have more autonomy;
- learners accept more responsibility for the outcome of the learning process;
- making vocabulary personal helps to make it more memorable [3].

Recently, ESP has been receiving even greater interest due to the effects of globalization within industry and academia, particularly in Kazakhstan. The latter objective has shown its viability, which strives to be a financial and educational hub for Asian and European countries. Learning ESP with the help of online courses will provide needed knowledge and training in Kazakhstani higher education institutions organization.

In industrial settings, workers increasingly need strong English skills to succeed in their jobs.

It can be concluded, students need improved English skills to not only study their specialized discipline, but also to collaborate within international research teams and find work upon graduation. The greater importance of English in industry and academia has resulted in higher-stakes English teaching, and subsequently increased pressure on English teachers to deliver measurable results in their classes.

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ИСПОЛЬЗОВАНИЕ MOOCS В ОБУЧЕНИИ ESP

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Аннотация

MOOCs можно рассматривать как инструмент обучения английского для специальных целей (ESP). Любой массовый открытый онлайн курс (MOOC), посвященный изучению профессиональных тем по специализированным дисциплинам, может служить мощным мотивирующим фактором в изучении английского языка, поскольку в настоящее время большинство из этих курсов предлагают высококачественные контентные лекции на английском языке одними из лучших университетов мира бесплатно для всех, кто имеет компьютер и интернет-соединение.

Ключевые слова: массовый открытый онлайн курс (MOOC), английский для специальных целей (ESP), личностно-ориентированный подход

ASSESSMENT OF WORD FORMATION COMPETENCE DEVELOPMENT

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Abstract

The word formation competence as a part of the language competence which must be developed as a result of studying a foreign language in secondary and higher educational institutions of Russia is considered. Methods for the assessment of the word formation competence development are analyzed. Most of them are related to students' knowledge of word formation models and skills to use such models in practice. The method of association experiment is suggested.

Keywords: assessment, education standard, language competence, method, word formation competence.

Introduction

At the present moment the education system in Russia faces some difficulties connected with the adaptation of a new model of education which significantly differs from the traditional one. This affects all levels of the education system including higher educational institutions. The main requirement for University graduates is the development of skills and abilities necessary for their future professional activity as well as knowledge of essential principles of their vocation. All these components show if competences identified in the education standards for all academic disciplines are developed or not.

A foreign language can be distinguished among other academic disciplines as it is considered to be 'a mediator' in the world of international cooperation giving opportunities for gaining a success in this sphere.

According to education standards related to different programmes in universities the study of a foreign language is aimed at the development of such a competence as the ability to communicate orally and in the written form in Russian and a foreign language in order to solve problems in the professional area. This description of the competence focuses teachers' attention on the development of students' oral and written speech in the professional context. However, it is important to develop other more specific competences directly related to studying a foreign language to reach this aim. They include:

- a linguistic competence which covers the main linguistic terms and notions;
- a language competence covering units of all levels of the language system;
- a communicative competence which allows to use language units acquired in the process of education for the successful communication [2].

In most linguistic dictionaries a language competence and a linguistic one are considered to be one and the same competence that is absolutely right. A language (linguistic) competence is interpreted as "the ability to use a system of rules and information about the language studied in accordance with its levels: phonemic,

The appropriate variant is:

*Henry Cartier-Bresson helped establish photo journalism as an **art** form. He believed that photography could capture the **meaning** of outward appearance. In his twenties he moved to **exciting** African countries to get some experience.*

The Russian state exam (RSE) in foreign languages has a part “Grammar and vocabulary” which also involves tasks depending on the difficulty level, but in the tasks with the advanced difficulty level four variants of words are given (table 1).

Table 1. Classification of vocabulary tasks (RSE)

No	Difficulty level	Task example
1	Elementary	Moscow is Russia's _____ (large) city.
2	Intermediate	For those who do not wish to continue full time education after school, one of the most difficult issues facing today's adolescents is _____ (employ). In the current economic situation it is _____ (likely) to find a job without any experience.
3	Advanced	Jake was walking home from school. It was a sunny autumn day. He'd usually stamp on the _____ of leaves on the footpath to hear them crunch under his shoes. 1) piles; 2) bundles; 3) sacks; 4) flocks

The criteria for the assessment of the word formation competence development in this case are words that are chosen or formed. The answers can be right or wrong. To do these tasks it is necessary:

- *to know* word formation models;
- *to understand* what model must be used in this or that case;
- *to analyze, synthesize and evaluate* words based on the developed skills.

So these tasks can help assess the word formation competence development at the cognitive level.

In higher educational institutions it is also possible to use a method of association experiment. Students are asked to remember or form all the words associated with some topic. The more word formation models are used by students the higher the level of their word formation competence development is.

Conclusion

So the word formation competence is one of language competences which must be paid attention to along with other competences in the process of teaching a foreign language. Several methods can be used to assess the development of the word formation competence. They are based mostly on the evaluation of students' knowledge of word formation models and skills to use such models in practice, i.e. oral and written speech. However, the method of association experiment can be considered to be quite useful as it allows getting an idea about the word formation competence development and those associations that students have on the given topic that represents their readiness to think in a foreign language.

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ОЦЕНИВАНИЕ СФОРМИРОВАННОСТИ СЛОВООБРАЗОВАТЕЛЬНОЙ КОМПЕТЕНЦИИ

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Аннотация

Рассмотрена словообразовательная компетенция как часть языковой компетенции, сформированность которой является результатом изучения иностранного языка в средних и высших учебных заведениях России. Проанализированы методы оценивания сформированности словообразовательной компетенции, большая часть которых связана со знанием учащимися словообразовательных моделей и умениями использовать их на практике. Предложен метод ассоциативного эксперимента.

Ключевые слова: метод, образовательный стандарт, оценивание, словообразовательная компетенция, языковая компетенция.

SITUATIONS AS A TYPE OF SPEECH ACTIVITY IN FOREIGN LANGUAGE LESSONS

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Abstract

The rapid development of the society and the world as a whole increases the necessity of studying foreign languages and creation of different methods of teaching. A speech (communicative) situation is one of the effective methods of teaching foreign languages. Each language uses phonetic combinations, situational pictures and other activities to increase speech activity and improve English skills.

Keywords: communicative situation, situational pictures, teaching English.

Why is it important to know foreign languages and their features? This is necessary for a modern, educated person because the knowledge of different languages allows overcoming many obstacles. In keeping with international trends, Kazakhstan, where people learn and use English as a foreign language (EFL) and which has made teaching and learning English mandatory in schools for more than a hundred years, has realized the increasing importance of the English language. President Nursultan Nazarbayev emphasized that all the Kazakhstan citizens should strive to know their national language. Kazakhstan has to know its official language – the Kazakh language. The Russian language is the language of our big neighbor and one of the six UN languages. This language enabled us to access the great literature, the great culture. That is why we should not forget it, or put it aside, every language is wealth for a person.

Nowadays, we need the English language to enter the global arena. Out of 10 million books published in the world 85% are in English. The science, all the new developments and information are all in English nowadays. And therefore, as future teachers of a foreign language, we strive to give a good education to our future students, as well as to teach how to use speech situations in real communication situations.

However, teachers face the problem of the discrepancy between the methods of instruction used and modern requirements for mastering a foreign language. Often the “practice test” forces to call in question the correctness of the examination evaluation in a foreign language in the secondary school, since despite a qualitatively new, rather specific requirements for the level of foreign language proficiency, the exams are still focused on traditional or some other method of instruction, where knowledge of language is given more importance than skills and the tools in the language itself, and where the possession of oral speech is secondary subordinate, and not a condition for the creation of other speech capacities such as reading and writing skills.

According to G.V. Kolshansky, knowledge of certain linguistic elements, such as specific words, separate phrases and idioms, possession of phonetics, cannot fully match to what we call the confident use of a foreign language as a means of communication; the possession of a foreign language must necessarily be considered in terms of the ability to

actively participate in real interpersonal interaction [1]. Learning free and active oral speech will have a real effect only if there is a significant communication situation.

The language teaching material is easier to remember and learn, and the response time to certain words of a good speaker in a foreign language is significantly reduced if the situation is relevant to the students' needs. The problem of teaching oral foreign-language speech communication should be solved in the context of a situation that has two interrelated aspects. First of all, the situation is a set of real time and spatial conditions that exist independently from us. In addition, the situation is relations and dependencies reflected in our minds, which are important and significant for us: the situation is something that we are really interested in [2]. These objective and subjective sides are closely interrelated, and this must be taken into account when determining the situational and semantic elements of the learning process in foreign language classes.

A speech (communicative) situation is the circumstances that cause the need to use an oral statement for the purpose of mutual influence of two or more communicants during the interaction. A narrow meaning of the situation implies an actual presence, the presence of an object, a person, a movement, an event perceived by our feelings at the moment of our speech [3, p. 386]. The situation in a broad sense includes both the fullness of the circumstances prevailing at a given time, and the presupposition of the corresponding speech act.

It is necessary to teach the students that they can successfully correct each other's statements (correct, ask follow-up questions). This is the first stage. At the next stage, communicative actions can be implemented with the help of lines - agreement or disagreement: (*Right you are; I think the same; As for me I think ...; I am afraid you are mistaken; I like it*); supplementing the speaker lines (*More than that; by; to make the things worse ...*); phrases with clarifying character (*As for me, I think ...; I suppose ...; I believe ...*); generalizing judgments (*on the whole; in general; summing up all you've just said; let's come to a conclusion*); emotional reactions (*That is rather strange (awful, nice); Brilliant; So many; Great; Well done*); ironic lines of the type (*So there you are! Why should you?*); lines expressing a request (*May I ...? Can you ...? Will you ...? Please, do not do it*); lines with giving a negative evaluation (*I find it bad; I find it not very good*); lines of astonishment (*Is it? Do you? Are you? Really?*).

At the initial stage of training, it is difficult to think about the technology for conducting a group discussion for students. The discussion is hard enough as it is and requires of many qualities of the participants in the discussion. In a role-playing game, all these qualities are naked. In the role-playing game, we offer fairly accurate and easily accessible guidelines for group speech interaction. Therefore, the game allows you to make this process more natural and interesting.

As a result of the analysis, the greatest opportunities in the embodiment of speech situations are revealed in the children's play activity. At the lower level of education, students like imaginary situations with elements of a role-playing game. This is the point where the speech situation makes it possible to improve their learning effect. In the fifth grade, you can offer simple situations: *You met a tourist from the UK. Let's get to know him better.*

Also you can use situations that involve the idea of helping someone. For example: *Help your mother in her work*, or the situation in the library: *You are a librarian. Try to help pupils to find books, which they need.*

The use of situational pictures helps to increase the speech activity of students. We can talk with pictures, choosing from the gained material in the memory what is required for conversation in this situation. Students become actors. What are the recommendations for this type of work: consider the picture in order to imagine the situation in which the conversation will proceed; try to remember some of the lines that can be used in a conversation in this situation. The main condition for communication is not to be afraid of mistakes.

We can use speech exercises in the middle and older stages of training. Such as expressing your opinion on the issue / statement / quote, etc., comment on the proverb, prepare a report / message on the topic, etc.

Accordingly, practice shows that speech situations close to real life help to improve the effectiveness of the lesson, to increase the speech activity of students, to increase their interest in language, and the search is the most importantly in creating speech situations and in the activity of the teacher. The teacher is given the opportunity to vary the situation from class to class, for different students, depending on their interests and level of training.

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СИТУАЦИИ КАК ВИД РЕЧЕВОЙ ДЕЯТЕЛЬНОСТИ НА УРОКАХ ИНОСТРАННОГО ЯЗЫКА

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Аннотация:

Развитие современного мира повышает необходимость изучения иностранных языков и создания разных видов обучения. Речевая (коммуникативная) ситуация является одним из эффективных методов обучения иностранным языкам. Каждый язык использует фонетические комбинации, ситуационные картинки и другие действия, чтобы увеличить речевую активность и улучшить навыки английского языка.

Ключевые слова: коммуникативная ситуация, преподавание английского языка, ситуационные картинки.

ORGANIZATION OF TEACHERS' RESEARCH ACTIVITIES

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Abstract

Teachers' research is both an important area of professional growth, and the field of productive pedagogical research. The value of their studies is explained by the fact that teachers explore school reality, identifying topical problems, unused resources and ways to improve the effectiveness of instruction. Despite the importance of teachers' research for improving theory and practice of teaching foreign languages, the role of this activity is still small. The reason is that teaching practitioners are not familiar enough with the technicalities, methods and organization of exploratory work. This article addresses the teachers who are interested in conducting exploratory teaching in their classrooms.

Key words: teachers' research, organizational model, research methods, technological resource.

Introduction

Teacher's research activities aim at solving relevant problems posed by the school reality. The range of such tasks is wide, the solutions are different and the approaches are variable. However, there is a common issue with the teachers' research caused by lack of the general organizational model of exploratory teaching.

Pedagogical research modeling

The organization of pedagogical research is best represented as an organizational model that displays the main elements of research in their functional relationship.

As the analysis of research process shows, in any pedagogical study there is a *goal*, a *task*, a *hypothesis* – teacher's original supposition, *teaching techniques*, *research methods*, *literature review*, *small-scale experiment* or *action research*, *data collection and data presentation*, *discussion of findings*, and the *conclusion* drawn from exploratory teaching. There is also such an element as *evaluation* of the conducted research work.

A goal sets the general direction of the pedagogical research towards a certain result while the tasks make concrete every new step of the exploration that teachers undertake. A hypothesis formulates an original research supposition that can be either proved or refuted as a result of the conducted action research.

Teaching techniques usually contain some elements of novelty that the researcher wants to put to test in one's own classroom. It is important that teacher's research be done in the classroom settings where some unique experience can be reflected upon and described.

Research methods are the key to success because with the help of these instruments the researcher gathers the necessary data. The data are to be presented in tables, graphs and photos. Video episodes or audio recordings as well as drawings and sketches are also an option.

Literature review provides a set of ideas generated and published by other authors, contributing to a better understanding of the problem in question. Controversial views expressed in previous publications are especially interesting to bring to the surface.

Presentation of data is accompanied by the discussion of findings where the author reflects on the expected and unexpected results obtained.

The conclusion drawn as a result of classroom work is based on the evidence both theoretical and experimental found during the exploratory teaching process

Research evaluation

The study is evaluated on a number of parameters. These include the relevance of the topic, the achievement of a clearly formulated goal, the novelty and significance of the results, the feasibility of the recommendations, absence of plagiarism and the exhaustive answer to the questions posed at the start.

One of the merits of the research goal is its modest scale. The author's overestimated ambitions in choosing a topic always raise doubts about the teacher's ability to implement such a "grandiose" plan. Narrow subjects of research within the teacher's abilities are preferable.

For example, a research goal to develop a methodology for teaching grammar is too general and hence unattainable for a teaching practitioner working alone. It might be better to choose a narrow goal to teaching students some skills of grammatical observation, to check the efficiency of certain grammar activities or the reliability of an experimental testing technique. The research topic is formulated in accordance with the goal. The narrower the topic the better. Language clarity adds to the author's deserves.

The relevance of the study shows how important the results are for the pedagogical community, that is, for the colleagues of the teacher-researcher.

The novelty of the research lies in a discovery though small that the author has managed to make. It is essential to introduce small innovation in the educational process and check its effect on the learners.

The impact of the teacher's research is determined by how useful the obtained results are for the teaching community. The wider the scale is the greater the impact is. A small step can bring about great changes in teaching.

A study can be considered implementable and replicable by others if the author offers the material ready for use with recommendations, training tasks and measuring techniques in the "take-away" form.

Plagiarism issue

The study must certainly be original and any form of plagiarizing is inadmissible. Plagiarism, that is, the appropriation of ideas, fragments or the whole text of someone else's research, should be completely banned. Cases of "hidden plagiarism" are also unacceptable, when the author carefully paraphrases other people's thoughts, presenting them as one's own ideas. Even a brief borrowing of other people's findings requires a reference to the author. Modern technological capabilities make it possible to identify in any text cases of unauthorized borrowing of someone else's information.

New opportunities of writing a research article with technology

In the digital age, new opportunities are opening up for integrating the human mind and elements of artificial intelligence (computer). The teacher-researcher will be interested in trying the interactive internet site <http://academic.tstu.ru>

The site assists the author in producing a research article according to the format accepted in the majority of international academic journals. It contains the tabs such as

“My archive” with the articles already written by the user. Another tab, “My library” assists the researcher in collecting the literature sources necessary for writing an article and quoting from them. The bibliography list in the article is automatically formatted in the required style, such as Chicago, APA, Harvard or the Russian quoting standard (GOST). The tab “My projects” is for the articles that the author is currently working on. This tab provides the needed guidance for structuring the paper. It also serves the author’s needs by semi-automatically compiling the list of key words, the summary and the conclusion of the paper in progress.

Conclusion

The proposed organizational model of pedagogical research can help the teacher to conduct their own study of a pedagogical problem relevant to their professional needs. The model contains the most essential parts of the research process and paper writing. It also gives an idea of research evaluation scheme as well as includes technological assistance in writing a research article. Remembering the English saying that “the proof of the pudding is in the eating”, the proof of the suggested research model for teaching practitioners is in doing a small-scale research in one’s own classroom and publishing the results.

ОРГАНИЗАЦИЯ ИССЛЕДОВАТЕЛЬСКОЙ ДЕЯТЕЛЬНОСТИ УЧИТЕЛЕЙ

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Аннотация

Учительское исследование представляет собой как важную сферу профессионального роста педагога, так и область продуктивного педагогического поиска. Ценность таких исследований, несмотря на их ограниченный объем, возрастает в связи с тем, что они отражают школьную реальность, выявляя актуальные проблемы, неиспользованные ресурсы и пути повышения эффективности обучения. Несмотря на важность учительского исследования для совершенствования теории и практики обучения иностранным языкам, роль этой деятельности пока невелика. Причина в том, что учителя-практики недостаточно знакомы с сущностью, методами и организацией научной работы. Эта статья адресована педагогам, проявляющим интерес к исследовательской работе в форме опытного обучения в своём классе.

Ключевые слова: учительское исследование, организационная модель, методы исследования, технологический ресурс.

PRESENTATION STRATEGIES FOR PhD STUDENTS

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Abstract: A PowerPoint presentation on the content of PhD students' research work is approved by the Ministry of Education of the Russian Federation № 274 of 8.10.2007 as a part of an oral exam stage. The article presents the content of the short-term course on teaching presentation strategies for PhD students.

Keywords: presentation strategies, training program, short-term course, compositional structure and peculiarities.

Introduction

The content, structure and requirements of foreign language exam for PhD students in Russia are in accordance with the program approved by the Ministry of Education of the Russian Federation № 274 of 8.10.2007. A PowerPoint presentation on the content of PhD students' research work as a part of an oral exam stage is approved by the Scientific Councils of Universities. For this reason, a short-term course in presenting in English is included into the training program of the postgraduates in Tambov State Technical University for passing their foreign language exam successfully.

This course implies learning of:

- compositional structure of the presentation;
- grammatical, lexical and syntactic features of the presentation;
- linking-words and phrases as means of textual connectedness;
- techniques of guiding the audience through a presentation.

At the introductory lesson postgraduates are given general advice on how to write an effective PowerPoint Presentation. The main idea *is to comply with 10(12)-5(6)-10(12) rule for slideshows*. This means that a PowerPoint Presentation should:

- contain no more than 10(12) slides;
- last no more than 5(6) minutes;
- contain no more than 10(12) % of textual information (a presenter should voice 90% of information).

The structure and peculiarities

Compositional structure of the PowerPoint presentation usually consists of an Introduction, Main part and Conclusion.

The Introduction or “start” should reflect the answers for four basic questions:

Who? A presenter introduces himself /herself (his/her name and background).

Why? A presenter tells an audience the reason they're there to listen to him/her and the purpose of a presentation.

What? A presenter outlines the main points that he/she is going to develop and the order in which he/she would like to develop these. When an audience have a clear view of the “roadmap” you want “to navigate”, they can follow you more easily and can also see you're planned, prepared and effectively managing the presentation.

How? A presenter addresses an audience's needs. An audience won't listen to a presenter if they have other concerns. They may be thinking: *How long do I have to sit here? Do I have to take notes? When can I ask questions? Is there any coffee here?* It can therefore be useful to answer such questions in the “start” so that an audience is ready to listen.

So, an Introduction should include these points but at the same time not be too long. Ninety seconds is a good guideline, the audience tends to listen to every word and form an impression of a presenter in these ninety seconds. An accurate “start” helps to create a good impression and you should aim to be grammatically accurate at this stage.

The content of a main part of a presentation depends on the degree of involvement in the postgraduates' research process at the moment of presenting. (At what stage of the research is a postgraduate? What can he/she already formulate? Are there any results of the study?) Here is an example of possible slides with possible headings (see fig. 1):


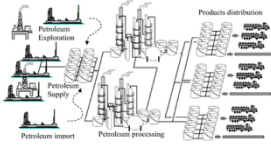
<p>Optimized Planning in Petroleum Supply Chains</p>  <p>Roman E. Kovargin E-mail: kovargin@gmail.com</p>	<p>Structure</p> <ul style="list-style-type: none"> Introduction Problem description Object & Subject of research Supposed results Conclusion 	<p>Introduction: Goals of Presentation</p> <ul style="list-style-type: none"> Define the terms "Supply Chain", "Supply Chain Management (SCM)"; Show typical Petroleum Supply Chain; Describe best practice solutions in supporting SCM decisions based on industrial software tools; Formulate actual problems in existing approaches and identify object and subject of the forthcoming research; Determine supposed results of the research.
<p>Problem description (1): What is SCM? Main definitions</p> <ul style="list-style-type: none"> A supply chain is a system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer. Supply chain activities transform natural resources, raw materials and components into a finished product that is delivered to the end customer; Supply chain management (SCM) is the management of a network of interconnected businesses involved in the provision of product and service packages required by the end customers in a supply chain. 	<p>Problem description (2): Typical petroleum supply chain</p> 	<p>Problem description (3) Actual problems</p> <ul style="list-style-type: none"> Initial parameters for optimization models sometimes are based on inaccurate forecasts; Initial variables for LP-problem are determined as constants; External factors of uncertainty may affect the initial parameters. <p>As the result an optimal solution that was received from LP-model may become useless or even harmful for supply chain.</p>
<p>Object & Subject of research</p> <ul style="list-style-type: none"> Object: software and hardware elements of supply chain management system, such as information systems, mathematical models, algorithms and etc.; Subject: economic factors of uncertainty and their influence on object of research. 	<p>Supposed results</p> <ul style="list-style-type: none"> Research methodology of economic factors of uncertainty and their influence on distribution process of material flows; Mathematical formulation of considered problem; Stochastic mathematical model of distribution process of material flows which takes into account the influence of external economic factors; The effect estimation of advanced supply chain planning system. 	<p>Conclusion</p> <p>Achieving all mentioned results could help a supply chain manager in Petroleum company to take much more optimal decisions about supply chains collaboration based on optimization planning tools.</p>

Figure 1- Possible slides

Speaking about the main part of the presentation, it is necessary to consider the language of presentations. If a presenter wants his/her audience to understand his/her message, his/her language must be simple and clear. A presenter should use short words and short sentences, active verbs instead of passive verbs, because they are much easier to understand and they are much more powerful. And, of course, it is preferable to speak about concrete facts rather than abstract ideas.

A presenter needs to be able to use linking-words and phrases to make his/her speech more coherent and logically aligned. They enable to establish clear connections between ideas. Examples of linking-words: *although/even though, even if, in case, in spite of/despite, so that, as a result, consequently, therefore, besides, furthermore, in*

addition, moreover, for instance, for example, on the contrary, on the other hand, however, nevertheless, in the same way, similarly, to sum up, briefly, to conclude, in conclusion etc.)

It is also important to use such techniques of guiding the audience through a presentation as *signposting* or *signaling*. Signposts create “verbal paragraphs” or “verbal signals” and raise the attention curve at the beginning and end of each point of your presentation. This technique allows linking one point of the presentation to the next, structuring and shaping the main content of a presentation. This is a simple but highly effective technique that adds clarity to your presentations.

The Conclusion or “finish” of a presentation implies the following steps:

- pausing and *signaling* about the finishing of a presentation;
- making *summary* without any conclusions, giving a brief overview of what has already been said (it should not be too long but detailed enough to cover all points);
- giving *conclusion* (it may be a call for action, a recommendation or assuring an audience that they’re better informed);
- making *closing remarks*: thanking an audience, asking for questions or passing round presentation handouts.

Conclusion

Thus, in this paper an attempt has been made to clarify some aspects of designing a course for teaching PhD students to make presentations on the content of their research work. Much attention was given to compositional structure of a presentation, its grammatical, lexical and syntactic features, as well as some means of textual connectedness and techniques of guiding the audience through a presentation.

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ОБУЧЕНИЕ АСПИРАНТОВ ПРЕЗЕНТАЦИОННЫМ СТРАТЕГИЯМ

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Аннотация

Презентации научных исследований аспирантов одобрены Ученым Советом ТГТУ в качестве одного из пунктов устной части экзамена по иностранному языку, согласно программе, утвержденной Министерством образования Российской Федерации № 274 от 8.10.2007. В статье представлено содержание краткосрочного курса по обучению аспирантов презентационным стратегиям.

Ключевые слова: учебная программа, краткосрочный курс, композиционная структура и особенности, методика.

CONCEPT STRUCTURE OF STUDENT READINESS TO PROFESSIONAL ACTIVITY IN ENGLISH

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Abstract

In this article the authors made an attempt to consider the structure of students' readiness for professional activity in English. Being guided by the analysis of psychology and pedagogical researches on a question of readiness structure for professional activity in a foreign language, the authors define components of readiness and prove their vision of the question.

Keywords: education, globalization, multilingualism, professional activity, readiness, trilingualism.

Significant changes in the Kazakhstan society in recent years have affected directly the education system followed by the reforming of this system. In particular, the reform has influenced the language education which importance for multicultural Kazakhstan is indisputable. The accession of Kazakhstan to the Bologna Process in order to create a strong competitive education system in the world [1] played a significant role in development Kazakhstan trilingualism. According to the principles of the Bologna declaration, the system of polylingual education has to be realized in Kazakhstan at which English has to be used on an equal basis with the Kazakh and Russian languages.

The legal and regulatory side of the above-named process is provided by the State program of development and functioning of languages in the Republic of Kazakhstan for 2011-2020 where it is about development of languages in new conditions, improvement of the regulatory framework directed to strengthening of the institutional status of Kazakh as state, to maintaining sociolinguistic activity of Russian and to development of English as integration tools in world space [2].

Within the realization of the State program of education development for 2011-2020 the systematic transition to training in the Kazakh, Russian and English languages is carried out [3].

Analyzing the readiness structure in the context of professional activity, it is possible to claim that various concepts of readiness distinguish components of its structure which reflect basic concept characteristics – positive attitude to profession, interest in it, possession of ways and methods of professional activity, knowledge and abilities, self-control, self-assessment, etc.

The analysis of psychological and pedagogical researches reference on a question of readiness structure for professional activity shows that most of scientists distinguishes reference three main readiness components for professional activity in a foreign language: motivational (motives, interests), cognitive (foreign language knowledge) and operational (abilities).

The allocated structure components of the concept of readiness for professional activity in a foreign language give to us the grounds to allocate three components: motivational, cognitive and praxeological.

The cognitive component reflects degree of theoretical readiness for professional activity in a foreign language. Preparation for professional activity in a foreign language has to cover two directions:

(1) professional and communicative (mastering and development of the language knowledge representing the respective sphere of professional activity by means of integration of disciplines "Foreign language", "The professional focused foreign language" in the general course of vocational training);

(2) professional and cross-cultural (knowledge of national peculiarities of native and foreign-language culture, speech and behavioral norms of society in the course of professional interaction).

The praxeological component characterizes practical readiness of students for professional activity. Allocation of this component is caused by the fact that assimilation of knowledge is inseparably linked with their application in practice and formation of skills of foreign language communication that makes a basis of practical training of students for communication in the professional sphere. We will divide all abilities entering a praxeological component into three groups: linguistic, sociolinguistic and professional and communicative:

(1) linguistic abilities include the ability to use the system of language for communication; the ability to distinguish value of the selected grammatical units; the ability to distinguish basic syntactic links between words and larger components of sentence structure; the ability to analyze syntactic links between words and larger components of sentence structure; ability to use syntactic words; the ability to use terminology in the specialty;

(2) sociolinguistic abilities include abilities to understand and to adequately use knowledge of cultural features of native speakers, their habits, traditions, standards of behavior and etiquette, ability to use adequate language forms and means depending on the purpose and situation in the course of communication, remaining at the same time the carrier of other culture;

(3) professional and communicative abilities assume communicative abilities in a foreign language in the professional sphere, ability to read and understand completely or generally contents of simple authentic texts of different genres and types; ability to orally carry out dialogical communication within the household, professional sphere of communication; ability to enter communication, to support, finish, leave it, to maintain a conversation, the ability to work effectively with the foreign-language professional focused information, to build the strategic line of conduct.

The motivational component characterizes the degree of moral and psychological readiness of student to use English in professional activity. It reflects the degree of formation of interest and motives to this type of professional activity, in our case – professional interest in studying and use of knowledge and abilities of communication in English in the future professional activity.

An interest in studying and the use of knowledge, abilities of communication in a foreign language finds the expression in a positive emotional attitude to this type of activity, to the culture of the people of the learned language, aspiration to learn foreign language culture for the purpose of mastering abilities of communication with representatives of other nation, self-improvement and self-development in this subject domain, formations of set of the motives including communicative, pragmatical and informative.

The existence of interest in a profession and learning of foreign language, satisfaction with results of mastering skills of communication are necessary conditions when forming readiness for professional activity in a foreign language and promote increase in activity of students in this educational process.

Thus, in the structure of students' readiness for professional activity in English we allocated three components: cognitive, praxeological and motivational whose formation and interrelation provide the efficiency of professional activity in English. The cognitive component makes a theoretical basis of knowledge for development of practical abilities and their application in the field of professional activity in a foreign language. The praxeological component assists improvement of abilities of communication in a foreign language in professional activity and reflects degree of practical students' readiness for implementation of professional activity in a foreign language. The motivational component is a necessary condition when forming this readiness and provides its integrity.

Being guided by the analysis of the definitions of the concepts "readiness", "readiness for professional activity", "readiness for professional activity in a foreign language" which are available in psychology and pedagogical literature we will formulate definition.

Readiness of students majoring in pedagogy to use English in professional activity is relevant from the perspective of linguistic, sociolinguistic, professional and communicative knowledge, abilities and positive motivation necessary for successful implementation of professional activity in a foreign language.

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СТРУКТУРА ПОНЯТИЯ ГОТОВНОСТИ СТУДЕНТОВ К ПРОФЕССИОНАЛЬНОЙ ДЕЯТЕЛЬНОСТИ НА АНГЛИЙСКОМ ЯЗЫКЕ

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Аннотация

В данной статье авторами предпринята попытка рассмотреть структуру понятия готовности студентов к профессиональной деятельности на английском языке. Опираясь на анализ психолого-педагогических исследований по вопросу структуры готовности к профессиональной деятельности на иностранном языке, авторы определяют компоненты готовности и обосновывают свое видение вопроса.

Ключевые слова: глобализация, готовность, образование, полиязычие, профессиональная деятельность, трехязычие.

FROM THE EXPERIENCE OF EDMODO IMPLEMENTATION: RESULTS

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Abstract

The past decades have seen the rapid development of online learning. Its development led many researchers to investigate the use of online platforms in foreign language teaching. The article considers the experience and results of Edmodo digital platform implementation. Particularly, article aims to determine perception of Edmodo implementation by both teachers and learners. The results showed that both teacher and learners should be equipped with the knowledge of using platform. Having pointed out the advantages of Edmodo implementation it helps us to understand further pace of its implementation in foreign language teaching.

Keywords: Edmodo, conventional teaching, ICT, teaching English.

Today successful education is impossible without the implementation of computer and information technologies in Kazakhstan. These technologies are becoming inseparable part of modern education. Nowadays technologies help teachers to meet the requirements of modern educational environment, namely, they make education more learner-centered.

Teaching modern generation requires changes in education approach from conventional to more comprehensive, communicative and technological way. Conventional teaching methods are focused on form, practice and repetition of structure. In conventional classes learners are asked to memorize English grammar rules and vocabulary and apply their translation skills [1].

In accordance to modern requirements, students must be given a chance to take control of their education. The whole process must still be facilitated by teacher and he observes learners' achievements, but the outcomes and the processes will depend on their efforts. Thus, implementing new technologies teachers need to allow second language learners to access and experience the target language in natural manner, particularly by utilizing technology which has been progressing rapidly to facilitate the learning process [2].

Today the question of technologies incorporation in higher schools education is relevant, although teachers still prefer old fashioned way of teaching.

Teachers of new generation today must eliminate the limitations of conventional methods and propose possible solution in language learning.

A lot of attention is paid to the peculiarities of e-learning courses selection for foreign language teaching on the basis of digital platforms, and to the selection of e-resources as a tool for students' competences development.

Learning based on the digital platforms is a type of learning becoming more and more popular, because it gives prospective for university's academic development[3].

Digital platforms application is relevant in foreign language teaching due to the following reasons: the Internet access, wide range of authentic teaching material for teachers and learners, technologies mobility, communication with people from other

countries, publishing textbooks with e-apps.

Having studied existing digital platforms used for learning Edmodo was considered as the best one for teaching “Language for specific purposes” in technical university.

Edmodo is an educational platform designed in the United States in 2008. It is considered the “Facebook for Education” and it has been approved as one of the popular online learning tools. The Edmodo implementing into the process of foreign language teaching is determined by the number of reasons:

- Edmodo is a reliable social learning platform dubbed as “Facebook” but it is entirely focused on educational community.
- Edmodo is platform presenting information in motivating and engaging way for students and at the same time it is controlled environment for peer tutoring and assessment. It develops strong class community.
- In contrast to learning management systems Edmodo gives learners freedom in their actions and provides them with a wide range of ways in solving problems.

Considering and analyzing Edmodo advantages the teaching staff of Karaganda State technical University chose it as an incorporative tool for face-to-face classes and learners’ independent work in “Language for specific purposes”.

Before Edmodo implementation into classes, to understand Edmodo, there was a series of workshops for teachers to learn the basic techniques of using Edmodo in two positions: teachers, students. Many things were done by teachers to acquire the skills in using Edmodo, from self - taught, learning from books, tutorials, studied to peers or ask questions in the discussion forum of digital learning in the internet media until attending training that organized by the institution or professional organization. After that process, teachers started implement Edmodo and helped students to run it.

Being interviewed teachers conducted classes with Edmodo platforms emphasized that it meets all the requirements for the class based on Internet technologies: available didactic tools (groups creation, tasks development, tasks performance, comments, discussion and consulting, obtaining of statistic data); it is cross-plat and cross-browser providing opportunity for service application by different types computer devices (PCs, lap-tops, tablets, smart phones and etc.); it is global service with high-quality of online-connection, stable and reliable services operation, qualitative updating of apps. Lingua-didactic Edmodo tools allow to use authentic texts, audio and video files, links to different multiform Internet-resources.

Moreover, it should be mentioned that Edmodo is a good tool for midterm and final control in different formats: automatic checking of learners’ works (QUIZ), checking and assessment by teacher (ASSIGNMENT), Peer assessment method implying learners assessment performed by other learners in accordance to designed rubrics with the chance of constant feedback, consulting, commenting and discussion.

In addition, teachers inform students about pools, alerts, quizzes, homework, reading materials and sub-groups where all of these can be done effortlessly and be accessed by students at any time. Students change the way of their thinking and information perception by analyzing and responding to tasks posted on Edmodo.

In terms of language learning enhancement through the use of Edmodo, the learners notices several ways for the platform use. According to information obtained from learners’ interview, we can make some conclusions. Firstly, Edmodo makes

learning more attractive to learners because it becomes learner-centered while teachers only facilitate, observe and assess. Secondly, it helps learners to get and study information in their own pace because they can be exposed to the material any time and any place, thus directly or indirectly they learn the language. Thirdly, learners are more responsible for what they write and it helps to develop their reading and writing skills. Before answering the questions posted on Edmodo, learners read others' replies to see how they write their responses, how they use grammar. In this way, they are learning by looking at other comments. And finally, learners can learn language not only by doing tasks or assessment on this site but also find resources online.

Edmodo is a media that can be used by teachers. Edmodo is easily installed on computers, laptops and android. There are benefits by using Edmodo. They are easy to use features in submitting online tasks, easy to access reference materials and increase of students' motivation because of online activities and discussions. But there are some things teacher should consider in applying Edmodo. Firstly, when teaching, teacher must ensure the availability of internet connection. Secondly, the number of electronic devices should correspond with the number of students in the class.

Overall, we determined some positives and negatives of implementing and using Edmodo in foreign language teaching. Students seemed to enjoy using Edmodo in classrooms and out. Further implementation and research into the use of Edmodo is implied.

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ИЗ ОПЫТА ВНЕДРЕНИЯ ПЛАТФОРМЫ EDMODO: РЕЗУЛЬТАТЫ

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Аннотация

Стремительное развитие онлайн обучения в последние десятилетия привели ученых к выводам о необходимости дополнительного исследования онлайн платформ в процессе преподавания иностранного языка. В статье рассматривается опыт и результаты применения образовательной платформы Edmodo. Основной целью статьи является анализ результатов внедрения платформы обеими сторонами образовательного процесса: студентами и преподавателями, а также выяснение положительного влияния платформ на качество усвоения учебного материала, в частности усвоение знаний и умений иностранного языка. Результаты показали, что и преподаватели и студенты положительно относятся к использованию в учебном процессе возможностей платформы. Определив на данном этапе преимущества внедрения платформы в образовательный процесс, вторым этапом исследования является выявление эффективных методов обучения в условиях внедрения платформы в процесс изучения иностранного языка

Ключевые слова: Edmodo, традиционное обучение, ИКТ, преподавание английского языка.

QUALITY MANAGEMENT SYSTEM FOR INTEGRATED SAFETY OF EDUCATIONAL INSTITUTIONS

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Abstract

The problem of ensuring the integrated safety of educational institutions is currently highly relevant, since the number of dangers and threats, such as terrorism, fires, crime, is regularly increasing. The level of safety of most educational institutions is extremely low and requires modernization. In order to improve the integrated safety of educational institutions, this article discusses measures and measures that should be implemented. The components of the integrated safety management process of an educational institution are identified; the priority directions of the educational institution's activities in the field of integrated safety are proposed.

Keywords: integrated safety, educational institution, management, process approach, process improvement, process effectiveness.

Recently, there has been an urgent need to strengthen measures to ensure the integrated safety of educational institutions.

The safety of an educational institution consists of many directions and is an integral system, the elements (directions) of which work are interconnected, providing conditions for the preservation of life and health of students, pupils, employees, as well as the preservation of wealth from possible emergencies.

Comprehensive safety of an educational institution is a state of protection of an educational institution from real and foreseeable social, man-made and natural threats, ensuring its safe functioning. [1]

The integrated safety of an educational institution is formed and achieved through the implementation of an integrated system of measures and measures of organizational, legal, personnel, technical, financial nature; such as:

(1) Physical protection of the object and territory (monitoring and ensuring safety, timely detection and prevention of dangerous situations) is carried out by private security units, internal affairs bodies, private security companies (PSCs) or full-time security guards.

(2) Engineering fortification (fencing, metal doors, grilles, etc.).

(3) Organization of checkpoint to prevent the entry of unauthorized persons.

(4) Engineering equipment (burglar alarm, fire alarm, alarm buttons, video surveillance, restriction and access control, intercom facilities).

(5) Compliance with fire safety and electrical safety standards.

(6) Planned work on civil defense.

(7) Anti-terrorism protection of an educational institution.

(8) Anti-corruption measures.

(9) Organization and coordination of labor protection.

(10) Information security.

(11) Interaction with law enforcement agencies and other structures, auxiliary services and public organizations in terms of combating criminal offenses (hooliganism, theft, violence), extremist manifestations, riots, drug trafficking.

(12) Legal education and the formation of a safety culture [3].

In this article, the comprehensive safety of educational institutions and its management system are considered from the perspective of total quality management within the framework of the quality management system of an educational organization, which allows ensuring the effectiveness of processes and their continuous improvement.

For the formation of an integrated safety management system of an educational institution from a technological standpoint, a process approach is used, which considers integrated security management as the systematic implementation of a number of coordinated activities and common management functions and focused on quality results, rational use of resources, continuity and continuous improvement life safety.

The process approach in an educational institution allows regulating the management of integrated security on the basis of assessing its state according to specially defined quality criteria for all components of the process itself, as well as factors affecting the final result.

The performance of the integrated security management system is the satisfaction of stakeholders in the safe conditions of the educational institution. The interested parties are the educational institution and all those who are connected with its activities in the external environment - social institutions (state, society, relevant departments, etc.).

One can also mention (on the basis of process models of quality management systems) the division of processes into life-cycle processes, resource management, measurement monitoring and improvement, as well as the processes of the top management of an educational institution. In the process of managing integrated safety within the set boundaries of an educational institution, indicators should be defined that characterize the process and its results; defined responsibility for each process.

The main characteristics of the management process of integrated safety of educational institutions are its repeatability and stability of the output characteristics for a given input, parameters and available resources of the processes [2].

A prerequisite for the organization of integrated safety of an educational institution is the development of a system for improving the management of integrated security. Based on this, the following improvement actions are proposed: - analysis and assessment of the existing situation to identify areas for improvement; - setting improvement goals; search for possible solutions to achieve goals; evaluating these decisions and choosing the best one; - implementation of the selected solution; - measuring, verifying, analyzing and evaluating the results of implementation to determine whether goals have been achieved; - documenting changes.

The results are analyzed accordingly in order to establish further opportunities for improvement. Thus, improvement is a permanent activity.

Feedback from stakeholders, audits and analysis of the quality management system can also be used to identify opportunities for improvement. [4]

Based on the analysis of the current state of educational institutions in the field of integrated security and the study of possible security threats, the article suggests the following priority activities: - improvement and introduction of new methods of work organization, including through the use of modern information technologies;

- increased vigilance and level of security training of employees;

- the study and improvement of the regulatory framework in the field of integrated security of educational institutions;

- improvement of the integrated security management system of educational institutions, including the development of effective mechanisms for managing integrated security and the distribution of functions ensuring certain aspects of integrated security among educational officials;

- the introduction of modern technical means and systems to ensure comprehensive security (intercom facilities, surveillance equipment, signaling means of warning, means of detecting unauthorized entry of violators or bringing prohibited items into the territory of an educational institution, etc.);

- definition of indicators and organization of system monitoring of complex safety of educational institutions;

- planning organizational and financial support for integrated security.

The introduction of these measures into practice will help to solve a number of problems in the field of ensuring integrated security. It is assumed that educational organizations will acquire internal competent employees.

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СИСТЕМА МЕНЕДЖМЕНТА КАЧЕСТВА В УПРАВЛЕНИИ ИНТЕГРИРОВАННОЙ БЕЗОПАСНОСТЬЮ ОБРАЗОВАТЕЛЬНЫХ УЧРЕЖДЕНИЙ

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Аннотация

Проблема обеспечения комплексной безопасности образовательных учреждений в настоящее время является весьма актуальной, поскольку число опасностей и угроз, например, таких как терроризм, пожары, преступность, постоянно увеличивается. Уровень безопасности большинства образовательных учреждений крайне низок и требует модернизации. В целях повышения комплексной безопасности образовательных учреждений в данной статье обсуждаются меры и меры, которые должны быть реализованы. Определены компоненты процесса интегрированного управления безопасностью образовательного учреждения и предложены приоритетные направления деятельности образовательного учреждения в области интегрированной безопасности.

Ключевые слова: интегрированная безопасность, образовательное учреждение, управление, процессный подход, совершенствование процесса, эффективность процесса.

BASIC IMPLEMENTATION OF HACCP PRINCIPLES AT PUBLIC FOOD ENTERPRISES

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Abstract

The article describes the main elements, as well as the stages of implementation of the HACCP system in public catering. The sequence of their introduction at the enterprise is defined, and also recommendations to their implementation are presented.

Keywords: safety, system, HACCP, control, quality.

Introduction

The HACCP system was first developed in the United States in 1960 under the strictest secrecy by Pillsbury, who worked for NASA. It was vital to ensure food safety for American astronauts. At that time, most food safety and quality control systems were based on the control of the final product. The need for a preventive system has emerged that provides a firm belief in food safety. For this, the HACCP system was created. After 10 years of its practical application in NASA, in 1971 it was presented at the First American National Conference on Food Safety, was approved and started to be introduced in the food industry. Its final version was developed and approved in 1996.

Around this point, the HACCP system began to spread rapidly throughout the world – food enterprises in America, Europe, and Australia actively introduced the principles of HACCP into their work. Today, in the countries of the European Union, the USA, Russia, Canada, the introduction and application of the HACCP method in the food industry, certification of the HACCP system are mandatory.

By the decision of the Commission of the Customs Union of December 9, 2011 No. 880, Technical Regulations of the Customs Union of the TR CU 021/2011 “On the safety of food products” were approved. According to paragraph 2 of Article 10 of these Technical Regulations, manufacturers are obliged to develop, implement and maintain procedures based on the principles of - Hazard Analysis and Critical Control Points (HACCP) [1, p.14] in the implementation of the processes of production (manufacture) of food products.

The introduction of the HACCP system in Russia at catering enterprises has been going on for more than 8 years, but only a small part was able to successfully use this system. Most of those enterprises that have implemented this system are leaders in their field. The experience of these enterprises in the development and implementation of HACCP systems can provide invaluable assistance in the implementation of this system in other enterprises. This paper describes the essence and the stages of the HACCP system.

The essence and the stages of the HACCP system

The HACCP system ensures control at all stages of the manufacture, storage and sale of products where dangerous situations may arise.

The development and implementation of a quality management system in a catering enterprise is not limited to the execution of documentation and the creation of

order in an organization, it affects the entire working group. The essence of the HACCP system is to identify and control “critical points” at all stages of the production of finished products. [2, p.3]

The implementation of the HACCP system at catering enterprises includes 12 stages:

- creating a working group;
- preparing product descriptions;
- describing the enterprise;
- drawing up technological schemes;
- determining process schemes;
- conducting hazard analysis;
- determining critical control points;
- setting limits for each critical control point;
- installing a monitoring system;
- setting corrective actions;
- establishing verification procedures;
- establishing a procedure for documenting and storing data [3, p.16].

The first stage is the creation of a working group. The working group should include people like senior shifts, cooks, etc. It is important to make sure that one of the members of the group should be a person who has the right to make decisions. Also, the working group should include a chef who has knowledge in the field of cooking and serving dishes, as well as senior shifts that are responsible for the stable operation of the system in the establishment. At least one of the group members must have knowledge of HACCP.

Depending on the type of catering activity, on the basis of manufactured, served as well as delivered products, a description of food products and their quantities is made at the enterprise.

Types of activities in catering are quite diverse. Therefore, as part of the introduction of the HACCP system, a description of the enterprise’s activities should be made, for example, the company only serves the serving and serving of finished products, or the processes of producing and storing food products, with its subsequent sale, etc.

The next step is the preparation of technological schemes. The basis for the preparation of technological schemes is to take the product groups from the previously compiled description; for an enterprise with a large menu, you need to make diagrams separately for each type of product. This practice is widespread in many places; most public catering establishments have their own cooking areas for different types of dishes, such as soups, main courses, as well as desserts. Process charts (for cooking dishes) should describe all actions and procedures necessary for preparing a dish, starting with the storage of raw materials and ending with the transfer of finished products to the consumer.

After drawing up the process chart they should be checked for accuracy and suitability. Usually, the check is carried out by a person who did not participate in the preparation of the process chart. In this case, the review will be more adequate, it will be possible to find out how correctly and accurately the charts are drawn up. If the prepared chart meets all the requirements of the working group, it should be approved. To do this, the date, position, last name and name of the person who approved the scheme and a signature should be written on the chart.

If all the preconditions are determined and all the technological processes are reflected in the process chart, then a hazard analysis should be carried out. For this, all

stages are sequentially analyzed for the possibility of the hazards described in the flow chart.

After analyzing the hazards, the next stage is going on - finding critical control points. Critical control point (hereinafter referred to as CCP) is a point where there is a serious danger, which may further affect the results of the subsequent stages described in the technological scheme. When determining the CCP, it is necessary to enter the lower and upper limits of permissible values for all cases; they are also called critical limits. Critical limits should be set for each CCP, and several critical limits can be set for one CCP. The critical limit may have an upper critical value, a lower critical value, or both.

To make sure that the position at the critical point does not exceed the established critical limits, monitoring (observation) should be carried out, during which the situation at the critical control point should be assessed and the results recorded. If the monitoring revealed that the value of a specific CCP went beyond the critical value, then corrective actions should be taken. Corrective actions are taken if during the monitoring process it turns out that the situation at the control (critical) point has gone beyond the established critical limits or limits. Any deviations and corrective actions should always be documented in the monitoring list in the column for a description of the corrective action.

Verification procedures are those measures that determine the effectiveness of the HACCP plan. These processes are required to be carried out during the development and implementation of the HACCP plan. In turn, documentation systems should cover all necessary documents, monitoring lists and supporting materials (audit results, laboratory analysis protocols). Documentation must be up-to-date, correct and accurate, and cover the entire system. Documents must be identified and be easily found. The HACCP system is makes it possible to detect drawbacks and fix them in a timely manner immediately after the introduction of the system into the enterprise.

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ОСНОВЫ ВНЕДРЕНИЯ СИСТЕМЫ ХАССП НА ПРЕДПРИЯТИЯХ ОБЩЕСТВЕННОГО ПИТАНИЯ

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Аннотация

Описаны основные элементы и этапы внедрения системы ХАССП на предприятиях общественного питания. Определена последовательность их введения на предприятии, а так же представлены рекомендации к их выполнению.

Ключевые слова: безопасность, система, ХАССП, контроль, качество.

SELECTING AUTOMATED SYSTEMS OF METROLOGICAL ACCOUNTING AND CONTROL

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Abstract

In this article the problems of automation of the workplace of the metrology engineer, namely, the reasons of automation, probability of problems of introducing automated systems are considered. The analysis of the most common automated systems of metrological accounting and control is carried out.

Keywords: automated system, measurements, metrology, software and information tools, measuring instruments.

Introduction

In modern society, metrology plays a significant role as a science and field of practice. The results of measurements are used in all spheres of human activity. Measurements quantitatively characterize the surrounding material world, revealing the laws of nature. If the measurements are accurate, we speak of metrology provision. Metrology provision is the establishment and application of scientific and organizational bases, technical means, rules and regulations necessary to achieve the unity and the required accuracy of measurements.

Automation of the workplace of the metrology engineer

The quality of metrology provision of measuring instruments (MI) significantly depends on the degree of automation of measuring processes. Without automation of the workplace of the metrology engineer at the enterprise not to do as in the average and big organizations park MI totals thousands of units, it is rather difficult to watch manually terms of verifications, to prepare monthly plans of works, to form reports for the management, etc. Software and information tools developed for metrological engineers are designed to increase the efficiency of the metrological services by distributing the load between man and computer. Metrological services of enterprises should not only maintain records of inspections, but also to convey information about them in the state accounting system verification “Mercontrol”.

The automated information system (AIS) “Mercontrol” is a uniform system of collecting and processing information about exploited in the Russian Federation instruments. This is a large-scale project that allows you to organize automated accounting and registration of the volume and nature of the verification work performed.

Types of automated systems

One of the main problems encountered in the implementation of automated systems (AS) is their adaptation to the specifics of each activity of the enterprise.

If the park of measurement tools is not large, it is possible to solve some problems by using the Excel program – to create a single database of measuring instruments in an

electronic form for the search of measuring instruments, samples from the database, lists, graphs and other dependencies in the preparation of metrological documentation. The weakness of this approach is that a Program is whole is also a developer. Consequently, it is not normalized and will problems arise over time.

View and format the most common automated systems are presented in Table 1.

Table 1 – Automated systems of metrology provision

No	Organization that provided the software (S) for verification	SOFTWARE
1	RCN LLC Moscow	Software “METR” version 2.1.32.10
2	KINEF LLC Kirishi, Leningrad region	Software “ASUMO” version 3.0
3	OJSC SPIK-SZMA St. Petersburg	Software “Delta-SI” version 4.0
4	LLC “Novosoft” Novosibirsk city	Software ACOMI version 1.4
5	OOO Gazprom transgaz Ufa, Ufa	SAP ERP software version 2005_1_700
6	LLC “Gazprom UGS” Moscow region	Software support “MetrExport” version 1.1 developer LLC “Palette of Systems”
7	JSC “Gazprom gas distribution Vladimir”	Software “Accounting for measuring instruments” version 1.0
8	LLC “TSNITEI-IS” Moscow	Program “ACS MO-Integration” version 1.0.0.0

The most common AS will be considered in this article.

ASOMI software is a multi-user automation system for metrological services, implemented on the basis of modern Internet technologies.

The advantages of this AS are:

- officially confirmed compatibility with AIS “Metrocontrol”;
- simple and convenient interface that allows you to master the system in a short time;
- ease of entering, receiving and displaying the required information;
- web interface. The system is implemented as a web application, which greatly simplifies exploitation and minimizes system maintenance costs, since it does not require the installation of any specialized software on user workstations;
- adaptability to new requirements (for example, to changes in reporting forms, etc.);
- unification of the system of normative and reference information;
- differentiation of user access rights to information about measuring instruments, etc.

The Automated Metrological Support System (ASMO) was developed by Dbsoft. It is sufficient to form an electronic database of measuring instruments in a visual graphic interface of the system, after which the program will process the database of measuring instruments by itself, build graphs, and maintain MI service logs, generate work plans and annual reports on the work of the metrological service. As the metrological works, it is enough to put in the program marks (ticks) and almost always will be ready 100% of the schedules for 100% of the divisions and technological sections in the last edition, a work plan will be drawn up for a given period of time (month, quarter), the amount of money needed for carrying out these works will be calculated. ASMO was immediately

designed as an enterprise-wide network software solution that allows you to connect a large number of users to your work at the same time.

PC DELTA-SI is intended for automated accounting of measuring instruments and automation equipment (CA) in an enterprise. PC DELTA-SI is developed by client-server technology and supports multi-user work with various levels of access to information. The database server is MS SQL Server 2000 and higher, and the client is a set of specialized automated workstations (AWP) of specialists. A flexible access control system allows allocating exactly as many rights and opportunities to each user as necessary for the performance of his official duties.

Conclusion

Currently, now there are already more than a dozen software products, they are being improved and widely used, but a significant drawback of the “boxed” versions has remained – this is the impossibility of quick adaptation to the tasks of a particular enterprise. Inconsistency or absence of the required reporting forms, imperfection of the interface and algorithms of work, insufficiency or redundancy of the information provided – all this, as a rule, leads to a decrease in labor productivity during the work with the program and need for completion of the received reports. Almost all automated systems have a focus only on accounting activities and service MI, and there are no proposals for the automation of activities such as metrological examination, testing MI, metrological support. An important limitation for the implementation of ready-made software systems for automation of metrological activities and their price, tied to the scope of the organization MI park. The analysis showed that no formed quite universal, affordable software a solution that would fit all the requirements for metrological automation activities.

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СЛОЖНОСТЬ ПРИ ВЫБОРЕ АВТОМАТИЗИРОВАННОЙ СИСТЕМЫ МЕТРОЛОГИЧЕСКОГО УЧЕТА И КОНТРОЛЯ

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Аннотация

Рассмотрены проблемы автоматизации рабочего места инженера-метролога, а именно, причины автоматизации, вероятность возникновения проблем при внедрении автоматизированных систем. Проводится анализ наиболее распространенных автоматизированных систем метрологического учета и контроля.

Ключевые слова: автоматизированная система, измерения, метрология, программно-информационные средства, средство измерений.

QUALITY MANAGEMENT TOOLS

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Abstract

This article illustrates and describes simple methods of quality management, which are mainly designed for a work with a numerical data, which in turn is a difficult process that requires serious and attentive work.

Keywords: control, management quality, quality management system, result, statistical methods, tools.

A quality management system is a system in which work is impossible without verified and objective information. With this information you can achieve any results. However, the correctness of the results can be established only by comparing them with the original data.

Statistical methods and tools are simple and straightforward. The most common are the seven methods that Japanese experts identified under the guidance of Ishikawa in the 1950s. Together these methods form an effective system of quality control and analysis methods. According to K. Ishikawa, these methods can solve up to 95% of all manufacture problems. According to K. Ishikawa, the seven simple methods include checklist, histogram, stratification of data, Ishikawa causal diagram, Pareto diagram, scatter diagram and control card. Let us consider these methods in detail.

(1) Scatter diagram, or a scatterplot (also scatter plot) is a mathematical diagram showing the values of two variables using the Cartesian plane. In the scatter diagram each observation corresponds to a point which coordinates (in the Cartesian coordinate system) are equal to the values of two parameters of this observation. If it is assumed that one of the parameters depends on the other, the values of the independent parameter are usually plotted along the horizontal axis, and the values of the dependent parameter are plotted along the vertical axis. Scatterplots are used to show whether or not there is a correlation between two variables.

(2) Checklists (or data collection) are special forms for data collection. They facilitate the collection process, contribute to the accuracy of data collection and automatically lead to some conclusions which is very convenient for quick analysis. The results are easily converted to a bar chart or Pareto chart. Control sheets can be used both for quality control and for quantitative control. The form of the control sheet can be different depending on its purpose.

(3) A histogram is a tool that allows you to assess visually the distribution of statistical data grouped by the frequency of data entry in a certain predetermined interval. Histograms are useful in describing a process or a system. It should be remembered that the histogram will be effective if the data for its construction are received on the basis of a stable working process. This statistical tool can be a good auxiliary material for the construction of control maps.

(4) Pareto diagram is a tool that allows you to objectively present and identify the main factors affecting the investigated problem and distribute the effort to solve it effectively. The Pareto chart is based on the principle that 80% of the defects come from 20% of the reasons caused them. Dr. J. M. Juran used this postulate to classify

quality problems as small but significantly important and numerous and insignificant and named this method the analysis of Pareto. Pareto method allows you to identify the main factors of the problem and prioritize their solution.

(5) Ishikawa diagram (cause-effect diagram) is a tool that allows you to identify the most significant factors (causes) that affect the final result (consequence). The systematic use of cause-and-effect diagrams can identify all kinds of causes that cause a problem and separate the causes from the symptoms.

(6) Control charts are a special type of a chart first proposed By W. Shewhart in 1925. Control charts reflect the nature of quality change over time.

(7) Stratification is the basis for other tools, such as Pareto analysis or scatterplots. This combination of tools makes them more powerful. The figure shows an example of the analysis of the source of defects. All defects (100%) were classified into four categories - supplier, operator, shift and equipment.

Product quality management is a complex dynamic process in which all enterprise management levels should be involved. Quality depends on different technical, economic and socio-psychological factors; therefore, firms that have a purposeful, well-thought-out policy for improving the quality of their products and services use a reliable set of methods, tools and ways to achieve their goals. Seven simple statistical methods are universal for analyzing the current state of technological processes, allowing them to be timely adjusted and, thus, ensuring the stability of quality.

The use of statistical methods is a very effective way of developing new technology and quality control of production processes. Many leading companies are striving for their active use, and some of them spend more than a hundred hours annually on learning these methods, carried out within the company itself.

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ИНСТРУМЕНТЫ УПРАВЛЕНИЯ КАЧЕСТВОМ

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Аннотация

Проиллюстрированы, изложены и описаны простые методы управления качеством, которые в основном предназначены для работы с числовыми данными, что в свою очередь является непростым процессом, который требует серьезной и внимательной работы.

Ключевые слова: инструменты, качество, контроль, система менеджмента качества, статистические методы, результат, управление.

REVIEW OF PLANT TISSUE QUALITY CONTROL METHODS

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Abstract

This article discusses the methods of quality control of objects of plant origin, their comparative characteristics, advantages and disadvantages.

Keywords: quality control, methods, review, plant tissue.

Primary changes in plant disease are invisible to the eye. The incubation period lasts for a while, and then external signs appear. Sometimes the symptoms of the disease do not appear at all. It should also be noted that some diseases have different causes, but similar symptoms.

Modern science does not stand still. A large number of methods have now been created that allow us to identify (distinguish) a disease at its earliest stages, and also accurately diagnose it.

The methods of quality control of plant tissues are as follows.

1. *Visual diagnostics* is an assessment of the appearance using simple instruments (such as a magnifying glass). The compliance or non-compliance of the plant with the requirements of the standard is measured.

A significant drawback of this method is that the study is limited only to the visible area of the object under study, that is, some phyto-diseases cannot be detected by humans.

Such methods include macroscopic (with the naked eye) and microscopic (using a microscope) methods, physical method (determination of seed density), and other phytopathological methods. [5]

There is also a *mycological method* (diagnosing diseases based on reseeded phytopathogenic organisms from plant tissues into special artificial or natural nutrient media) and the chemical method (using color indicators that change the color of water extracts from plants affected by various fungi).

2. The *hyperspectral method* is based on spectrum analysis. At different wavelengths, an array of images of the object is obtained and their spectral features are investigated further.

The advantages of the method include ease of use (sensors can be attached to agricultural equipment), speed (infection and pathogen, as well as the stage and severity are determined immediately) and minimal changes in the health status of the plant are recorded.

The disadvantage is a narrow range of wavelengths (some diseases in this range are simply not visible).

3. The *thermal method* is based on measurement, observation and continuous analysis of temperatures inside and on the surface of the object of plant origin under

investigation. The main condition for using this method is the convection of heat in the object of study.

The advantages include the remoteness of work, speed, the possibility of studying the object from different sides and obtaining several parameters.

4. Nowadays, *the absorption method* is widely used (the difference in absorption spectra of various chemical components of plant tissue is used), fluorescence analysis (only in laboratory conditions, the method of Raman scattering, backscattering method (difference in absorption spectra of various chemical components of plant tissue is used, it is possible remotely)). [1]

5. *Functional diagnostics* is more often used to study the nutrition of the plant. The method consists in determining the photochemical activity of a suspension of chloroplasts (obtained from an average sample of leaves of diagnosed plants). Then a certain concentration of nutrition is added to this suspension and the photochemical activity of the suspension is again determined [2].

If the activity of chloroplasts increases in comparison with the control, then this means a lack of battery, if it decreases, an excess. About the optimal concentration in the nutrient medium says the same activity.

6. The *conductometric method* is based on assessing the degree of damage to cell membranes — due to the action of adverse factors, electrolyte leakage from tissues increases, indicating a violation of the selective permeability of cell membranes. [4]

7. *Molecular methods* [6] include:

- enzyme immunoassay - consists of immune and enzymatic reactions.

The immune response consists in the specific binding of an antigen characteristic of a given microorganism with a diagnostic antibody. An enzymatic reaction is required to detect this binding. As a rule, it is accompanied by a color change, and the extent of this change can be used to determine the amount of antigen present.

- polymerase chain reaction.

Of interest is the analysis of a drop spreading in the radial direction (lateral flow assay). It does not require special equipment or knowledge, it is possible to carry out the analysis “on site” [6].

PCR with real-time registration allows detecting the presence of the pathogen DNA and measuring its amount.

The method is based on changing the fluorescence of the sample (Fluorescence Signal); it increases with the accumulation of the reaction product.

8. A *method for diagnosing the functional state of plants* by measuring the amplitude-phase characteristics of quasi-monochromatic radiation scattered on plant tissue of a probing laser beam [7]. Using this method, one can assess the state of photosynthetic and non-photosynthetic plant tissues by ordering their microstructural organization.

9. *Luminescent analysis* differs in speed, high sensitivity (you can find hundred billionth grams of a luminescent substance). It is based on the properties of a substance to luminesce in a stream of ultraviolet rays [8].

10. *DNA technologies* are an effective method for studying pathogenic microorganisms. They are based on the use of DNA analysis. The basis for the detection of pathogens is the uniqueness of the structure of DNA of different species and the phenomenon of complementarity [9]. Their advantages include early and accurate diagnosis, speed of analysis, the absence of human factors.

11. The *method of IR-spectroscopy* with Fourier transform. It contributed to the development of new methods for analyzing samples that were developed to solve complex problems, which could not be achieved by old methods. It is a measurement of spectra of different nature, where the spectrum is calculated from the response in the time or spatial domain.

There are a huge number of methods to determine the state of the plant, the presence and extent of the disease. And most importantly, modern methods allow it to be done at the earliest stages and to take some measures in a timely manner. And this in turn helps preserve yields.

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ОБЗОР МЕТОДОВ КОНТРОЛЯ КАЧЕСТВА ТКАНЕЙ РАСТЕНИЙ

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Аннотация

Рассмотрены методы контроля качества объектов растительного происхождения, приведены их сравнительные характеристики, достоинства и недостатки.

Ключевые слова: контроль качества, методы, обзор, растительная ткань.

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MAIN ASPECTS OF RADIO ADVERTISING AND ITS CONCEPTS

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Abstract

The article is devoted to the peculiarities of radio advertising. It examines its main types and differences from television advertising. The characteristics for selecting a radio advertising channel are described; the classification of the radio advertising is given. It is concluded that radio advertising has its own specifics for effective implementation of an advertising campaign and increase in profits of the advertised object.

Keywords: advertising, advertising business, public relations, radio.

Introduction

In the modern world, it is believed that advertising is an effective element of promoting a product or service. No wonder that behind the scenes the media is called the “fourth estate”. After all, they have a tremendous impact on people's opinions. The purpose of the advertising message is to attract the consumer, increase the demand for a product or service, as well as raise the image of the product and increase sales. The main object of the advertising impact is the consumer who they try to convey an advertising message to, thereby motivating the consumer to perform an act, such as buying a product. Advertising affects the mind of the consumer psychologically putting pressure on emotions and feelings. It has many varieties and distribution channels. But one main difference of radio advertising from other types is the method of influence on the consumer through the audio format, because other types of advertising are more associated with visual perception.

Main aspects of radio advertising

The level of attention to audio information is lower because a human memorizes more information through the eyes than through hearing, therefore television advertising is considered to be one of the most effective, as it has both sound and a picture, thus the television clip has more memorability. That is why using radio advertising is not advisable for all firms. Radio advertising is only a sound means which causes sensations and visual images which bring the listeners' imagination into the game, affect only the ear, using only three elements: a word, sound effects and music. Music performs diverse functions: from background to jingle melody. Promotional songs (jingles) help to remember the slogan. Musical slogans have been used by companies such as McDonald's and Coca-Cola for years. And without background music, radio advertising is poorly remembered. That is why when recording audio clips for radio advertising, great attention is paid to musical accompaniment [1].

At the same time, the imperfections of radio advertising are its advantages, because those goods or services that can be easily remembered by the customer, e.g. a music event, a nightclub, etc., receive a special advantage. Psychological studies have shown that radio is an effective channel primarily for informative advertising. Therefore, it is advisable to advertise on the radio some trade news, such as the opening of a new store, the appearance of a new product or service, exhibitions, presentations, discounts, sales, etc. Radio advertising of drugs, foodstuff and personal services is also sold well; advertising for furniture and electronic household appliances is a bit worse. The best perceived advertising radio message is the one lasting from 30 seconds to 1 minute, accompanied by music. The listener does not have time to understand a shorter audio clip, a longer one tires him out.

It is also important to take into account the fact that radio stations can be network and local. Ones networks have branches throughout Russia, and they have an advertising block on the air, in which advertising is broadcast in all cities of Russia where the radio station has branches. And because of this, its value increases significantly. But it is important to note that advertising in this block is not suitable for all types of goods, only for large corporations, for example, for pharmaceutical companies, banks, etc. And local radio-stations are located in a particular city, in the one that the client needs.

There is such a prime time period in radio advertising - this is the most active time of listening to the radio during the day. Radio prime time has two periods: from nine to eleven in the morning and from six to eight in the evening. Despite the higher cost of advertising time during these periods, they are optimal for increasing sales, as well as for announcing an existing or new brand. After all, radio is one of the few sources that have such an opportunity, is always near the consumer, our receivers work in cars, at work, at home, on vacation.

Radio advertising has several forms of presenting information: advertising messages which are usually read by the announcer in the intervals between programs; advertising appeal (slogan), promotional interview the purpose of which is to acquaint listeners with the content of advertising with the help of an uninformed interlocutor; speech of some important persons on the radio; advice to listeners; a song with advertising content that may sound in between the programs; advertising competition, hidden advertising, included in various radio broadcasts, sponsorship.

Radio channels are classified into: informational, music and mixed. All of them have their own specifics and target audience. But the most popular are mixed radio stations, where news and music blocks are combined in equal proportions. Only 11% of the population of the entire share of radio advertising listeners only listen to music. These are mostly men aged 25-45 years. News fans are the least numerous segment: it makes up only 9% of the total audience. In the advertising market of Russia, the share of radio accounts for 7% of the total advertising resource. The composition of the radio listeners is essential to the effective action of advertising. Business needs to know the composition of the audience and its number, in order to determine, depending on this, a convenient time for the transmission of advertising [2].

To choose the right advertising placement channel, we need to consider the following characteristics:

- *Reach*. This characteristic is expressed in thousands of listeners (rating) or in the share that the listeners of the radio station comprise in relation to the population (rating,%).

• *Rating*. It is determined for the audience of the time interval, most often the 15-minute one: the number of people who listen to this radio station for at least 5 minutes during the interval. It can be expressed in absolute values (thousand people) or as a percentage of the population. In the general case, the rating is calculated as the ratio of the number of people listening to the radio station to the entire population.

• *CPT (Cost Per Thousand)*. This is the cost of reaching 1,000 people from the target group. It is calculated as the ratio of the cost of advertising to reach of the audience (in thousands).

Conclusion

Thus, radio advertising like any other type of advertising has its pros and cons. But due to its specificity for a certain business segment, it is ideal as an advertising platform as it is a “mobile means of advertising” (people can listen to the radio at home, at work, on the road, on vacation). In addition, the radio has a large audience of listeners, which helps to make radio advertising one of the most effective channels.

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ОСНОВНЫЕ АСПЕКТЫ РАДИОРЕКЛАМЫ И ИХ ПОНЯТИЯ

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Аннотация

Рассмотрены основные виды радиорекламы, ее особенности и ее отличия от рекламы на телевидении. Описаны характеристики для выбора канала рекламы на радио, приведена классификация радио. Сделан вывод о специфике радиорекламы, которая позволяет эффективно реализовывать рекламную кампанию и увеличивать прибыль у рекламируемого объекта.

Ключевые слова: радио, реклама, рекламный бизнес, связи с общественностью.

A POLITICIAN'S IMAGE

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Abstract

The paper focuses on the problem of the image in general and the image of a politician in particular. The author considers different approaches to the concept "image" underlining the importance of the image as an instrument of influence on public consciousness in the political sphere. The article is aimed at the analysis of various components included into the image and their role at the present time. The conclusion is made that the image of a politician should be neither stable not modified greatly.

Keyword: image, politics, politician.

Introduction

In the modern, dynamically developing world overloaded with information and competition, the image is of great importance in the most different spheres of life. Every organization as well as every person has its own image. The image is used in everyday communication of people, in economy, culture and political processes. It is the most important social and communication tool for influencing various target audiences.

There is no single concept of "image". The English word image ("image, view") originates from the Latin *imāgo* - ("type, representation, likeness"). In Russian, it has been widely used since the late 1980s, along with the revival of competitive relations in the economic and political spheres. The concept of "image" is continuously updated with new interpretations related to changing social realities.

Thus, in one of the definitions, the Webster dictionary interprets the image as "an image of a person, a product, a social institution, etc., which is shared by the general public and which is often deliberately shaped or modified by the media, advertising, propaganda, etc." [1].

Russian analysts put a capacious, universal meaning, into the concept of image taking into account not only external but also internal components of the "image", while foreign authors focus mainly on the appearance of the image carrier.

The closest Russian interpretation of the "image" is the one given by Petrova E.A., an academician of the Russian Academy of Imagiology - as a phenomenon of individual, group or mass consciousness, the image functions as an image-representation in which the external and internal characteristics of an object are in a complex interrelation with social roles and functions, as well as they represent an interaction in the semantic field of culture with other categories of consciousness, involvement in mentality [2].

The correct approach to the construction and application of the image allows us to extract from it the meaning and benefits, which is especially important for public, in particular, political activities. Therefore, it is very important to influence the mass consciousness by forming and maintaining the image of a politician. This should take

into account a number of features of the phenomenon called “image”. Here are some of them.

In the political sphere, the image is, in fact, the main mediator between the government and the people. The image forms social stereotypes, affects the masses through stereotypes, and can turn itself into such a stereotype.

In the era of the omnipotence of the Internet, the phenomenon of political image becomes an increasingly necessary component for the politician to exert the desired influence on his voters and to achieve success consequently. The image of the target audience is not “specific”, but a massive impact. The fact is that stereotypical thinking is peculiar to people. On the basis of life experience, various socio-demographic characteristics (age, gender, profession, etc.), a person or a group is formed by a predisposition to react to certain phenomena in a certain, predictable way. The result of such attitudes is a social stereotype - a simplified, clichéd image of reality. Social stereotypes go back to the “collective ideas” that dominated the traditional society and helped people cope with various difficulties together. This kind of clichés and patterns help a person psychologically: they accelerate the processes of understanding, cognition of the changing reality. Not even the most developed individual can comprehensively analyze and thoroughly study every phenomenon and every person he meets, just as he cannot objectively know the whole world. Therefore, stereotypes necessarily "accompany" a person in his everyday practice. However, it should be remembered that it is they who lead people away from the logic of common sense and make them uncritical to the perceived information, and, therefore, easily manageable.

Conditions for maintaining a positive image

The image can be both positive and negative and consist of many indicators, including those not dependent on the will of the subject himself. An example of this is the situation with the governor of Tambov, A.V. Nikitin. In October 2018, Nikitin took the 21st place in the rating of governors, which showed a clearly positive assessment of his activities by public. However, in early November, false information about unscheduled vacation that led to the further possible resignation of Nikitin [3] appeared in the Internet. This message caused a negative public outcry. These and similar “ducks” are a classic version of black PR, which, unfortunately, is not uncommon and can seriously damage the image and reputation of a fairly successful political manager. Everyone knows that it is very difficult to earn a good name and national respect, and you can lose them quickly and easily.

Thus, for the image of a public person (this also concerns an organization) not to be mythic and too vulnerable, but to be true, stable and beneficial, it must be constantly confirmed and reinforced by purposeful intensive work, acts, that influence effectively on the wide audience ‘s opinion.

Conclusion

The image in politics (whether it is some politician or a whole political-imperious institution) must be stable and reasonably mobile: on the one hand, it cannot “turn to stone”, without changing at all in the context of social transformations, on the other hand it should not be modified greatly. Perhaps the most common mistake of image makers working in the political sphere is that the political image created by great efforts eventually becomes unchangeable and, at best, turns into a kind of monument to the former living image, and at worst - into a caricature, grotesque.

The study of the problems associated with the formation of the image of politicians, political organizations, and government institutions at various levels allows us to state that the image components of politics are of paramount and lasting importance. The problems of creating an attractive political image should be combined with the work to ensure the sustainability of the created image. When constructing an image, political technologists are increasingly actively oriented towards stable social stereotypes, historical analogies and universal value systems. Today it can be said with confidence that the tasks of developing and promoting a political image sometimes determine the attitude of political subjects to issues of ideology, strategy and tactics of political actions. The image in politics becomes in fact a material value, and sometimes it determines the behavior of political elites.

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ИМИДЖ ПОЛИТИКА

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Аннотация

Статья посвящена проблеме имиджа в целом и имиджа политика в частности. Автор рассматривает различные подходы к понятию «имидж», подчеркивая важность имиджа как инструмента воздействия на общественное сознание в политической сфере. Целью статьи является анализ различных компонентов, входящих в образ и их роли в настоящее время. Сделан вывод, что имидж политика не должен быть ни стабильным, ни сильно измененным.

Ключевые слова: имидж, политика, политик.

UNUSUAL CUSTOMER RESEARCH METHODS

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Abstract

The article discusses eight unusual methods of customer research. The advantages and disadvantages of each of the methods, as well as the ways of their implementation and scope, are analyzed. It is concluded that it is necessary to use both traditional and innovative methods of customer research.

Keywords: customer service, market research, methods.

Introduction

One of the main tasks of any marketer, even just starting his career, is customer research, which is carried out by certain methods that have to be properly used. The correct understanding and application of these methods has a number of advantages.

Here are some of them:

- a company's image will be associated as customer-oriented;
- a large number of loyal customers;
- high-level services and products that are attractive to customers;
- advantages among competing companies that are difficult to achieve;
- the influx of potential customers due to the recommendations and the word of mouth.

Traditional research methods are not always suitable for customer service.

There is a logical explanation for this. Such widely used methods as interviews, focus groups, surveys, web analytics can help to understand the client, and quite deeply. But they are absolutely useless if you need to find out whether customers feel comfortable working with you, whether they have any comments on the work, what impressions and associations they have when interacting with you and your product.

Main customer research methods

To find out these questions in the client service, special research methods are used. The most simple and interesting of them will be discussed below.

Mysteryshopper

This method is also suitable for customer service. First, the "a mystery shopper" method provides information about the impressions and experiences of customers from interacting with the company. You can find out customer preferences and dislikes, the causes of annoyance and dissatisfactions.

The method is aimed at the following objectives:

- identification of missing or key points of contact of the company;
- assessment of customer experience;
- search for worthwhile ideas to improve customer service;
- identification of weak points in the client service.

Ways of the method implementation:

- making existing customers or new ones to use the services of your company or purchase a product;
- talking to the customer and getting feedback;
- asking the shopper about what thoughts and feelings he had at one time or another of the purchase, using the service;
- asking a shopper a question about changes they want to make in the service or product.

The “Mystery Shopper” method is universal and should be used by all companies regardless of their type of activity.

Thinking out loud

This is an effective and at the same time simple way to research customers. Its main feature is that you do not have to ask a large number of questions to customers and thus, extract the necessary data from them. To do this, it is enough to ask your client to express out loudly the thoughts that arise when performing any task. It is very important that everything that comes to mind be expressed. This information will allow you to learn a lot of interesting and useful.

The method is aimed at the following objectives:

- revealing some hidden problems;
- assessing the customer’s experience (emotions and thoughts);
- understanding the customer;
- identifying important points of contact with the company.

How to use this method:

- ask the customer (client) to perform an action (use the goods for their intended purpose);
- ask him to say aloud all the thoughts that arise when he performs the necessary action;
- take notes of the customer information and then analyze it.

From a formal point of view, this method is applicable to all areas of activity. Still it is necessary to take into account that not every client agrees to express his thoughts, and everything depends on a certain situation. We must remember this when planning the customer research.

Questions in context

You can truly understand your customers if you study them while they are in contact with your product or company. You need to pay attention to how customers perform actions, interacting with your company, and if you notice anything unusual, strange and incomprehensible, then you need to ask them questions. The client is able to give more detailed and honest answers to your questions while he is in contact.

The method helps to:

- anticipate opportunities for improving services for customers;
- understand the motives of customers.

How to use this method:

- track the “customer path”;
- do not hesitate to ask the customer about the reasons because of which they decided to take this or that action, right during their execution;
- write down all the answers and use them while exploring company contact points.

This method is universal and can be applied to all products and companies. What you have to bear in mind is that you have to be able to monitor customers in real time.

The five “why”

This method can be used individually or in combination with other methods. It combines well with the “Questions in context” method. The method is very simple: the client leaves you with any feedback on your product, company or communication with it, and you in turn ask the client the question “Why?”. Thus, you can find out the true motives and causes of the buyer. Ask your customers five questions and you will receive unexpected answers to these questions.

The method is aimed at:

- finding out the real needs of customers;
- determining the causes of the company problem;
- assessing the contact points of the company;
- looking at the problem through the eyes of the buyer.

This method assists in solving almost all the arising difficulties. Moreover, it does not depend on the type of activity of the company and the type of its services.

Analysis of the customer dissatisfaction

This method will make it possible to identify inconveniences for clients because of which they refuse to cooperate with you. This may be due both to the company itself and to the product that it produces. It is clear that the existing inconveniences irritate customers by adding negatives to their lives and creating a negative customer experience. It is logical that it is pointless to count on the return of a disgruntled customer. In addition, he will not recommend you to his friends and acquaintances. A customer-oriented company has only one way - to recognize and eliminate all existing inconveniences.

The method has the following objectives:

- to improve the customer service and make it more understandable for customers;
- to identify key negative points of contact for which customers do not return;
- to reduce the time of the purchase process and the formation of the order.

How to use the method:

- conduct a conversation with your customers;
- pay attention to how customers interact with you and when they have difficulties;
- conduct a study and identify at what stages people are delayed for a sufficiently large time period.

The method “Analysis of inconveniences” is applicable to all components of the client service, ranging from a conversation with a manager at the company's office and ending with the development of the site.

“Moccasins”

The name of this method does not mean accidentally one of the types of shoes. The fact is that its main idea is to put yourself into the customer's shoes, i.e., to go through the customer's “purchase path”. First of all, think “Who is your client?”, “What are their life principles and needs?”, “In which case do they come to you exactly?”

The method aims to:

- find out the reasons for the customer comments;
- determine how comfortable it is for customers to use their products;
- assess the experience of customers;
- improve the service or product of the company.

How to use this method:

- analyze your clients and describe them (lifestyle, current life situation, physical condition, motivation, etc.);
- “play” the role of your customer and try to simulate the purchase process (search for the necessary information on the site, place an order, install and connect the device);
- identify weak points and correct them.

This method is suitable for companies that have a clear idea of who their customers are. There are no special restrictions in this case.

Interview

This method is widely used in traditional marketing. Questions prepared in advance for interviews cannot provide reliable information to be used in the future to improve the service. Always listen carefully to the person you are interviewing; do not hesitate to ask clarifying and additional questions.

The method aims to:

- determine the minimum customer requirements;
- find out the needs, characteristics and patterns of behavior of the target audience of the company;
- search for potentially successful areas in the development of new products and service companies.

How to use the method:

- create a list of key questions, the so-called topic-guide;
- add to the list a wide list of questions relating to the lifestyle of the buyer, his principles, habits, key parameters that affect the adoption of his decisions;
- at the beginning of the interview, ask introductory, simple questions to set up the buyer in the desired fashion;
- do not limit yourself to a pre-made list of questions; always ask for additional and clarifying information;
- give preference to open questions.

An interview is a basic way to research customers. It is understandable to both sides of the process - both to marketers and customers.

Observation

This method is not an innovation at all, but it is worth noting that it is used quite rarely in marketing research. From a technical point of view, the “Observation” method is not complicated at all. Its main difficulty is the ability to interpret the information collected during the observation.

The method aims to:

- see how the buyer is in contact with the product or service of the company;
- track and assess the “customer path”;
- understand how to improve the product or create a new service for the client.

How to use this method:

- watch your customers;
- record the sequence of their steps and actions;
- make sketches (if possible);
- take notes of all unusual and strange actions;
- draw on paper the situations that occurred during the observation. Based on the information received, try to understand the causes and motives of buyers.

The method is used for everything that can be observed in a physical way (with the help of a web-camera, video camera and other equipment).

Case studies of customer research methods

The application of these eight effective and simple methods of researching the target audience can improve customer service. Let us look at one of quite common cases [1].

A commercial bank receives a large number of negative reviews about customer service in offices, and the bank plans to improve its quality. A trivial example, when due to poor-quality service in the sales departments of services, a company loses its customers. This is due to the fact that people feel discomfort, inconvenience, it is unpleasant for them to come and interact with employees of the company.

When the point is to observe and physically contact customers, then most of the research methods mentioned above can be applied, including questions in context, observation; “moccasins”, interview, “mystery shopper”, analysis of inconvenience.

Focus your attention on observation and interactive contact with bank visitors directly inside the company's offices. Thus, you will find out that it negatively affects the impression of the company's sales outlets.

Conclusion

Each of these methods can be useful in researching clients in different situations. But also do not forget about the traditional methods of obtaining research. After all, not always unusual methods can give more accurate information. In such cases, it is worth resorting to traditional methods.

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МЕТОДЫ ИССЛЕДОВАНИЯ КЛИЕНТОВ

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Аннотация

В статье рассматриваются восемь необычных методов исследования клиентов. Проанализированы достоинства и недостатки каждого из методов, а также способы их реализации и область применения. Сделан вывод о необходимости использования как традиционных, так и инновационных методов исследования клиентов.

Ключевые слова: обслуживание клиентов, исследование рынка, методы.

FEATURES OF NATIONAL ADVERTISING IN JAPAN

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Abstract

The article is devoted to the features of Japanese advertising. It discusses the main features of Japanese advertising that distinguish it from advertising in the west. The influence of the culture and traditions of the Japanese people on the techniques used by advertisers to create creative advertising, which may interest the audience in a new way, is described. The conclusion is made why Japan is rightfully one of the leaders in the advertising business.

Keywords: advertising, advertising business, Japan, public relations.

Introduction

At present our life cannot be imagined without an advertisement that haunts us everywhere: on the Internet, on TV and on the street. With the help of advertising companies increase the popularity of their products, which has a positive effect on sales. It happened so that advertising is often repelled by the mentality of the country in which the product is advertised, but if advertising in Europe and America does not have strong differences, then advertising in Japan contrasts strongly against the background of advertising from any other countries. It has distinctive features that depend largely on the special perception of advertising by the Japanese themselves.

Features of advertising Japan

There are a few things that makes Japanese advertising so different from the rest of the world. The most important tool of the creators of Japanese advertising is the image. In television commercials and in brochures that can be obtained on the street, specifics come to the second plan; usually they lack direct information about discounts and promotions. The content is made in such a way that this information is taken for granted and does not come to the fore and is not directly imposed.

Details play an important role in Japanese advertising. For creators of advertising in Japan, there are no things that they would consider irrelevant. And in Japan, they like very much to have as much creativity as possible in the advertisement. Japanese advertisers try to use few templates that are not welcomed by the public. The Japanese often become innovators in advertising. But sometimes in the pursuit of newness, advertisers from the Land of the Rising Sun use rather shocking elements in their advertisements in an attempt to make something even catchier. This leads to the fact that quite often commercials from Japan come to various international advertising competitions. The creativity of Japanese advertising is also evidenced by the fact that it has a strong influence on the west. European and American colleagues are eager to use the experience of Japanese advertisers to create their product capable of a new impact on the consumer.

Currently Japan can rightfully be considered to be one of the leading countries in the world in the field of advertising business. Japanese advertising, both in structure and in creative approaches, has always stood out and was considered outside the country to be

very specific and immune to world trends. However, advertising in Japan is not only susceptible to the general trends of the global advertising process, but also, as practice shows, it itself brings in fresh ideas. At the same time, Japanese advertising does not comply with the idea of total globalization and therefore retains its national identity and individuality in advertising each individual product or service. This concerns the combination of the newest concepts and traditions of Japanese art.[1]

It is worth noting another important feature of Japanese advertising. Japanese advertisers are always trying to show the viewer ordinary things in an unusual form, making them more interesting. This trend is particularly evident in the advertising of such popular foreign brands as McDonald's, Pepsi, Coca-Cola on Japanese television.

The principles of household and industrial advertising in Japan are based on the culture and traditions of the Japanese people. So, for example, goods (lunch boxes, telephones, toys), made in the form of a daruma doll, are bought more readily. The name of the doll is in honor of the Buddhist priest BodaiDaruma. Daruma reminds the Japanese that, even after meeting with misfortune, you can always find a way out of the situation and rise up again.[1] Sanrio products are very popular among young people. Products depicting characters invented by the company are in great demand, and the character of the Japanese pop culture Hello Kitty, depicting an anthropomorphic white kitten of Japanese bobtail breed with a red bow on his head, has become incredibly popular and recognizable outside Japan.

A very important role in the advertising business is played by a variety of advertising banners, billboards and videos displayed on the screens located on the buildings. A good example is the Tokyo-Akihabara area. It is difficult to meet the same amount of diverse street advertising present there anywhere else in the world. And here, too, the influence of the national character and culture of the Japanese people is traced. This is most striking when you pay attention to the drawing style of graphic advertising, which, like all other aspects of modern Japanese life, was greatly influenced by manga. Manga accounts for about one third of all printed products in Japan. Graphic style, implemented in manga, was embodied in the world-famous Japanese anime. Almost always, when the Japanese advertising poster has drawn graphics, it is made in the style of "manga" or depicts popular manga characters.[1] The concentration of such advertising on Akihabara is huge and includes video ads with anime characters.

Another feature of Japanese design in advertising is going beyond traditional pictorial genres. This is possible due to the detachment from a particular genre, when a designer, trying to create something unique and adopting the full potential of his own consciousness, technical capabilities and craft skills, thinks about the embodiment of a specific advertising project.

All this leads to the fact that a frequent picture is photographing a tourist's advertisement, which is usual for a Japanese resident, and not a specialist who is interested in it.

As an advertising method, you can also give an example with the showcases of small cafes and eateries. Here they do not only hang out the menu on display of passers-by, but also demonstrate the dishes themselves. The quality of "food" is surprising. For the first time it may seem that the neatly lined ramen is real. Even carefully looking at the dishes, it is impossible to notice the catch. In fact, the Japanese have a special technology for manufacturing plaster food. Samples look so appetizing that one involuntarily wants to go inside and try the dish.[1]

Conclusion

Thus, we can summarize that advertising in Japan includes many features. It is very detailed, creative and built on images. Also, advertising often relies on the special culture and traditions of the Japanese people, but at the same time it does not become their hostage and allows itself to borrow the ideas of the rest of the world without losing its originality. All this together allows Japan to rightfully occupy the leading place in the global advertising business.

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ОСОБЕННОСТИ НАЦИОНАЛЬНОЙ РЕКЛАМЫ В ЯПОНИИ

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Аннотация

Рассмотрены особенности японской рекламы. Описаны влияния культуры и традиций японского народа на приемы, используемые рекламщиками для создания креативной рекламы, которая может по-новому заинтересовать аудиторию. Выявлены факторы, обуславливающие лидирующие позиции Японии в рекламном бизнесе.

Ключевые слова: реклама, рекламный бизнес, связи с общественностью, Япония.

NEW BANKING PRODUCTS: TYPES, TECHNOLOGY OF CREATION AND WAYS OF INTRODUCTION

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Abstract

The goal of the study is to study new banking products and the development for a commercial bank. To achieve this goal the following tasks were set: to study the nature and order of introduction of a new banking product, to analyze the economic activities of PJSCSberbank and evaluate the banking products sold by the bank, to develop recommendations on the creation of new banking products.

Keywords: banking, product, technology, creation, method, implementation.

Introduction

The banking system of Russia is developing in accordance with global trends. The main trend is the transition to innovative types of economic development. The globalization of the world economy has led to increased competition in the global market. The bank competitiveness at this stage of development is determined by the introduction of innovation. Traditionally, the banking sector is one of the most progressive among all industries. Many innovations have emerged in the Russian economy, with commercial banks are adopting them from other areas of the economy. The basis for the development of banking innovations is information technologies; they improve and accelerate the implementation of standard banking procedures.

One of the types of innovative activities of the bank is the creation of new banking products; their development and implementation solve the problem of low competitiveness of a commercial bank.

The role of the banking products in strengthening competitiveness of credit institutions

A product is any banking service or operation provided to customers. A banking product is offered as a commodity in various segments of the banking market, its distinctive feature is the intangible and monetary nature. Classical classification of banking products includes:

- currency operations;
- accounting of commercial bills and provision business loans;
- savings and demand deposits (checking accounts);
- consumer loans;
- consulting services;
- services for the management and storage of valuables;
- brokerage services for operations with valuable papers
- investment banking services;
- insurance services;
- financial services of the bank[1].

Banking in the market

Economy is a special type of entrepreneurial activity related to the movement of funds - their mobilization, distribution to improve the quality of banking services.

The current economic situation forces banks to look for new ways and apply new. The issues of quality improvement of bank marketing have come to the fore. It is important not only to expand the list of banking products and improve the technology of their creation, but also to learn how to implement them.

The analysis of various types of banking products and features of their creation, as well as the study of marketing strategy to promote the market new products and services is the requirement of time.

Nowadays, the most successfully functioning Russian banks have begun to restructure the is own financial marketing and management systems, move from assessing the activities of a bank solely in terms of legislative and oversight requirements for evaluating their business and products.

Development and implementation of new banking products and services

The creation and introduction of new banking products and services is one of the areas of banking management. The research procedure begins with the search for ideas of new products, after which the bank sets for itself the optimal and develops the concept of the chosen idea, that is, certain events according to the provision of this service to the buyer.

The basis for the formation and introduction of a banking product is the satisfaction of any customer needs, since the consumer acquires not a product as such, containing a certain set of properties, but its ability to fulfill a specific need. In a similar way, the performance of a bank depends on the extent to which it is able to provide real benefits to the buyer who buys this banking product. In developing any proposal, the intermediary bank establishes a set of its qualities, which allow to satisfy the designated need of the customer.

At the next stage, the bank's abilities are investigated in accordance with the introduction of this product or service, the market research is offered, in order to determine the sales volumes, expenses and, accordingly, the allowable profit.

Having determined their own capabilities, the intermediary bank accepts the study of the newest product or service and proceeds to specific actions according to their provision to customers (organizing regulatory documents, training workers, developing banking actions, methods for prescribing this service and communication policy, presence of need - creating computer projects, and d.)

Testing the properties of the newest product or service usually involves recommend actions to cut down he number customers in order to control their interaction with this banking product. If the new service really meets absolutely all the conditions of the customer, in this case, the intermediary bank makes an excellent offer to prospective and existing customers.

When developing and introducing new banking products and services, the bank sets and evaluates the structure of expenses and, thus, their cost.

One of the problems of the bank is the optimization of the structure. The existing banking goods and services must be balanced in the relationship, have profitability, and diversity. The best structure allows banks to react rapidly to changes in market conditions [2].

Proposals for the creation and promotion of new banking products and services

The basis of the traditional banking products of PJSC “Sberbank” is represented by loans, deposits and payment and settlement services, but the bank provides other services and updated modern products for citizens.

PJSC Sberbank was created with the aim of attracting temporarily free funds of the population and enterprises, and their effective placement on terms of repayment, payment, urgency, in the interests of bank depositors and in the interests of the development of the national economy.

The savings bank of the Russian Federation is considered the largest bank of the Russian Federation, which meets the needs of different groups of people in a large range of services provided.

PJSC Sberbank is considered to be a reliable bank, which has an impeccable reputation and uses the trust of the residents, someone seizes a significant part in the bargaining of contributions and is considered the main lender of the Russian economy[3].

Since the possible and true buyers of the bank regularly expect the appearance of new or improved long-standing products and services, and competitors in their own turn will put a lot of effort in order to provide buyers with the proper innovations.

For a bank, an important source for the development of liabilities is the involvement of foreign currency funds of the population in investments, since they are intended as additional resources for the purpose of lending, for this reason I advise a new type of deposit.

The proposed new type of deposit will be in addition to the existing banking services and products that are provided to individuals. Opening a new deposit can be made by any client of the bank who has a main card.

A new type of deposit Top up at ATM can be opened quickly and easily. “Top up at an ATM” aims to create savings and generate income without the possibility of withdrawing funds. The deposit “Pay at ATM” can be opened in the currency of the Russian Federation, the minimum deposit amount is 500 rubles, and it will be possible to open such a deposit for a period of 3, 6 and 12 months. The minimum amount of replenishment is 500 rubles. The interest rate will depend on the amount and time for which the deposit is open.

Conclusion

Commercial banks are becoming increasingly popular, becoming a necessary component of the monetary concept, whose main job is to provide services to individuals and, moreover, to legal entities.

A banking product is an interconnected complex of specific services provided to a client in a certain sequence and satisfying his specific financial need.

The work done makes it possible to understand that as studying the market for banking products and services allows banks to choose more promising areas in the development of services and sell those that are in demand in the market.

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НОВЫЕ БАНКОВСКИЕ ПРОДУКТЫ: ВИДЫ, СОЗДАНИЕ ТЕХНОЛОГИЙ, СПОСОБЫ ВНЕДРЕНИЯ

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Аннотация

Целью исследования является изучение новых банковских продуктов и разработок для коммерческого банка. Для достижения этой цели были поставлены следующие задачи: изучить сущность и порядок внедрения нового банковского продукта; проанализировать хозяйственную деятельность ПАО Сбербанк и оценить проданные банком банковские продукты; разработать рекомендации по созданию новых банковских продуктов.

Ключевые слова: банковский, продукт, технология, создание, способ, внедрение.

IS NEUROSCIENCE “LENDING THE FUTURE OF ADVERTISING A HELPING HAND”?

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Abstract

The article raises an issue of the potential successful and effective interaction between neuroscience and advertising industry. The author examines scientific discoveries in the field of neuroscience, analyzes approaches of obtaining data, provides examples, and identifies relevant methods for integrating the advertising business and the scientific approach.

Keywords: ad campaign, advertising industry, neuroscience, reptilian brain, scientific approach, target audience.

Introduction

The art of successful advertising campaign is based upon multitude of factors. The process of creating an effective and profitable advertisement must consist of following procedures: extended analysis of target audience's behavior, preferences and global trends; market and social environment research; preliminary focus group interviews. Most of the companies are attempting to make a productive use of all the available, experimental or default advertising tools, precisely following the above-mentioned routine. However, certain brands still prefer to operate according to the outdated motto: “where there's supply, there's demand”, not investing enough resources in advertising campaigns, getting low-quality ad products as an outcome and being content with the scenario. The enigma is both approaches nevertheless frequently fail than not. People are ignoring the advertisement, products and services are not sold out, companies are losing money, potential or active customers, compromising former reputation. Some piece of the puzzle seems to be missing.

To buy or not to buy

There is one common truth that can be comprehended and properly applied. In other words, to create an outstanding promotional campaign, to gain loyal client base and increase sales advertisers have to obtain a solid understanding of how actually human brain actually function, why people make certain decisions, what's defining their choices. First and foremost, advertisers have to find that “button”, located in the target audience's brain “push and keep pressing it”.

In fact, in the early 1950s, two scientists at McGill University inadvertently discovered an area of the rodent brain dubbed “the pleasure center”, located deep in the nucleus accumbens [1]. According to the researcher's reports, when a group of lab rats had the opportunity to stimulate their own pleasure centers via a lever-activated electrical current, they took the opportunity and started to relentlessly flipping the switch over and over again, thousands of times per hour, ignoring such vital needs, as food or sleep, to the degree of many of them dropping dead from overtiredness and starvation. Further research found pleasure centers exist in human brains, too.

For instance, scientists suppose that the most ancient section of human brain – reptilian brain is the only center responsible for the final decision making. Reptilian brain is absolutely not “thinking” rationally, giving the top priority to feelings and emotions, stimulating own pleasure centers. Thus, to manipulate person’s choices, advertisement should strongly affect audience emotions and leave a long-lasting impression, because we are definitely great at remembering events during which we experienced powerful roller-coaster of emotions.

There is a guide on how to influence reptilian brain. First, the old brain reacts to everything that is related to the person’s “me”, in the view of the sense of self-preservation and survival instinct, it forms utter self-centeredness. Second, the old brain is sensitive to obvious contrast, for example, hot/cold, safe/dangerous. Contrast allows the old brain to make quick and secure decisions. Third, the use of complex terms is able to slow down the process of decoding the message, people would rather prefer to “consider” buying a product, and not “taking action” to buy a product. Moreover, reptilian brain has a predominantly visual perception due to the fact that the optic nerve physically connected with the old brain and reacts forty times faster than the auditory nerve. Furthermore, the brain is constantly trying to preserve vital energy and tends to omit major piece of information at the same time.

Predicting the future success of an advertising campaign

During the process of tracking brain functions, neuroscientists commonly use either electroencephalography (EEG) or functional magnetic resonance imaging (fMRI) technology. By attaching electrodes to subjects' heads and evaluating the electrical patterns of their brain waves, researchers can track the intensity of visceral responses such as anger, lust, disgust, and excitement [2]. To give a detailed illustration of productive collaboration between neuroscience and advertising industry, let’s look at the textbook case study of how Cheetos brand took advantage of consumers’ brain responses to brand itself and launched a rewarding ad campaign.

Using EEG technology on a focus group, neuroscientists detected vigorous response to the fact that chips leave orange traces on subjects’ fingers – remains of cheese dust. The collected data became a main reason for setting an exceptional ad campaign called “The Orange Underground” going. The ad included a series of TV-commercials in which the mascot was encouraging consumers to rise, unite and commit rebellious acts with Cheetos. The campaign was rewarded with Grand Ogilvy Award from the Advertising Research Foundation in 2009.

Conclusion

All things considered, the significance of scientific approach in advertising cannot be underestimated, neuroscience discoveries shall be undeniably taken in consideration and elaboration. Theoretically modern studies of human brain provide solid knowledge basis for launching and navigating a successful ad campaign. Neuroscience observations point out the importance of “speaking” to reptilian part of a customer’s brain directly. Some of the methods include: emphasizing problems of the target audience, not the characteristics of the product itself; showing an obvious benefit for the customer’s “me”; using contrast technique and key visuals while creating the ad messages; offering pleasant, concrete and recognizable, an already familiar motivation to the old brain, for example, related to a implicit childhood memories; placing essential information at the beginning of the message and repeating it in the finale; collecting feedback.

However, neuroscience has just recently learnt how to walk and started to take baby steps towards the wonderers of human brain's capacity. Therefore, nowadays the only effective solution for advertisers and neuroscientist is experiments. **Every time people go online, researchers can test which ads and prices make customer most likely to purchase. To conclude, we still don't know which one of man's meats is another's poison, but there is definitely a hope for an incoming breakthrough.**

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НЕЙРОНАУКИ «ПРОТЯГИВАЮТ РУКУ ПОМОЩИ» БУДУЩЕМУ РЕКЛАМНОГО БИЗНЕСА?

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Аннотация

В статье ставится вопрос о возможности успешного и эффективного взаимодействия нейронаук и рекламной индустрии. Автором рассматриваются научные открытия в области нейронауки, анализируются способы получения данных, приводятся примеры, выявляются актуальные методы интеграции рекламного бизнеса и научного подхода.

Ключевые слова: рекламная индустрия, рекламная кампания, нейронауки, научный подход, рептильный мозг, целевая аудитория.

VIRTUAL REALITY AS AN INTERACTIVE TEACHING TOOL IN SOCIAL SCIENCES

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Abstract

Virtual reality (VR), an immersive interactive tool for learning, can play a unique role in addressing educational challenges in the modern world. In this paper, we present examples of how the application of virtual reality leads to new opportunities that support learners, who study social sciences. In particular, VR can lead to increased student engagement, provide active learning, enhance learning experience, develop creativity, and provide a medium for visualizing abstract concepts or past events.

Keywords: virtual reality, interactive teaching tools, social sciences

Introduction

Virtual reality (VR) is gaining recognition for its enormous educational potential. Visualization tools that take advantage of VR technologies are being designed to provide engaging and intuitive environments for learning visually and spatially complex topics in technical sciences, medical sciences and social sciences as well. These applications present dynamic, three-dimensional views of structures and their spatial relationships, enabling users to move beyond "real-world" experiences by interacting with or altering virtual objects in ways that would otherwise be difficult or impossible [1,2].

By virtual reality, we mean a new concept of using modern computer systems and a human-machine interface in order to obtain an effect of a three-dimensional environment where user interactively contact with virtual objects, thereby creating a sense of three-dimensional presence [3].

At present, there are many different virtual worlds, all of which have 6 attributes that are inherent in all worlds [4]:

1. Common space: many people can simultaneously participate in the life of a world.
2. Graphic interface: world's space is reflected virtually and varies from 2D "animated" images to more impressive 3D images.
3. Efficiency: communication takes place in real time.
4. Interactivity: participants are allowed to modify, develop, build, or accept content that is tailored for them.
5. Consistency: a world exists regardless of whether there are individual users in the system.
6. Communication: a world provides an opportunity and facilitates formation of social groups within a world, such as teams, guilds, clubs, cliques, neighborhoods, communities and so on.

VR is being used in various social sciences nowadays [5-7]. Being limited by the scope of this paper, let us pay special attention to application of VR to learning historic sciences. This subject primarily concentrates on the events from the past and involves

description of places and scenes which no longer exist. Thus, VR becomes a powerful tool of reconstructing these events using digital technologies.

VR as a teaching tool for learning local history

On the example of a virtual reconstruction of the Nobel brothers' oil products warehouse near the village of Platonovka, Rasskazovskii district, Tambov region we'll try to illustrate application of VR to creating a virtual museum of local history of a particular historic place.

Using three-dimensional environment for development of a virtual museum is attractive to users of the system. They like that their own personality is represented as an avatar, which can freely move within a virtual world and study it from any point. In addition, social aspect plays an important role. Users like that they can meet other people inside a virtual world, watch their movements and actions and communicate with them in real time. Resemblance to a game is undoubtedly attractive for young audience.

A three-dimensional virtual museum is implemented using an open source software platform OpenSimulator 0.8.2, which is a server platform for creating three-dimensional virtual worlds [8].

At the initial stage of reconstruction, all available information about the objects of historical heritage was studied, including historical materials and archival information. Then, based on known parameters (dimensions, material) and using 3D-modeling programs (Google SketchUp, Blender) we have developed 3D models of production facilities, which are parts of the oil products warehouse built near the village of Platonovka, Rasskazovskii district, Tambov region, which was one of the 364 warehouses belonging to an oil production partnership of the Nobel brothers.

Figures 1 through 3 present individual fragments of the virtual museum.



Figure 1 – General view of a warehouse model

The warehouse consists of: tanks for gasoline and fuel oil with a capacity of 25,000 and 3,000 liters, respectively; cooper workshop, firefighter's booth for a hand pump; cellar for food supply; canopy for storing of 200 barrels; cellar for 120 barrels, etc.

Using landscape design programs (L3DT, Terragen) based on available topographic information (maps, plans, schemes, images from space) a 3D landscape model was designed. Based on 3D models of objects and landscape a total virtual space was formed in the software system for creating multi-user 3D worlds - OpenSimulator. A visitor of the museum connects to the server via the Internet using a specialized software client

(Cool VL Viewer, Singularity) and manages movements of an avatar (virtual character) inside the simulated virtual world.



Figure 2 – View of an oil pouring facility

With the help of the developed system it is possible to conduct virtual tours. The uniqueness of such tours lies in the fact that virtual reality can immerse visitors in different epochs and demonstrate not only the current state of historical objects at various stages of their existence, but also unrealized projects and architectural monuments that have disappeared, were lost or partially destroyed.



Figure 4 – View of a firefighter's booth

Conclusion

Teachers and academic instructors of the 21st century must embrace and leverage better methods to deliver the most effective learning experiences. A strong reason for utilizing VR as a learning tool is that it matches the way students communicate nowadays using different gadgets. Our current education system needs engaging, authentic experiences that will promote successful learning. VR can provide this and offers potential to expose students to worlds and people that are normally inaccessible. VR can encourage greater participation by students who typically try to ignore classroom activities. VR has the potential to enrich traditional teaching methods with interactive simulations, to expand the boundaries of traditional classroom to be engaging, creative, and to be responsive to the needs of the student [9].

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ВИРТУАЛЬНАЯ РЕАЛЬНОСТЬ КАК ИНТЕРАКТИВНЫЙ ИНСТРУМЕНТ ОБУЧЕНИЯ В СОЦИАЛЬНЫХ НАУКАХ

Аннотация

Виртуальная реальность (виртуальная реальность), как интерактивный инструмент для обучения, может сыграть уникальную роль в решении образовательных задач в современном мире. В этой статье приведены примеры того, как применение виртуальной реальности открывает новые возможности для учащихся, изучающих социальные науки. В частности, виртуальная реальность может привести к увеличению вовлеченности студентов, обеспечить активное обучение, обогатить учебный опыт, развить творческий потенциал и предоставить среду для визуализации абстрактных концепций или исторических событий.

Ключевые слова: виртуальная реальность, интерактивные средства обучения, социальные науки

THE TERMINOLOGICAL ANALYSIS OF THE CONCEPT OF MARKETING OF RESTAURANT

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Abstract

The article presents different points of view on what is considered the marketing of the restaurant. Similar views were grouped and analyzed in a systematic way. The terminological analysis of the term “restaurant marketing” from different scientific articles was carried out.

Keywords: marketing of the restaurant, marketing, service sector, demand

Today, the market of restaurant services has entered a new stage in its development, when visiting restaurants and eateries, the bistro ceased to be something exotic and gradually turned into a kind of everyday routine. But this is not the case everywhere. A distinctive feature of the Russian market of restaurant services is the varying degree of culture of the population in relation to visiting a restaurant. The difference here is manifested mainly by geographical and financial criteria.

The geographical principle is proximity to European States, where the restaurant business has long and firmly took its place in the economy of the countries of the continent. European culture catering dates back several centuries, and therefore everything that concerns this industry worked through. It's no accident that Moscow restaurateurs borrow many of their projects from their European colleagues. An example of European integration is the city of Kaliningrad, where, in general, with a rather mediocre purchasing power of the population, the culture of restaurant business is much better developed than in other Russian cities, even with a large population and well-being.

With a financial criterion, everything is rather trivial: in cities with low income per capita there is simply no place to take a restaurant for the middle class; a similar layer in these regions does not exist in such quantity to recoup the costs of a catering business.

In general, if considered in the hierarchy of catering enterprises, a restaurant occupies the highest level. In order for the food sphere of any city to be balanced, all elements of its structure must be present in it: restaurants, canteens, mobile taverns, etc. The absence or insufficient level of development in this system of any of the links indicates a weakness of the system as a whole. An example is the Moscow restaurant business in the early 1990s, when the premium segment was mainly developed on the market.

The first thing to start any business activity is to do marketing research. This will provide information, which will be mainly quantitatively characterized the audience, yet not the target. In the statistical report of the conducted research it is desirable to have data on the age and sex composition of the population, the audience education level, marital status.

In general, the definition of restaurant marketing is as follows: it is a complex system of organizing production and marketing of products, focused on meeting the

needs of specific consumers and making a profit based on research and market forecasting, studying the internal and external environment of an enterprise, developing strategies and tactics for market using marketing programs. This wording appears in almost all information sources related to restaurant marketing.

But the authors O.N. Pinigin and V.K. Tarasova give a slightly different definition of the marketing of the restaurant. They believe that this is a rather broad set of activities aimed at solving simultaneously two problems: first, the study of the demand for restaurant services, and secondly, the purposeful formation and maintenance of the demand for restaurant services [5].

The author E.V. Khristinia believes that the marketing of the restaurant includes elements of classical marketing, but it has three distinctive features, characteristic for the marketing of services: intangibility, inseparability, instability of the quality of services [1]. Under intangibility refers to the fact that because of the uncertainty associated with the scope of services, you need to create something tangible that will allow the visitor to assess the quality of the services that he wants to obtain, such as external and internal appearance of the restaurant, the design, appearance of staff, and most importantly the appearance and taste of cooked dishes. Inseparability - this means that all staff and the client itself is considered part of the service offered. If for example a waiter or another employee serves a visitor poorly or not well enough, then this will affect the popularity of the restaurant. The third feature is due to the fact that the quality of services is unstable, i.e. the quality of the service depends on when and under what conditions they were rendered, as well as who provided them, there are difficulties in quality service at the same level.

The definition of restaurant marketing in [2] is almost the same. The authors believe that the marketing activity underlying the marketing of restaurants and catering enterprises differs from other spheres in the presence of specific tasks, but in general is the development of a range of services that are provided to the client to ensure an adequate standard of living.

In [4], marketing is defined as a huge complex of various events that allows solving two problems simultaneously: to study the demand for services; to keep and maintain it in conditions of sufficiently high competition.

Table 1. Terminological analysis

Definition №	1	2	3	4	5	6
complex system of organization of production and sales of products	1	1	1	1		
study of public demand for restaurant services	1	1	1			
maintain it in a highly competitive environment		1	1			
intangibility, inseparability, instability of service quality				1		
ensuring an adequate standard of living	1				1	
optimal relationship between the organization and the environment						1

In the conditions of tough competition of the modern market, marketing plays an important role in the restaurant's activities because it allows establishing the optimal relationship between the organization and the environment of which it is a part. The main functions of restaurant marketing are the ability to assess the situation, work out a certain strategy, as well as reduce the possibility of risk when making wrong decisions.

Thus, restaurant marketing is a complex system of measures aimed at studying the population's demand for a service, preserving and maintaining a high level of competitive struggle to provide the population with an adequate standard of living.

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ТЕРМИНОЛОГИЧЕСКИЙ АНАЛИЗ ПОНЯТИЯ МАРКЕТИНГ РЕСТОРАНА

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Аннотация

В статье представлены различные точки зрения на то, что именно считают маркетингом ресторана. Похожие точки зрения были сгруппированы и проанализированы на основе системного подхода. Был проведен терминологический анализ термина «маркетинг ресторана» из разных научных статей.

Ключевые слова: маркетинг ресторана, маркетинг, сфера услуг, спрос.

SOCIAL NETWORKS AS MEANS OF COMMUNICATION

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Abstract

The article deals with modern popular networks and their significance for people. A survey was conducted as well as official information of VTsIOM was analyzed and the most popular social networks for residents of Russia were identified. The preferences of users in accordance with their age and gender concerning the use of social networks were determined.

Keywords: Internet, modern society, social network, user.

The modern society is becoming more and more immersed in the Internet every day. Thousands of social networks and applications allow not only to communicate, but also to follow the world news, share photos, videos and music. The presence of the home Internet has become commonplace. However, the world is developing so dynamically that the Internet at home is no longer enough. It should be always at hand.

Almost every person on the planet has his own personal account, whether on *Facebook*, *Twitter*, *Tumblr*, *Vkontakte*, and so on. Social networks are a great place for dating, communication.

The concept of “social network” appeared in 1954 and at that time had nothing to do with the Internet. It was introduced by the sociologist James Barnes and interpreted as follows: A social network is a social structure consisting of a group of nodes, which are social objects and the connections between them [1, p.124].

However, as the society developed, people came to the information age and came up with hundreds of ways to communicate, but in the Internet space. A social network is an Internet platform, a site that allows its registered users to post information about themselves, and communicate with each other, establishing social links. The content on this site is created directly by the users themselves. The most important component of the development of telecommunication networks is the possibility of direct communication between people.

Social networks did not appear overnight. Ancestors are e-mail, newsgroup, and interactive conversation.

The world famous Facebook appeared after almost 10 years. But, despite its youth, it became the most popular social network in just a couple of years. In 2017 Facebook’s audience reached 2 billion users and 50 million companies had their official web pages.

In Russia, until recently, Facebook has not been as popular as in the west. Therefore, in 2006, an alternative was created for Russia, as well as other countries of the CIS - *Vkontakte*. The Russian social network did not receive mass distribution around the world at the start. However, in 2009, *Vkontakte* acquired the VK.com domain, from which the conquest of other countries began. By 2018, the total number of users on the *Vkontakte* network had reached about 97 million people. And it is the fifth fastest growth rate among other social networks [1].

A survey was conducted among a group of citizens. On average, a person spends from two to three hours to communicate in social networks. The most popular messenger on the territory of Russia is WhatsApp (44%), the second place is shared by *Vkontakte* and *SMS* (32%), *Viber* is on the third place (30%). According to VTsIOM, the social networking market in Russia is divided as follows: *Vkontakte* (28%), *Odnoklassniki* (19%), *Instagram* (14%), *Facebook* (4%).

Facebook and, especially, Instagram are dominated by female users, in the latter the proportion of girls is more than 76%.

Age groups are most fully represented in the *Vkontakte*: the most active group is at the age of 25-34 years old, but at the same time, 23.3% of the authors are users aged from 18 to 24, and another 20% are under 18 years old. On Facebook, the users of 25-34 and 35-44 years old show approximately the same activity, this is the core of the network [2].

According to most researchers, the media and social networks have long since merged with each other. The former draw news from networks and social media, actively discuss events interpreting in their own way and actively express their opinions. In this regard, official representative offices of newspapers, magazines, radio, Internet publications, and television channels are being created in major social portals. As a result, the media receive a huge influx of young audiences who spend dozens of hours on social networks. In addition, the media received new tools to communicate with the old and new audience.

The list of media with official social media accounts does not stop expanding. In the modern society, even local publications have their pages on major social portals.

Thus, we learned how many people use social networks; we learned the age preferences of users, and determined the place of social networks in the life of the modern society.

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СОЦИАЛЬНЫЕ СЕТИ КАК СРЕДСТВО ОБЩЕНИЯ

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Аннотация

В статье рассматриваются современные популярные сети и их значение для людей. Был проведен опрос, была проанализирована официальная информация ВЦИОМ и выявлены наиболее популярные социальные сети для жителей России. А также определены предпочтения пользователей по возрасту и полу в использовании социальных сетей.

Ключевые слова: интернет, пользователь, современное общество, социальная сеть.

THE PROBLEM OF TOURIST AND RECREATIONAL POTENTIAL OF THE TAMBOV REGION

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Abstract

Various forms and types of tourism are discussed in this article. The analysis was carried out to identify the tourism potential of the selected region, to find and recommend new and attractive tourism opportunities, thereby increasing its attractiveness and competitiveness.

Key words: recreation, region, research, tourism development

Introduction

Cultural and cognitive motivation plays a leading role in the global structure of tourist trips. Today, cities which have lots of cultural and historical sites are becoming places of an increasing number of tourists. In this connection, countries and cities are purposefully engaged in the development of models of cultural and recreational tourism, focusing on the promotion of their territories and the formation of their own brand, which determines the tourist attractiveness of the area.

Despite the fact that Russian regions have a huge recreational potential to date they remain largely untapped and unknown in the domestic and global tourist markets.

Thus, the study of the prospects of recreational development of the Tambov region is necessary because tourism has prospects for further economic development of our region. Developed tourism can become a powerful catalyst for the socio-economic development of the region, ensure the inflow of investments, promote the growth of related industries and help to solve the problems of employment.

If we turn to the historical information about the city of Tambov, we should note that it is a small provincial town that keeps a lot of undeniable advantages. Multifaceted interesting history - the history of the city has left its mark on the modern life and the appearance of modern Tambov. There are lots of famous sights and memorable places, outstanding events, characters and figures that lived, worked and glorified our city far beyond its borders. [1]

Such well-known personalities as G.V. Chicherin, S.V. Rakhmaninov, I.V. Michurin, V.I. Vernadsky, A.M. Gerasimov, St. Pitirim, Archbishop Luka (Voino-Yasenetsky) and many others are connected with the Tambov region.

History gave our region a number of brands such as S.V. Rakhmaninov and Kozma Prutkov, V.I. Agapkin and I. Shatrov, the famous 'Tambov wolf' and 'Tambovskaya Kaznachejsha'.

Every year events that contribute to the increase of tourist flow are held on the territory of the Tambov region. However, the Tambov region is not among the regions with a developed tourist sector, a positive image of the region as a tourist region has not been formed.

That's the reason for conducting this research to identify the most visited sites and areas, as well as preferences among various forms and types of tourism, to analyze the

structure of the contingent of visitors and to study the reasons, factors that hinder or favor the development of tourism in the Tambov region.

The algorithm for creating a tourist product

In order to receive profits from the tourism industry it is necessary for our region:

- to determine the main strategic directions, taking into account local natural, historical, cultural and other features;

- to identify the tourism potential and develop regional programs for the development of the tourism industry and projects for the development of tourism business on this platform,

- to analyze the most effective models of tourism and recreation development;

- to develop new information technologies, modern databases and databases on tourism and recreation,

- to develop a navigation database,

- to develop information and reference and cartographic support of tourist activities, introducing an effective advertising strategy. It is necessary to provide for continuous work on the provision of information and the creation of an information product, which plays an important role for the market research. They determine the direction of tourism development, attract additional customers.

It is also obvious that for further development of tourism it is necessary to be guided by deep fundamental developments in all branches of knowledge where tourism acts as an incentive for further research and where it is the main consumer of new knowledge.

There is a close and long-standing relationship between tourism, philosophy and religion, philology, the private manifestation of which are history and literature, art, mainly architectural monuments, and geography as a global distribution of mass-visited tourist sites.

When we consider the resources of the Tambov region in terms of their use for the development of tourist attractiveness and competitiveness of the region, it is important to consider the architectural, historical and religious monuments that have become a national treasure.

The Orthodox pilgrims were interested in pilgrimage tourism in the Tambov region for many years. It is known that the greatest wealth that Russia can offer the world is its spiritual wealth. Many people from all over the world perceive the Russian Orthodox Church as the last Bastion of Christian traditionalism and conservatism.

The growing geography of monasteries, their noticeable shift towards rural areas, small and medium-sized cities create certain conditions for the development of religious tourism and pilgrimage. The richness of spiritual traditions and shrines combined with a high level of transport infrastructure, density of urban and rural settlements favor the creation of new tours in the "Golden heritage of Russia", "Golden ring of Russia". The influx of tourists, both Russian and foreign, to the monasteries has a significant impact on their financial condition. According to published data, every year about 2 million people make a pilgrimage within Russia. The influx of pilgrims from abroad does not exceed 15-20 thousand people. Unfortunately, there is no accurate statistics on the number of visitors to the monastery complexes as pilgrims and tourists, but the "road to the temple" began to occupy an increasing number of travelers. Being the centers of Russian Orthodoxy, monasteries define the aesthetic face of both large and small Russian cities" [2] pp.74-75.

However, despite the significant tourism potential and the existing market demand, the volume of tourist services remains low in Tambov region.

It should be noted that an important aspect of the accessibility of the tourist route is its livability: providing transport accessibility, convenient parking, viewing platforms and recreational facilities, toilets, garbage cans and information stands — this is the mandatory minimum. It is necessary to improve the quality of services provided to tourists: in museums and other objects, in accommodation, catering enterprises, in the retail network, in transport, in tourist information centers, etc.

Conclusion

The aim of this work was to identify the most visited sites and territories as well as preferences among different forms and types of tourism, to analyze the structure of the contingent of visitors, to study the reasons and factors that hinder or favor the development of tourism in Tambov region and to formulate proposals, recommendations and specific measures to increase and optimize the flow of tourists Tambov region on the basis of the results.

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ИССЛЕДОВАНИЕ ТУРИСТСКО-РЕКРЕАЦИОННОГО ПОТЕНЦИАЛА ТАМБОВСКОЙ ОБЛАСТИ

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Аннотация

В данной статье рассмотрены различные формы и виды туризма. Проведен анализ с целью выявить туристический потенциал выбранного региона, найти и рекомендовать новые и привлекательные возможности туризма, тем самым повысив его привлекательность и конкурентоспособность.

Ключевые слова: развитие туризма, регион, исследование, рекреация

PROSPECTS OF USING THE INSTITUTE OF MEDIATION IN DISPUTE RESOLUTION IN THE SPHERE OF INTELLECTUAL PROPERTY IN THE RUSSIAN FEDERATION

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Abstract

The article examines the problems of applying mediation in the field of intellectual property. A retrospective analysis of this category was carried out and the main tendencies of development of the mediation institute in Russia were revealed.

Key words: intellectual property, mediation, WIPO.

The Civil Code of the Russian Federation (hereinafter - the CC RF) defines intellectual property as legally protected results of intellectual activity and equated to them means of individualization of legal entities, goods, works, services and enterprises [1].

Disputes regarding intellectual property rights have a rather deep history. One of the most ancient disputes regarding copyright, information about which has been preserved to this day, occurred in the 4th century between the abbot of St. Fingtan monastery from the Irish city of Movil and the apostle St. Colomba, an eminent monk who introduced Christianity to the territory of modern Scotland. The dispute was caused by the apostle St. Colombo copying the Psalter, which belonged to St. Finnian. The conflict led to a battle that caused many human casualties [2].

Today, the most problematic issue remains the possibility of using alternative dispute resolution tools for intellectual property disputes in the Russian Federation. By the way, this mechanism has long been applied in the international arena as part of the activities of the World Intellectual Property Organization (hereinafter - WIPO).

WIPO proposes two main mechanisms for resolving disputes - arbitration and mediation. Within the framework of this organization, the WIPO Arbitration and Mediation Center (hereinafter - the Center) operates, which is an international body that offers time-efficient and materially efficient alternatives to judicial settlement of intellectual property disputes. The legal basis for the Center is the General Rules and Procedures of WIPO [3] and the Uniform Domain Name Dispute Resolution Policy (UDRP) as a model for resolving disputes over intellectual property rights [4].

The WIPO Arbitration and Mediation Center has established a base in which about 1,500 neutral mediators, arbitrators and experts with their experience in resolving disputes and specialized knowledge in the field of intellectual property law operate.

The efficiency of the WIPO Center's activities is indicated by statistical indicators, since from 1999 to 2016, the WIPO Arbitration and Mediation Center considered 480 disputes in mediation, arbitration, or according to an expert [2]. Official WIPO statistics distribute requests for resolving conflicts in intellectual property depending on the

objects: for example, 30% of requests concern patent disputes, and, for example, only 7% are copyright disputes.

Mediation exists as long as conflicts exist. This method of resolving disputes as it grew became popular primarily in the countries of Anglo-Saxon law - the USA, Australia, Great Britain, and then began to spread gradually in Europe.

If gives examples of national practices on the use of mediation, it is quite remarkable the US experience, where the whole system of law intended to most of the disputes were resolved voluntarily before the court. The proceedings may be interrupted for the parties to the mediator. Austria is one of the few States where the profession of the mediator made in the nomenclature of professions. Austrian legislation provides that the agreement resulting from mediation in connection with court proceedings may be recognized by the court as a result of pre-judicial mediation judicial protection does not receive [5, p. 270].

Thus, the following advantages of mediation over traditional dispute resolution methods can be highlighted: confidentiality of the procedure; relatively low cost; reliability [5, p. 76].

In Russia, the mediation procedure in intellectual property disputes is practically not applied. Russian companies are prone to resolving disputes in court. However, the benefits of alternative dispute resolution are becoming increasingly apparent. The above signs of mediation characterize this process from the most advantageous position. In this connection, companies need to pay attention to this method of dispute resolution.

In our opinion, several factors can be singled out that more than any other factors can influence the choice of the parties in favor of mediation in disputes in the field of intellectual property: imperfect legislation; lack of competence of key persons - that is, the incompetence primarily of those involved in resolving the dispute - judges, experts, professionals, lawyers, lawyers; the complexity of the system of interaction between participants; the need for creative dispute resolution; maintaining links between the parties is essential; the desire of the parties to keep secret the fact of negotiations and agreements reached.

However, the most striking advantages of mediation are speed and efficiency in resolving disputes. Due to the peculiarities of the disputed objects in this sphere, a quick and accurate reaction is required, as the delay entails irreversible consequences in the form of disclosure of confidential information, loss of profits and market positions. The trial in these conditions is most losing - the terms of the trial can be calculated in months and years.

It is worth saying that today there is a favorable situation for the introduction of alternative ways of resolving disputes in the field of intellectual property in Russia, including mediation. On the one hand, these methods allow resolving the conflict without contacting the judicial authorities, thereby ensuring the right of defense to the disputants. On the other hand, extrajudicial settlement of disputes will significantly relieve the judicial system, thereby facilitating citizens' access to justice. Due to the fact that litigation is costly both in relation to monetary resources and in relation to temporary resource, it is worth saying that the trial is open and transparent, and alternative dispute resolution methods are completely confidential procedures, which is an important factor for the holder of intellectual rights.

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ПЕРСПЕКТИВЫ ИСПОЛЬЗОВАНИЯ ИНСТИТУТА МЕДИАЦИИ В РАЗРЕШЕНИИ СПОРОВ В СФЕРЕ ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ В РОССИЙСКОЙ ФЕДЕРАЦИИ

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Аннотация

Рассматриваются проблемы применения медиации в сфере интеллектуальной собственности. Осуществлен ретроспективный анализ данной категории и выявлены основные тенденции развития института медиации в России.

Ключевые слова: интеллектуальная собственность, медиация, ВОИС.

RELIABILITY OF A COMMERCIAL BANK

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Abstract

The primary goal of any commercial bank is to make profit by providing paid services to its customers. But in order for people to use the services, the bank must have not only a good reputation and image, but also absolute reliability. The study aims to expand the concept of reliability of commercial banks; to disclose and systematize methods for analyzing bank liquidity; to analyze the financial condition of the bank.

Keywords: banking, reliability, sustainability, economic, control.

Introduction

The reliability of a bank is a certain qualitative condition of a commercial bank, characterizing:

- (1) strength and safety, i.e. financial stability of the bank;
- (2) a certain constancy of the existence of the bank in the market, i.e. long-term sustainability co-storage;
- (3) trust from counterparties, i.e. reputation of a “reliable bank” [1].

The stability of the financial condition of the bank includes the following parameters:

- (1) liquidity is the ability of the bank to meet its obligations;
- (2) profitability characterizes the profit received from each bank (its own and borrowed) ruble;
- (3) credit risk is the possibility of a bank losing a financial asset as a result of the inability of counterparties (borrowers) to fulfill their obligations to pay interest and principal amount of the debt in accordance with the terms of the contract;
- (4) market risk is the risk of a decrease in the value of assets due to a change in market factors;
- (5) capital adequacy is a measure of the bank’s activities, expressed as the ratio of the bank’s own funds to the total volume of assets weighted by risk.

Long-term sustainability is the ability of the bank to withstand periodic changes in external factors.

To find out which bank is now reliable, people use authorized opinion of ranking agencies. The ranking agency is an organization that uses open information (certified by the auditor, the consolidated and consolidated non-consolidated financial statements under IFRS, audited annual accounts according to RAS, etc.) and calculates banks’ ranking every six months. The ranking of the bank is based on the analysis of blocks of factors: the independent creditworthiness of the bank (taking into account internal support factors and exposure to internal stress factors) and the significance of external support factors (AF) and stress factors (SF). Initially, the independent credit rating of the bank is determined, and then adjustment is made to external support factors and stress factors to determine the final rating number [2].

Bank reliability assessment

When interacting with the bank, it is necessary to evaluate its reliability, which has its specific goals and criteria for evaluation. Table 1 shows the objectives of assessing the reliability of the bank for both partners and the bank itself. [3]

Table 1 - Assessing bank reliability

Assessment criteria	The subject of evaluation	Bank reliability assessment objectives	Criteria for evaluation
(1) from the perspective of the state	Central Bank	- determination of the stability of the banking system - protection of interests of investors and shareholders	- criteria for the implementation of the bank all of these laws
	The Federal Tax Service	- control over the correctness of calculation and timely payment of taxes and payments to the budget	
(2) in terms of the bank itself	Management staff	- identify your market position - reserves of reaching a new level of development	- criteria determining the reliability of customers and partners of the bank - banking risk criteria
	Employees	- employment - career opportunities	- decent wage confidence
(3) in terms of partners of the bank	Shareholders	- definition of long-term and profitable development of the bank	- banking risk criteria - bank management quality criteria
	Banking customers	- determination of the feasibility and prospects for further relations	- current liquidity
	Counterparty banks	- setting limits on interbank transactions for each bank	- criteria for compliance with Central Bank regulations - banking risk criteria

The concept of “reliability” on the part of clients is characterized by the fulfillment of all their obligations to invest, accumulate, preserve and return funds.

When interacting with the bank, it is necessary to assess its reliability, which has its specific goals and criteria for evaluation.

Internal and external factors ingesting bank reliability

In addition, the content of the concept of “reliability” includes the factors determining the stability of the bank. These factors should be divided into internal and external.

The internal factors of commercial bank “reliability” are organizational, economic, technological, and strategic.

External factors are characterized by the influence of the external environment on a commercial bank, namely, such factors that determine the state of the financial market, the national and economic economy, the political climate in the country and force majeure.

External factors of reliability of a commercial bank include:

- (1) economic and political situation in the world;
- (2) political trends in the country;
- (3) the general state of the country's economy;
- (4) external infrastructure;
- (5) the field of activity of a particular bank;
- (6) business reputation.

Internal factors are caused by such factors as the financial position of the credit institution itself, the level of management, etc.

Of all the above factors, the special influence is exerted by economic factors - wealth of liquidity, profitability; and strategic - ones the development of the most effective strategy of a commercial bank.

Conclusion

Having analyzed the structure of the concept of the reliability of a commercial bank, one can say that a large number of indicators that influence it. Conventionally, all these indicators can be divided into 2 large groups: external and internal factors. The internal factors include calculated economic indicators, and the external factors include the situation in the country and abroad. It is also worth noting the importance of finding a bank in the ratings published by rating agencies. This fact affects the choice of customers of this particular bank.

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НАДЕЖНОСТЬ КОММЕРЧЕСКОГО БАНКА

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Аннотация

Первостепенная цель любого коммерческого банка состоит в получении прибыли путем предоставления, своим клиентам, платных услуг. Надежность банка в узком смысле - это его способность функционировать без финансовых затруднений в течение некоторого периода времени. Цель работы - рассмотреть и изучить надежность коммерческого банка и определение его методов.

Ключевые слова: банковский, надёжность, устойчивость, экономический, контроль.

NETWORK MARKETING AS A SOCIO-CULTURAL PHENOMENON (THE EXAMPLE OF TAMBOV)

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Abstract

The article deals with network marketing and the study of attitudes of the population of the city of Tambov to network marketing. A survey was conducted and the reasons for people's perception of this type of activity were clarified. The conclusions were made on the research.

Keywords: business, distributor, multilevel marketing, network marketing.

Introduction

In modern Russia, network marketing is becoming increasingly popular. Many people have different attitudes to this phenomenon; often opinions are completely opposite to each other. This raises the question of why people begin to be engaged in this type of activity, every day what reasons they are guided by signing a distribution agreement with a particular network marketing organization. The same processes we observe in the city of Tambov.

Network marketing from the point of view of Tambov residents

The problem of network interactions and, alternatively, multilevel marketing, can be considered as a problem of modern society, developed in the post-industrial type. We consider network marketing or multilevel marketing as a concept of sales of goods and services, which is based on the creation of a network of independent distributors (sales agents), each of which, in addition to sales, also has the right to attract partners with similar rights. The article aims at studying the relationship of network marketing population of the city of Tambov. Tasks: to find out how people learn about network marketing; to consider the reason why people join network marketing organizations; to find out what they experience in relation to people who are engaged in network marketing; to identify the pros and cons of network marketing through a survey.

A survey was conducted in December 2018. The number of respondents was 65, of which 63.1% were men and 36.9% were women. Age of respondents: 16-17 y.o. -3.1%, 18-25 y.o. -70.8%, 26-35 .o. -24.6% and more than 36 y.o.-1.5%.

As a result of the survey, it was found that the number of people learning about network marketing mainly from friends/acquaintances was 52.3% and from the Internet it was 46.2%, while only 1.5% learnt about it from television / radio and none of them learnt from the newspapers / magazines.

The survey revealed that 38.5% of the respondents believe that one can make money from network marketing, 29.2% of the respondents believe that you can earn something if it is combined with the main job. A slightly smaller number of people (24.6%) generally found it difficult to answer and 5 people (7.7%) believe that you cannot earn money by network marketing.

It also turned out that the majority of respondents (32 people – 49.2%) are indifferent to people who are engaged in network marketing. Almost the same number (30 people) experience positive emotions, while only 3 people have a negative attitude.

When answering the question, if network marketing brings benefit or harm to society, more respondents chose the answer that it brings more benefit than harm – 38.5% (32 people), 4.6% had the opposite opinion. 32.3% (21 people) found it difficult to answer this question. 24.4% (16) considered that network marketing is beneficial. And no one gave a negative answer.

The survey revealed the main advantages of network marketing, according to respondents. The majority of the respondents (58.5%) stressed flexible, convenient hours of working; 43.1% mentioned the opportunity to meet new people and have self-development. The opportunity to work online was mentioned by 36.9%, while 33.8% of the respondents mentioned lack of pressure from the boss, and lack of stress. The same number of respondents named the possibility of unlimited earnings and being self-employed 30.8%. Finally, the respondents mentioned free training in network marketing and purchasing company products at a discount – 16.9% and 10.4%, respectively.

However, the majority of respondents - 46.2% - mentioned the problem of running into scams. 44.6% of respondents believe that the disadvantages are the instability of earnings. 40% named high competition and 32.3% focused on the need to look for customers. 23.1% do not want to take responsibility for others and 15.4% were unsatisfied with the moral load.

Information was obtained about the popularity of certain brands of network marketing in the Tambov region. It is not surprising that almost all respondents know such a brand as Avon (55 people). The same number of respondents is aware of Oriflame and Amway (28 people, respectively); 18 respondents were familiar with Project WWP Capital. Very few people were familiar with CielParfum and Omegabit.

Conclusion

Thus, we learned how people learn about network marketing; we learned what they experience in relation to people who are engaged in network marketing and identified the pros and cons.

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СЕТЕВОЙ МАРКЕТИНГ КАК СОЦИАЛЬНО-КУЛЬТУРНЫЙ ФЕНОМЕН (НА ПРИМЕРЕ Г. ТАМБОВА)

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Аннотация

Рассмотрена проблема сетевого маркетинга и изучение отношения к сетевому маркетингу населения города Тамбова. Проведено анкетирование и выяснены причины восприятия людей данного вида деятельности. Сделаны выводы по результатам исследования

Ключевые слова: бизнес, дистрибьютор, многоуровневый маркетинг, сетевой маркетинг.

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