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The materials of the conference have presented the results of the latest research in various fields of science. The collection is of interest to researchers, graduate students, doctoral candidates, teachers, students - for anyone interested in the latest trends of the world of science.

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Content

SECTION I. Information Technology

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DEVELOPMENT OF EDUCATİONAL TECHNOLOGİES İN THE İNFORMATİON SOCİETY

The development of technology leads to the formation of a new type of society - the information society. This process, which began with the advent of the first computers, continues today at an accelerating pace. In 1972, an advisory board of industry, transport, political, and religious leaders prepared a two-volume report, Information Technology, summarizing the idea of a transition from an industrial to an information society as an imperative for the future of the United States [1]. A few years earlier, Japan proposed in the so-called «White Paper» on computerization and informatization to build an information society as a response to the problems of our time in the form of environmental pollution, re-urbanization, etc [2]. This approach has become the basis of the concept of sustainable development, which is currently supported by most countries, based on one of the most important strategic directions for the development of civilization - global informatization. It is information that will determine the development of the information society. One of the most accessible and widespread information sources today is the «Network of Networks» - the Internet, the technology of which was developed in 1969 by order of the US Department of Defense for the fast and reliable exchange of information and united the four largest universities.

Today it includes all universities, national libraries and research centers in the world, and the number of users has reached 2.4 billion (34% of the total population), and is growing steadily. The growth in the number of Internet users for the period from 2011 to 2021 amounted to 600%, according to the FOM (Public Opinion Foundation) for 2021, the penetration of the boarding school in Russia was 52% [3]. In connection with the increase in the number of active users of the network, the amount of available information also increases. According to research by the analytical company ICANN, the amount of data stored on the Internet in 2011 is 2.56 zettabytes (2.7 billion Tb) and is increasing on average 2 times every 2 years [4]. An example is the popular Internet

encyclopedia Wikipedia (http://ru.wikipedia.org) containing more than 30 million articles in 276 world languages.

The Internet affects all social institutions, including education. With its spread, new opportunities open up, such as distance learning, online lectures and seminars. Online libraries and databases provide unlimited potential for self-education and self-realization.

Many common video and audio courses allow you to master new technology in a short time, in a form that is convenient for the student. With the ability of the latter to adjust the training to your rhythm of life.

Distance education is gradually becoming more and more popular, especially in the 3rd world countries, where the cost of a similar traditional education is 5 times higher.

IBM's 2021 report «5 Innovations That Will Change Our Lives in the Next 5 Years» ranks first in the classrooms of the future, built on the basis of Internet technologies and self-learning networks, which will improve the quality of education, create a personalized, flexible approach to to each student [10].

All this leads to a new stage in the development of educational technologies. The student can find any information of interest to him, bypassing the teacher. The presence of students at lectures is less and less taken for granted. Now the teacher needs to be «interesting» for students.

Another competitor for the teacher is the multimedia method of presenting information on the network. Modern teenagers at the age of 15-16 «live» in the multimedia space. According to the survey, 93% use the Internet [5], which leads to the formation of a new type of thinking in them, which in a certain way differs from the thinking that was formed on the basis of operating with printed information, using the mass media.

At the same time, the Internet provides them with a choice between universities and world-famous teachers who implement Internet technologies in their activities. In 2021, over 200,000 students attended an online course at the University of London at the same time [6]. Whereas the most popular online lecture has collected more than 20 million views for all time.

As a result, the teacher will have to think not only about the content of his lectures, but also about the form of their presentation, taking into account the focus on the modern media format.

Openness and the possibility of free exchange of information have given rise to new combinations, often arising from already known concepts. This determined the emergence of new disciplines based on the combination and mutual influence of existing ones. «Earth Science»

- one of the courses at the University of Amsterdam is a combination of: geography, physics, biology and a number of other disciplines. «Quantum information» (Quantum informatics), which includes elements of quantum physics and computer science, «Bioinformatics» - formed at the intersection of molecular biology and informatics.

Another modern trend in the scientific community is transdisciplinarity. As a result of the International Conference on Higher Education, held in Paris in October, at UNESCO Headquarters, recommendations were made to encourage the transdisciplinarity of educational programs and teach future specialists to use a transdisciplinary approach to solve complex problems of nature and society [7]. A modern institution is a complex, static structure created for stable, unchanging conditions. The market today, however, is not stable. The influence of informatization on the educational process entails not only the use of new technologies and new disciplines. New requirements for the format of education are being created, the adoption of which becomes necessary for higher education institutions if they want to remain competitive in the new society.

Speed and flexibility are the trend of today.

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CONTROL OF TRANSPORTATION OF CARGO MODERN INFORMATION MEANS

For many companies and enterprises whose management fights for competitiveness, quality and speed are important deliveries at minimum cost. Such companies adhere to the strategy of creating transport systems in which means of communication, command and control originally built into vehicles and objects infrastructure, and management capabilities, based on, received in real time, information is available not only transport operators, but also to all transport users. To achieve this goal, a GPS/GLONASS system has been developed. monitoring of cargo transportation, with the help of which control over the transportation of goods and the personnel of the company [2].

Eleven Global Navigation Satellite System (GLONASS) is a Russian satellite navigation system. GPS (eng. Global Positioning System - a system of global positioning) - satellite navigation system, providing measurement of distance, time and determining location in the world coordinate system.

GPS/GLONASS is designed for operational navigation temporary provision of an unlimited number of users ground, sea, air and space based. Implementation of the GPS/GLONASS system on a global scale became possible in conditions of intense communication space, when there are no problems with the transfer of significant volumes of digital information at any point of the transport network. Fuel control using GPS/GLONASS monitoring is one of the priorities modern transport industry, because it allows effectively solve several urgent and important tasks at once trucking companies. Among them it is worth noting determination at any time of the coordinates of the moving vehicle with an accuracy of 5 m, the speed of its movement and direction. Using this system, each company can provide fuel control in exchange for increased discipline on the part of drivers, fully this, excluding «left-handed flights», theft of fuel and lubricants, as well as increasing efficiency of the dispatching staff. Due GPS/GLONASS monitoring became possible today improving the quality of customer service and customer service, for why they can be provided with a unique tracking service cargo. In addition, the use of GPS/GLONASS monitoring provides quick location of loading and unloading cargo, and also allows you to control the weight of the cargo on used vehicle [3].

The GPS/GLONASS system allows you to monitor the movement on highways, and also provides an opportunity to prevent collisions of vehicles and their safety. Intelligent systems for vehicles equipped with collision avoidance system, warning system collision, driver assistance system.

As part of the eCall program since 2012, each car manufacturer that wants to produce and sell its products on the territory of the Russian Federation, in a mandatory order must complete the car with a standard device – «black box»: GPS/GLONASS telematics unit, with which determines the exact coordinates of the place finding a vehicle. In recent years, satellite information, and in particular navigation systems have become essential components information support of the transport industry, which play an indispensable role in the operational assessment of the road situation in remote areas of the country. With the use of this system, optimization is increased passenger traffic and the level of passenger safety, so how is road transport the most dangerous form of transport transportation.

Along with GPS/GLONASS, in transport and communications Recently, geographic information systems (GIS). This is because infrastructure facilities are usually scattered over a large territories and / or themselves have a significant extent. And for their full-fledged modeling in the data is also needed and geometric characteristics. In addition, GIS are very useful for the implementation of services produced infrastructure: search for the shortest path, transport logistics, passenger transport route planning and etc. [1].

Thus, the GIS software allows carry out deep automation of business processes transport and communication companies and organizations. Data modeling tools allow you to describe in detail infrastructure facilities, business entities and interactions between them, and the means for analysis - to optimize the activities of the enterprise and increase its effectiveness.

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SECTION II. Biological sciences

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ASSESSMENT OF DİVERSİTY OF WİLD POMEGRANATE (*Punica granatum* L.) GENOTYPES OF AZERBAİJAN

The pomegranate belongs to the Punicaceae family with one genus (Punica) and two species (*P. protopunuca* Bolf. and *P. granatum* L.). Pomegranate is one of the earliest cultivated plants among fruit plants. In his works, Levin believed that the origin of the pomegranate spread to other parts of the world from Central Asia, especially from the Transcaucasian-Caspian region [1]. In our study we used *P.granatum* L., one of two species of the genus Punica. 90 pomegranate genotypes used in the study were collected in 6 regions of Azerbaijan Agsu, Gabala, Ismayilli, Goychay, Samukh and Sabirabad. Morpho-pomological and biochemical evaluation was carried out on 5 randomly selected fruits [2, 3]. Mean values, standard deviation (SD), standard error (SE) and coefficient of variation (CV%) were determined for the studied instruments. Each of the studied traits showed high genetic variability. Among the characters, the highest coefficient of variation was rind thickness (CV=36.8), and the lowest coefficient of variation was in percentage of juice yield (CV=7.8). Fruit shape index (CV=35.5%), calyx shape index (CV=35.5%) and seed hardness (CV=30.3%) are among the highly variable indicators. The "principal component" method was used to study the significance of various traits in genotypes. PCA (Principal Component Analysis) is used to reduce the dimensionality of data during data analysis. The main goal here is to keep the changes stable and make as few mistakes as possible. Also,

since PCA reduces the amount of multidimensional data, it allows you to visualize the data. This analysis shows high variability between different groups and within each group. According to our results, the variation of the sum of seven components was 87.15%. The values of the first three PCs, which accounted for 66.9% of the observed variability, were 48.1%, 10.8%, and 7.9%, respectively. These three components (PC1, PC2 and PC3) separated genotypes with high fruit weight, fruit diameter, berry width, berry height and 100 berry weight. According to PC1, traits such as fruit weight, fruit diameter, weight of 100 gills showed a variation of 48.1%, and among these indicators, fruit weight was the most important trait. The width and height of the separate seeds of pomegranate showed a variation of 10.87%, appearing as significant signs according to the second factor. Among these features, the width of the separate seeds of pomegranate was of the greatest importance. PC3, which accounts for 7.9% of the total variance, represents the trait of width the separate seeds of pomegranate. The correlation between the two traits was calculated. Correlation analysis can provide valuable information about the most important traits in the evaluation of genotypes. It was seen that there is a highly significant (r=0.954) dependence between fruit mass and juice yield. It was found that there is a negative significant (r=-0.220) relationship between fruit shape index and seed hardness. This correlation is a very important indicator because it may be possible to reduce seed hardness by increasing the fruit shape index. Cluster analysis was performed using the Euclidean genetic distance index of the SPSS statistical software package. The studied genotypes are grouped into 6 main clusters according to the indicated traits. According to the Euclidean distance index, the most distant dendrogram genotypes were samples collected from Agsu and Sabirabad (327.51), which can be explained by their different origin. Among the common genotypes, the closest were the genotypes collected in Gabala (1.41). This closeness can be explained by the fact that their origin is the same. The results showed a high level of diversity of the studied traits. Fruit mass, juice yield, juice content, and seed hardness had a fairly high range of variation, and therefore their diversity was assessed to be high.

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SECTION III. Earth Science

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OPTIMIZATION OF DRİLLİNG AND BLASTİNG PARAMETERS FOR INCREASING THE PRODUCT OUTPUT

Annotation. The paper analyzes the conditions for drilling and blasting operations at the open pits, which made it possible to identify existing problems in the technology of drilling and blasting operations and in the operation of the crushing and screening complex, in connection with which it is necessary to develop and justify measures to increase the productivity of the quarry and cone crushers. A theoretical calculation was performed and experimental explosions were carried out to confirm the decisions made. Based on the results of experimental explosions, the fractional composition

was processed in the WipFrag software. The possibility of switching wells from a diameter of 134 mm to 171 mm is substantiated, which will lead to the possibility of increasing the productivity of the crusher, with an increase in the average piece of blasted rock mass and an increase in the volume of blasted ore mass and, as a result, an increase in the economic efficiency of the enterprise.

Key words: drilling and blasting; charge diameter; performance of the crushing complex; fractional composition; explosive

Problem statement: Based on the analysis of the state of mining and drilling and blasting, as well as the need to increase the productivity of the quarry in terms of ore mass, the following problems were formulated that affect the economic component of the enterprise, namely:

1. The existing parameters of drilling and blasting do not allow the enterprise to increase the capacity for the extraction of minerals and ore mass in general, which leads to a loss of potential profit.

2. The average size of a piece of blasted rock mass does not provide an opportunity to increase the productivity of the crushing complex, which entails a set of inappropriate economic costs.

Presentation of the main material.

The existing technology for mining ore blocks at open pit does not provide an opportunity to increase the productivity of the crushing complex and the enterprise as a whole. To solve this problem, I proposed to conduct experimental explosions, on the basis of which a conclusion was drawn about the most cost-effective parameters of the drilling and blasting. The existing technology uses a well diameter of 134 mm, a well grid of 4.3x3.7 m and explosives - Granulite NP, and the proposed technology uses a diameter of 171 mm, a well grid of 5.0x4.5 m and explosives - Fortis Advantage 70. The purpose of the experiment was establishing the actual average size of a piece of the exploded rock mass after the explosion. Experimental blocks were located on the account. "Southern" (Figure 1) in the places of distribution of ore zones on the horizon +877.5 m (along the "foot" of the block). Number of blocks - 3 pcs. The configuration is rectangular. In the northern part of the block they are limited by a buffer of blasted rock mass, on the other sides - by a "pillar". Thus, on the one hand, the pillar will be drilled according to the proposed drilling and drilling parameters, and on the other hand, according to those already available at the enterprise (Figure 2). There are no underground mine workings with their access to the surface.

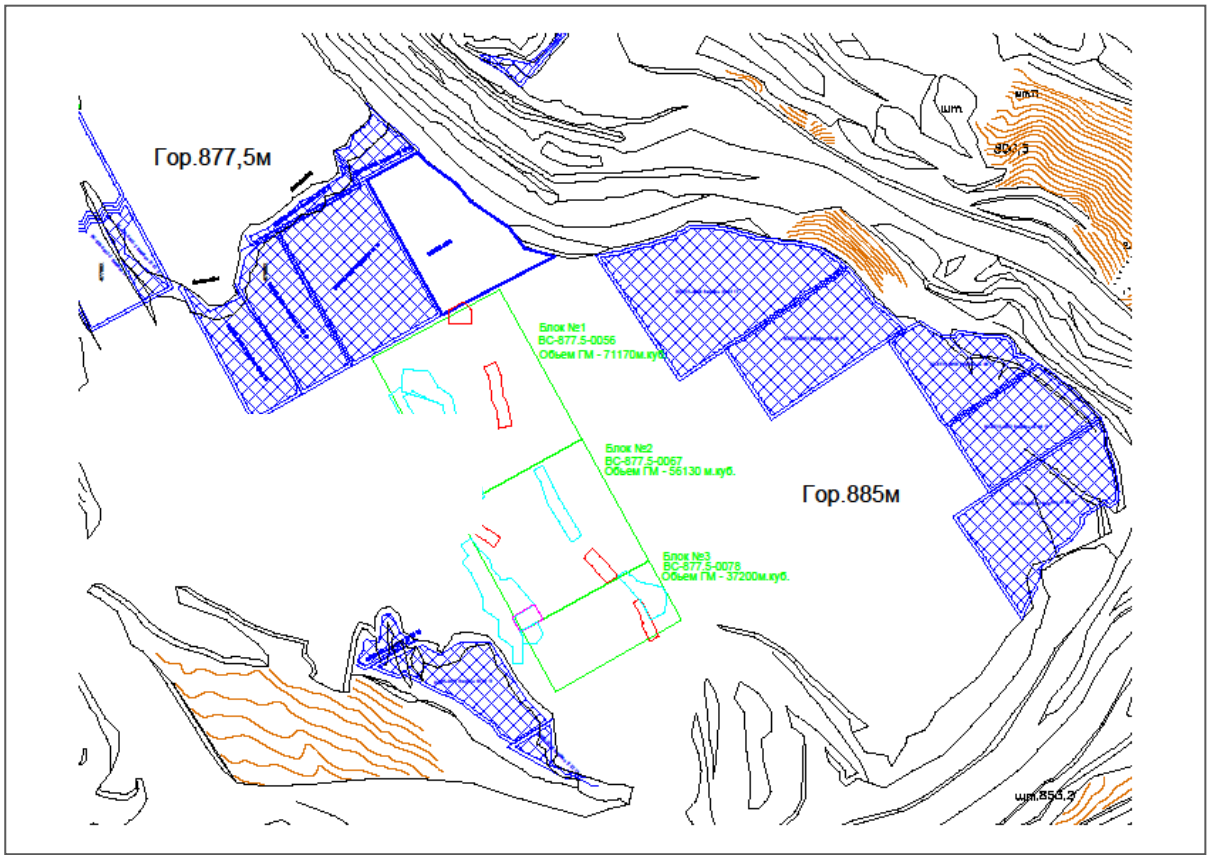

Figure 1. Layout of blocks on the "Southern" site

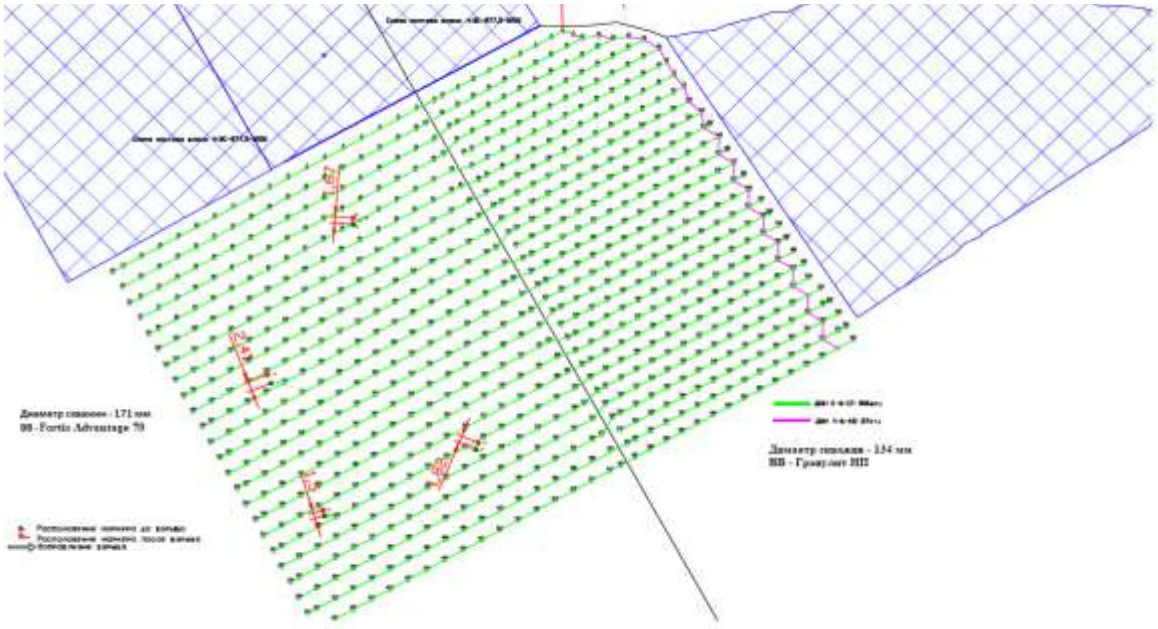

Figure 2. Scheme of drilling of experimental blocks

The final result of 3 explosions was a photoplanimetric analysis of the blasted rock mass using the WipFrag software.

Analysis of Block No. BC-877.5-0056
(diameter 134 mm, BB Granulite NP):

Figure 3. Photo of the site of the collapse of the exploded rock mass

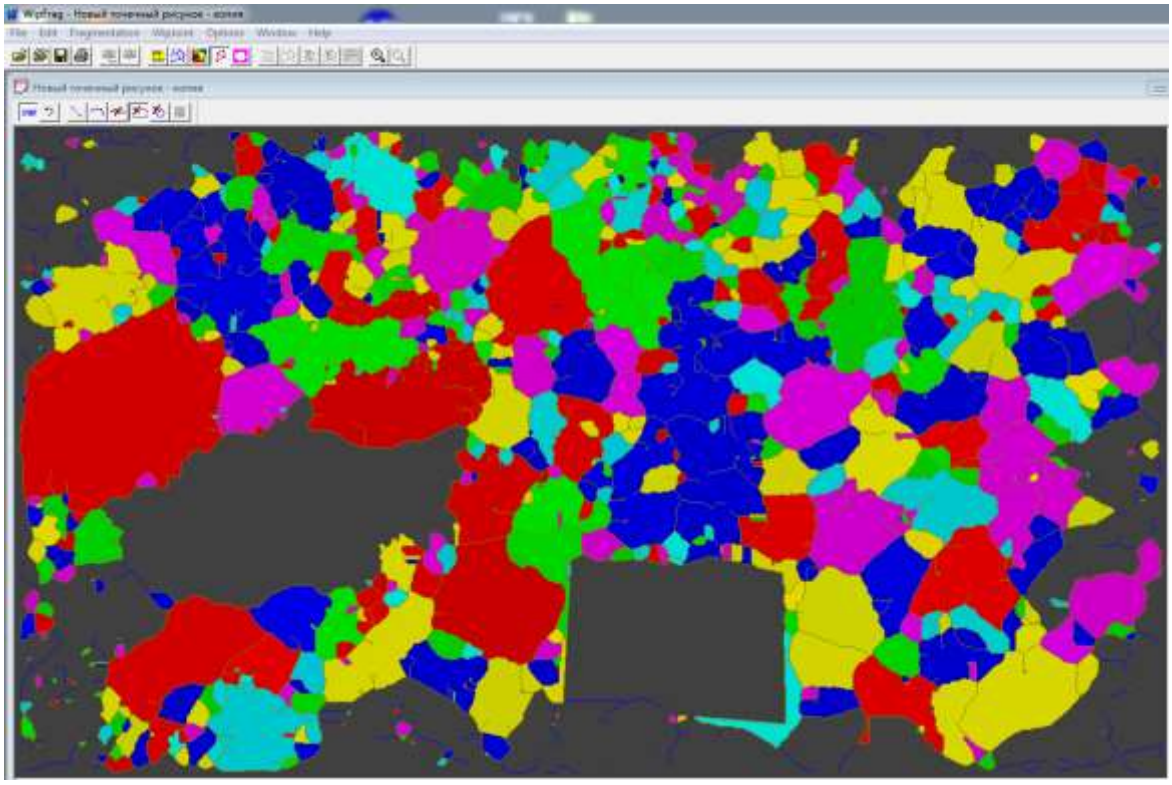

Figure 4. Photoplanimetric analysis in the WipFrag program

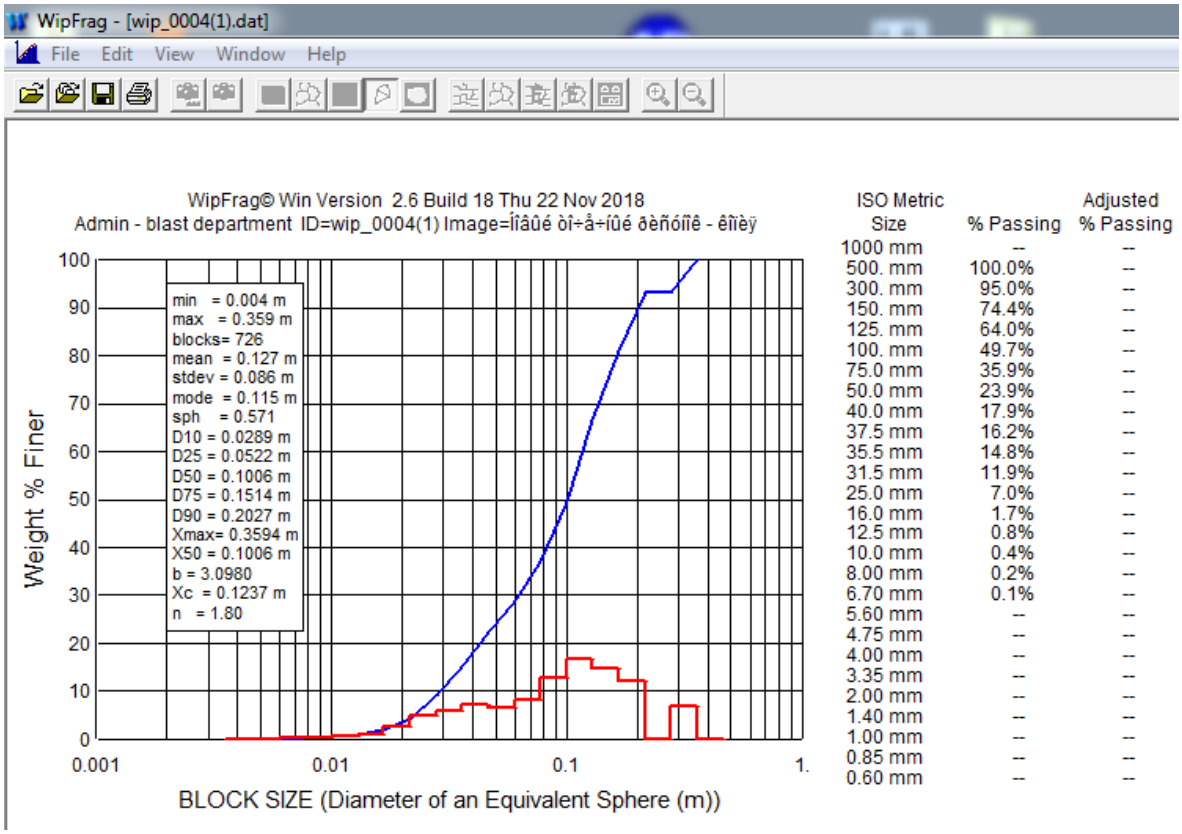

Figure 5. The result of the analysis of the WipFrag software

After analyzing the graphical results of the WipFrag software, we can conclude that the average piece of the exploded rock mass in the collapse after the explosion will be 151 mm.

Using the method of calculating [5] the productivity of the crushing complex, we will calculate and analyze the result.

Program code (screenshot):

Производительность дробилки Metso 60-110 Superior MK-II:

d := 0.15 средний кусок отдельности в массиве, мм

Z := 1.4 коэффициент закрупнения

Qmin := 1400 минимальная производительность дробилки, т/ч

Qmax := 2800 максимальная производительность дробилки, т/ч

imax := 0.250 максимальная ширина входной щели дробилки, мм

imin := 0.150 минимальная ширина входной щели дробилки, мм

Kp := 1 поправочный коэффициент на плотность

Kцф := 1 поправочный коэффициент на крепость

Kw := 1 поправочный коэффициент на влажность

Kкр := 1.1 поправочный коэффициент на крупность

$$i := \frac{d}{Z} = 0.107$$

$$Q1 := Qmin + \frac{Qmax - Qmin}{imax - imin} \cdot (i - imin) = 800$$

$$Q := Q1 \cdot Kp \cdot Kцф \cdot Kw \cdot Kкр = 880$$

The result of the calculation was 880 t/h.

According to the changed parameters of drilling and drilling, we will make a theoretical calculation of the average size of a piece in the blasted rock mass using the Mathcad 15 software resource, thereby making sure that the adopted parameters will provide us with the required output of the average piece separately in the array.

Program code (screenshot):

Проверка оптимальных параметров БВР:

$W1 := 4$ сетка скаважин

$d1 := 0.2$ размер куска горной породы в массиве после взрыва

$D1 := 0.134$ диаметр скважин

$\rho 1 := 950$ плотность ВВ (Гранулит НП)

$l1зар := 4.7$ длина заряда в скважине

$L1 := 8$ длина скважины

$$g1 := \frac{\pi \cdot D1^2}{4} \cdot \frac{l1зар \cdot \rho 1}{L1 \cdot W1^2} = 4.919 \times 10^{-4}$$ удельные энерго затраты эталонного ВВ

$W2 := 5.3$ сетка скаважин

$D2 := 0.171$ диаметр скважин

$\rho 2 := 1250$ плотность ВВ (Fortis Advantage 70)

$l2зар := 3.7$ длина заряда в скважине

$$g2 := \frac{\pi \cdot D2^2}{4} \cdot \frac{l2зар \cdot \rho 2}{L1 \cdot W2^2} = 4.594 \times 10^{-4}$$

$$i1 := \frac{1}{g1} \cdot \ln\left(\frac{W1}{d1}\right) = 6.09 \times 10^{3}$$ отношение КПД к пределу прочности материала

$$dd := W2 \cdot e^{\left[-i1 \cdot g2 \cdot \left(\frac{W2}{W1} \cdot \frac{g1}{g2}\right)^{\frac{2}{3}}\right]} = 0.325$$

According to the theoretical calculation in the Mathcad 15 software environment, with the parameters of drilling and blasting set by us, the average piece of the individual in the array is 325 mm. Having new data on the middle piece, we will again calculate the performance of the Metso 60-110 Superior MK-II crusher.

Analysis of Block No. BC-877.5-0067 (diameter 171 mm, BB Fortis Advantage 70):

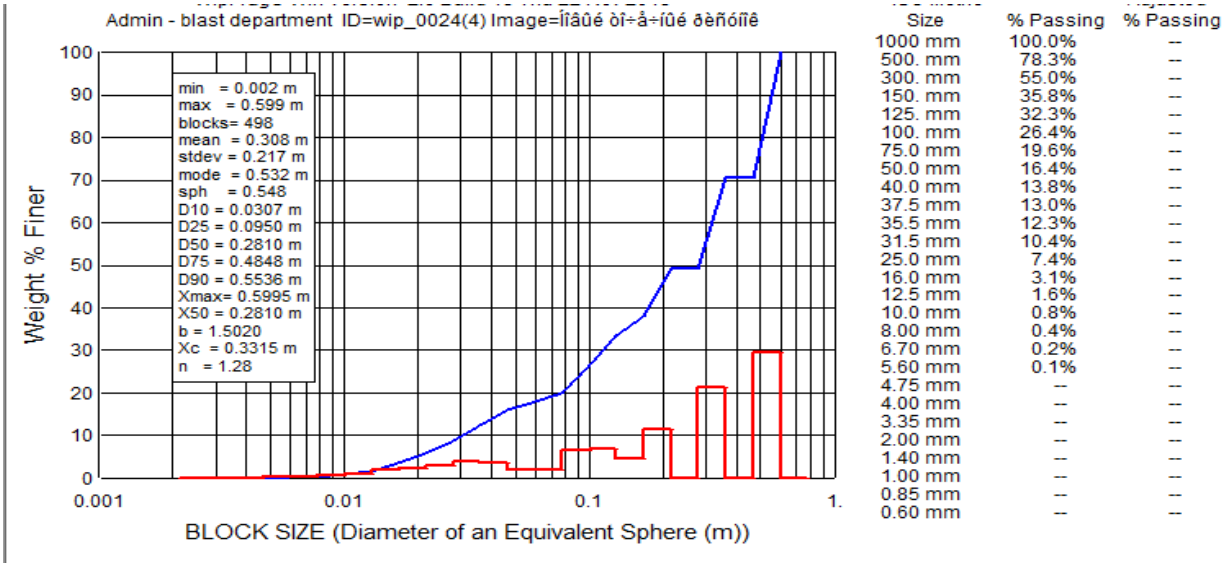

Figure 6. The result of the analysis of the software "WipFrag"

Block Analysis No. BC-877.5-0078 (diameter 171 mm, BB Fortis Advantage 70):

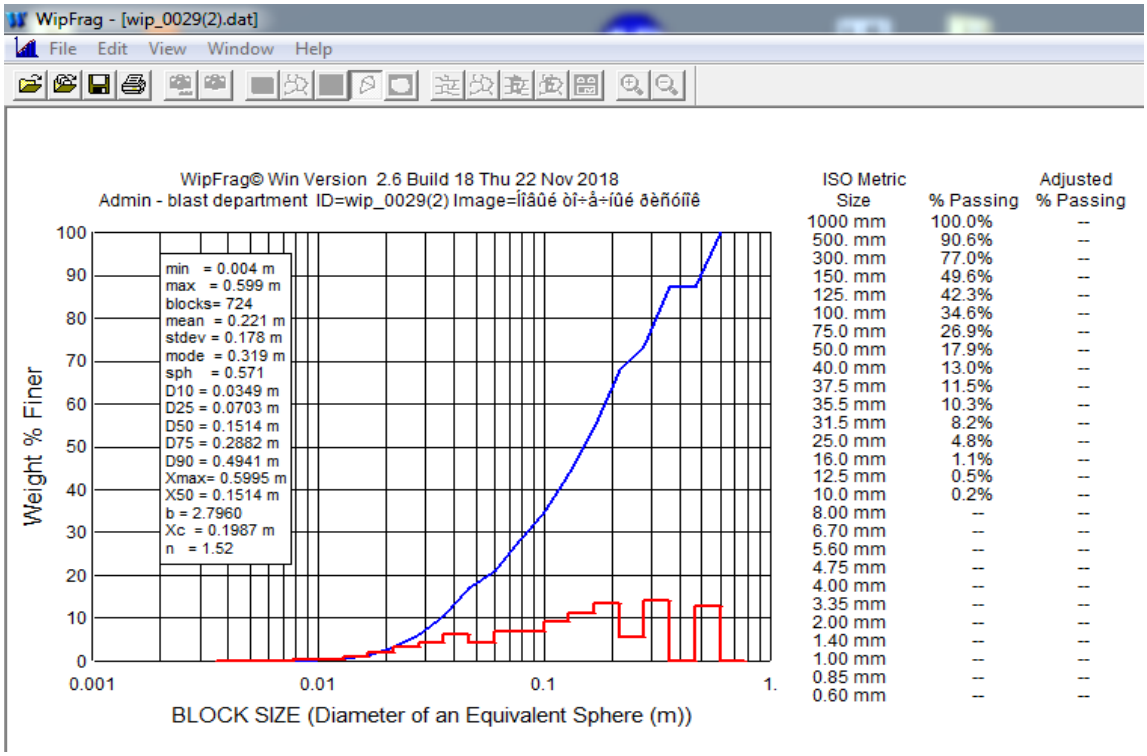

Figure 7. The result of the analysis of the software "WipFrag"

After analyzing the graphical results of the WipFrag software, we can conclude that the result obtained after experimental explosions

confirmed the theoretical calculation made in the Mathcad 15 software environment, that when using the well diameter is 171 mm, BB - Fortis Advantage 70 and a grid of 5.0x4.5 m, the average piece of exploded rock mass in the collapse after the explosion will be 320 mm.

Conclusion:

1. The result of the analysis of the fractional composition based on the results of experimental explosions and theoretical calculations showed that with the transition to a well diameter of 171 mm, the use of EHV - Fortis Advantage 70 and a grid of wells of 5.0x4.5 m, an increase in the average piece of blasted rock mass occurs from 151 mm to 320 mm, which in turn has a positive effect on the productivity of the crushing complex, which will increase.

2. After switching to a borehole diameter of 171 mm, using EBB - Fortis Advantage 70 and a grid of boreholes - 5.0x4.5 m, the average piece size in the blasted rock mass was 320 mm. The transition of the enterprise from 134 mm to 171 mm will lead to an increase in the annual productivity of the mining and ore mass in proportion to the growth in the productivity of the crushing complex.

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SECTION IV. Engineering

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SCREW INSERTS AS A WAY TO INTENSIFY THE HEAT EXCHANGE PROCESS

At modern industrial enterprises of chemical, gas, petroleum, petrochemical, food and other industries, as well as in energy, aviation and space technology, heat exchangers are widely used for cooling, heating, evaporation and condensation of liquids, steam and their mixtures.

Optimization of such complex thermal power systems makes it possible to find ways to improve the efficiency of equipment. It also opens up the possibility of maintaining the working condition of thermal power equipment in the required temperature ranges, not to mention reducing capital costs and energy resources.

The efficiency of a heat exchanger is determined by the amount of thermal energy it transfers over a certain time. Reducing the size and weight of heat exchangers is an urgent problem today. One of the promising ways to solve this problem is the intensification of heat exchange. Intensification of the heat exchange process in a heat exchanger is one of the most effective ways to reduce energy consumption, which is of great interest and has great economic importance.

While choosing the method of heat exchange intensification, it is necessary to take into account the universality of the method for various heat carriers, the contamination of the surface, the manufacturability of the manufacture and assembly of the heat exchanger and the features of operation. All these limitations significantly reduce the possibility of choosing one of the possible methods of intensification [1].

In accordance with the Reynolds Analogy, when intensifying heat exchange, it is necessary to increase the resistance of the channels of the heat exchanger, since the heat transfer coefficient is directly proportional

to the coefficient of hydraulic losses. This is implemented in various ways – using screw inserts, screw knurling, changing the flow direction, using curved pipes, etc. All these methods have their own application ranges, advantages and disadvantages, which should be guided when choosing a particular design solution.

As a practical example, in the framework of the work, we will further consider the use of screw inserts in pipes as a way to intensify heat exchange. The essence of the method is reduced to placing long twisted tapes or screws inside the channel (Fig. 1) to change the structure of the coolant flow. When the flow is swirled, the local wall velocities increase, and the overall flow changes. At the same time, the twist is maintained continuously along the entire length of the pipe, which ensures the constancy of the ratio of the tangential and axial component of the velocity [2].

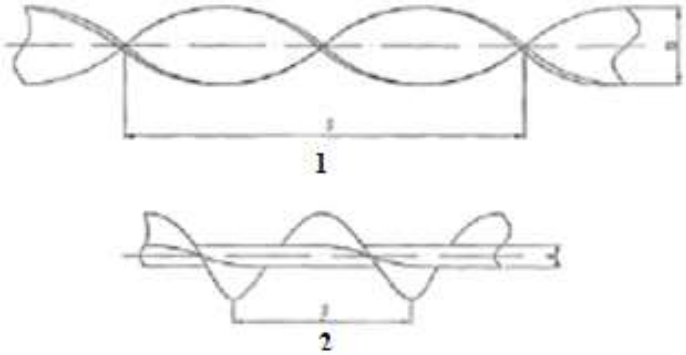

Figure 1: Screw inserts: 1-twisted tape; 2-screw

When the flow is twisted by a ribbon in a cross section, the liquid flows from the periphery to the center as a result of the pressure gradient. In addition, the liquid from the boundary layer penetrates into the core of the flow. These movements lead to the appearance of four vortex regions (Fig. 2), which contribute to increased heat exchange and, together with the action of centrifugal forces, reduce the thickness of the boundary layer.

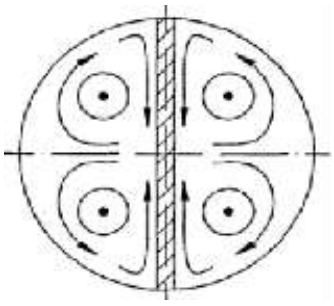

Figure 2. Diagram of the formation of secondary flows
in a pipe with a twisted tape.

The advantage of this flow pattern is the absence of stagnant zones – the liquid in the channel is mixed evenly. In addition, the presence of additional radial velocity components leads to an increase in the Reynolds number. As a result, the heat transfer coefficient also increases.

Structurally, such tapes are made of metal sheets on specialized machines. At the same time, three parameters can be changed – the twist angle, the twist pitch and the thickness of the tape. Fastening of the tape in the channel is carried out by soldering or welding. In some cases, it is possible to use a detachable connection – on screws or bolts. The picture shows the placement of screw inserts in the pipes of the shell-and-tube heat exchanger.

Figure 3. Placement of screw inserts in the pipes
of the shell-and-tube heat exchanger

A similar effect of heat exchange intensification can be achieved by using a screw knurling (Fig. 4). In this case, the screw profile is formed using the material of the pipe itself, and a new one is added to the design parameters – the height of the knurling protrusion [3].

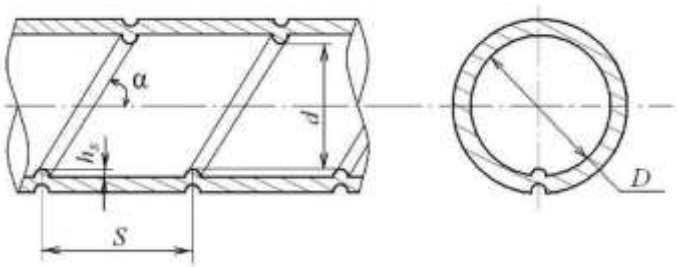

Figure 4. General view of the pipe with a screw knurling

Thus, the use of pipes with screw belts or knurls in heat exchange equipment contributes to increased intensification compared to smooth pipes. This effect is caused by a change in the flow structure, the appearance of radial flow directions and an increase in the Reynolds

criterion. The design parameters that determine the geometry of the screw insert are the twist angle, the twist pitch and the thickness of the tape. In the case of knurling, a new one is added to the design parameters – the height of the knurling protrusion.

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COMPARİSON OF COMPOSİTE MATERİALS EXTERNAL REİNFORCEMENT TECHNİQUES

Abstract. Using composite materials for reinforcement of reinforced concrete structures is very common abroad and has been winning the Russian construction material market in the recent years. The insufficient amount of scientific research activities does not allow to apply composite materials in reinforcement of reinforced concrete structures to the full extent. Moreover, there is no unified gage where composite materials of different brands have similar properties.

Due to the troubled political situation in Russia, a range of composite producing companies have stopped their supplies to Russia. In this regard, it shows the necessity of researching new producing companies and their reinforcement materials. Taking into consideration the big responsibility applied to load-bearing structure reinforcement projects, the behavior and properties of reinforcement materials should be studied.

This work presents the comparison of materials and reinforcement process methods of two different firms. The reliability and efficiency of one of them, i.e. ‘BASF’, has been approved by scientific research, but the firm has stopped their activities in Russia, while the other firm ‘Hydrozo’ is more popular but underexplored. Also, the work describes all the positive and negative properties of reinforcement technological processes, and gives the analysis of possibilities of using reinforcement materials.

Key words: concrete, reinforced concrete, reinforcement, carbon fiber reinforced plastic, composite material, reinforcing element, carbon fiber

Operation of buildings may involve facing such defects as cracks, deflections, reinforcement corrosion, spalls, etc. which occur due to the improper operation, overloading, and effect of corrosive environment [1]. Structure reinforcement may result from construction or engineering errors [2, 3]. Concrete and metal [4] are mostly used as the reinforcement materials, however in some cases application of such traditional reinforcement methods is expensive, labor-consuming, or impossible to perform [5]. In recent decades along with traditional techniques composite materials and relevant reinforcement techniques have increasingly been studied and developed. The special aspect of composite reinforcement is the simplified technological process and minimal set of tools, which makes the method more cost-efficient comparing to the traditional ones [6-8]. Composite reinforcement with carbon fibers is effective for reinforced concrete bending [9-11], compressed [12-14], and stone [15] constructions. Carbon fibers have little weight and high strength [16], and also allow for reinforcement of almost any form of structures. In recent years the department together with the partners has been studying the effectiveness of composite materials in the reinforcement of reinforced concrete elements [17].

As the composite materials products of German firm ‘*BASF*’ were used. During a range of experiments [18-19] the effectiveness of these materials and the whole adhesive system was approved. The results of the scientific research on the materials are expressed in more than 50 scientific works written by such scientists, as Polskoy P.P., Mailyan D.R., Georgiev S.V., Shilov A.V., Mikhub Ahmad; the main results are shown in works [20-21]. Three Ph.D thesis papers on the composite reinforcement of reinforced concrete constructions were defended at the Department. In practical application, based on the performed research, reinforcement of the autocenter building in the town of Aksay [22] was analyzed.

However, firm '*BASF*' stopped its operation on the territory of Russia which made it impossible to use its raw materials in practical application. The search of new firms selling composites in the Russian Federation led to firm '*Hydrozo*'. The interest towards studying the materials of firm '*Hydrozo*' arose after studying the characteristics of the composites, which being compared to the ones of firm '*BASF*' [23] occurred to be as good as the latter. Nevertheless, the properties and reinforcement techniques differ significantly from the ones studied earlier.

According to [6], the key parameters of the carbon fiber serving as the basic reinforcement material are the modulus of elasticity and tensile strength, and for the adhesive system these are the good adhesion of reinforcement materials and concrete of the construction, which provides for the reliable joint operation.

Based on the manufacturer's rates of reinforcement materials of '*Hydrozo*' brand, the parameters are comparable to the materials of '*BASF*' brand, studied before. However, there are differences in the composite carbon fiber stitch, as well as in the reinforcement technological process. These aspects are quite essential, since for the effective operation of the composite materials and concrete of the structures what is important is their joint operation including the destruction of the structure. According to the analysis of the published scientific research, the materials have not been tested in Russia.

The purpose of this research is to define all the advantages and disadvantages of '*Hydrozo*' process technology in comparison with the tried and tested '*BASF*' technology for determination of all the prospects and further study of their reinforcement materials.

For the understanding of the research topic below is given the technology of firm '*BASF*', based on which the above-mentioned experiments have been carried out [17].

At the first stage the cement grout is taken off the surface of the structure with denudation of the crushed stone for extending the area of adhesion between the concrete and reinforcement material. The cement grout is removed mechanically, by hand, thus giving an irregular surface. Then follows dust elimination and treatment with a special primer, curing during 3 days until the complete drying out. The next stage involves smoothing of the surface with a high-strength filler to provide firm adherence between the reinforcement material and concrete of the structure; the surface is left again for drying out during 3 days. The final stage is gluing the composite material, applying a coat of adhesive on the top. This technology, the adhesive system and reinforcement

materials are described in details in works [24].

According to the experiment results, adhesion is provided at all stages of testing, including the destruction of samples. At this stage there occurs simultaneous splitting of the composite material together with the protective concrete layer from the reinforcing element, which indicates the reliable operation of the adhesive system and reinforcement technique.

Nonetheless, this method, in our opinion, has several drawbacks, one of which is the high labor intensity of the process, owing to the great number of stages. Moreover, after the primer and filler treatment the operation is interrupted for drying out, thus increasing the operation due date. This can play a key role when choosing the reinforcement method, for example, for the premises where stopping operating processes is unacceptable.

The next drawback is the labor-consuming and dusty process of removing the upper cement layer of concrete until denudation of the crushed stone. Under laboratory conditions [24] the process is carried out with a chisel and hammer; at the industrial scale sand-blasting is performed. This choice of manual concrete surface treatment is very labor-consuming and requires special control to avoid damaging concrete integrity of the structure. Also, when using a sand-blasting system, the processing is very dusty, which requires leaving the premises, where the reinforcement operation takes place, and further cleaning the premises. One more drawback may be presented by unprofitability of the reinforcement method given low volumes of work. Each of the stages entails using specific mix of a primer, filler, adhesive, and each of them should be opened up, which causes shortening of the materials' working life. Moreover, the great number of adhesive system mixtures will have to be used on site, which increases the labor input.

Operation technique provided by firm '*Hydrozo*' includes the following stages. At the first stage the surface should be grinded with a special grinder with a vacuum cleaner which provides for dust-free, less labor-intensive and rather high-tech production. Then the primer layer is applied that is also an adhesive for impregnation of the reinforcement materials. It is left to dry out for one hour, and in case of any damages or spalls a filler should be used for the surface smoothing which is prepared of the same primer mixed with a dry additive. This could be defined as the advantage of universality of the adhesive system. Using the same adhesive for priming, gluing fibers, and surface smoothing has a range of benefits, i.e. the lack of a great number of various adhesive bounds as well as its low cost overrun at small volumes. These

advantages help the firms performing reinforcement to keep the prices low given a small amount of works which goes along with the rise of operation flexibility and attraction of fewer specialists.

Among the negative peculiarities we may name the wet process of gluing carbon fibers. Thus, the fibers previously cut to the required sizes are laid out on a clean flat surface on a film. Using brushes and rollers the total fiber area is impregnated with the epoxide adhesive, after that the process is repeated on the other side of the fiber up to a full impregnation level. After the impregnation the fiber is laid on the concrete surface in layers and smoothed out with a plastic roller or by hand. The first coat of adhesion is applied to the primed concrete surface; the next coat is impregnated fiber which is laid on the 'fresh by fresh' principle. According to the technology, adhesion is not applied on top of the last fiber coat.

From the perspective of convenience, the above-mentioned wet method of gluing fibers is way below the method of '*BASF*' that suggests dry reinforcement [24]. This is foremost due to the inconvenience of reinforcement of long-span structures with long fibers. Moreover, additional impregnation of fibers on a film is an additional stage complicating the process of reinforcement.

After reviewing all the advantages and disadvantages it may be concluded that the reinforcement technique developed by firm '*Hydrozo*' is easier, cheaper, and more flexible with regard to labor costs and material consumption. We have come to such conclusion considering the following advantages: dust-free work; there is no need to interrupt the work between the stages due to the necessity of drying out and minimum number of adhesion bounds being used. Nonetheless, among the disadvantages we may name the manual method of wet gluing of fibers, which requires technological improvement of the process.

Using the reinforcement technique and materials of firm '*Hydrozo*' certainly has great prospects. However, the performed search of scientific studies has shown that no experimental research has been carried out on the territory of the Russian Federation, and the bond performance and joint operation of the reinforcement material and structural concrete remains in question, which basically becomes our further outlook.

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UTILIZATION OF HEAT FROM HEAT TECHNOLOGICAL EQUIPMENT IN MULTIFUNCTIONAL VORTEX TYPE APPARATUS

An analysis of the heat balances of textile enterprises showed that thermal secondary energy resources (SER) at textile enterprises can reach 50 percent or more of all process heat [1]. As the analysis shows, in heat technological installations of this type, low-grade waste heat is the main reserve for saving fuel and energy resources (FER).

Feasibility studies have shown that from the point of view of heat recovery, thermal SER should be divided into two groups: SER with temperatures above 60-70 and SER with temperatures up to 60-70. It is advisable to use secondary thermal energy resources of the first group for heating process heat carriers in heat exchangers, or directly use them in technological processes, depending on their composition and the presence of contaminants. The economic effect from the use of thermal SER of the second group, having a temperature below 60 ° C, can be obtained with the help of heat pumps that increase the thermal potential of the coolant to such a level that it becomes possible to use it in the corresponding heat-technological devices. For this purpose, for the conditions of textile production, a two-level heat pump installation has been developed and proposed, which makes it possible to increase the temperature potential of the heated drying agent to 100–110°C [1].

The search for reserves to save thermal energy is part of the program to improve the energy efficiency of engineering systems. One of the key energy-saving measures with a rather high potential for saving thermal energy is the use of exhaust air heat exchangers in ventilation systems [2-3].

Supply and exhaust ventilation units with exhaust air heat recovery compared to traditional supply ventilation systems have a number of advantages, including significant savings in thermal energy spent on heating ventilation air (from 50 to 90% depending on the type of heat exchanger used) at a high level of air - thermal comfort, due to the aerodynamic stability of the ventilation system and the balance of supply and exhaust air flows. Currently the most widely used:

1. Regenerative heat exchangers, in which the heat of the exhaust air is transferred to the supply air through the nozzle, which is alternately

heated and cooled. Despite the high energy efficiency, regenerative heat exchangers have a significant drawback - the likelihood of mixing a certain part of the exhaust air with the supply air in the unit body, which contributes to the transfer of odors and bacteria. Therefore, they are usually used within the same room.

2. Recuperative heat recovery units. They include two fans (supply and exhaust), filters and a plate heat exchanger of counter-flow, cross and semi-cross types. Such heat exchangers allow you to flexibly adjust the air-thermal regime depending on the type of operation of the premises, including the use of recirculated air and reduce external noise.

3. Heat recovery units with an intermediate coolant, which have a number of design features that make them unsuitable for individual ventilation, and therefore in practice they are used for central systems.

4. Heat recovery units with a heat exchanger on heat pipes. The use of heat pipes makes it possible to create compact, energy-efficient heat exchange devices. However, due to the complexity of the design and high cost, they have not yet found application in ventilation systems.

For example, in basic terms, the distribution of heat energy consumption in a typical multi-storey building is carried out almost equally between transmission heat losses (50–55%) and ventilation (45–50%). Approximate distribution of the annual heat balance for heating and ventilation:

transmission heat losses – 63–65 kW•h/m2 year;

ventilation air heating – 58–60 kW•h/m2 year;

internal heat generation and insolation - 25–30 kWh/m2 per year.

Here, the increase in the energy efficiency of apartment buildings is associated with modern heating systems using room thermostats, balancing valves and weather-dependent automation of heat points, as well as using mechanical ventilation systems with exhaust air heat recovery. With similar weight and size indicators, the best result is shown by regenerative heat recovery units (80–95%), followed by recuperative ones (up to 65%), and last place is occupied by heat recovery units with an intermediate coolant (45–55%). Heat recovery units should be mentioned, which, in addition to transferring thermal energy, transfer moisture from the exhaust air to the supply air. Depending on the design of the heat transfer surface, they are divided into enthalpy and sorption types and allow utilizing 15–45% of the moisture removed with the exhaust air. An audit of heat consumption systems (during the implementation of these measures) showed a savings in heat for heating and ventilation in the amount of 43% compared to similar facilities in the control group. Tests of the

installation with a heat recovery unit have shown that its efficiency can reach 67%.

The use of mechanical ventilation systems with exhaust air heat recovery is widespread in world practice. The energy efficiency of heat recovery units is up to 65% for plate heat exchangers and up to 85% for rotary ones. When using such systems in the climatic conditions of Moscow, the reduction of annual heat consumption to the base level can be 38–50 kWh/m2 per year, which allows reducing the total specific heat consumption to 50–60 kWh/m2 per year without changing the basic level of thermal protection and achieve a 40 percent reduction in the energy intensity of heating and ventilation systems.

Theoretical and experimental studies in the field of creating equipment for the recovery of heat from the supply and exhaust systems (HSES) made it possible to conclude that it is promising to use a vortex multifunctional apparatus (VMFA) based on an apparatus with counter swirling flows (CSF) for this purpose.

Until recently, the main factor hindering the widespread use of devices with interacting swirling flows (they are sometimes referred to by the abbreviation “CSF”, introduced for the counter swirling flows mode), is the residence time in the drying zone, not exceeding 3-5 seconds, (with the exception of multi-chamber and combined devices, in which the residence time may be longer, but the design and process control are much more complicated). This circumstance limited the scope of application of drift-free single-chamber apparatuses with interacting swirling flows, including apparatuses with counter-swirling flows (CSF), in which the residence time of the material is somewhat longer than that of apparatuses with co-current (unidirectional) swirling flows. Based on a detailed analysis of hydrodynamics [1, p. 544; 4, p. 506], we found that the most promising forms of single-chamber apparatuses with interacting swirling flows are entrainment-free apparatuses with counter swirling flows (CSF). However, for these apparatuses, the factor limiting the scope of their application is the residence time of the material in the apparatus [6, p. 408; 7, p. 336].

We have shown that one of the methods for increasing the efficiency of CSF devices is the implementation of the possibility of using the regime of a rotating annular layer of particles of a dispersed material. The simplest visual planar analogue of this effect is a kind of virtual cylindrical basket with dispersed material placed in the apparatus. We have established that such a regime can be controlled quite precisely (by changing the geometric parameters of such a virtual basket, and hence the residence time of the particles of the dried material in the

apparatus). However, until recently, this mode was practically not studied: the area of its existence was not established, the possibility of achieving the required processing time of the material in the layer was not developed, methods for its calculation were not developed, the scope of such a mode was not established when drying dispersed materials. Based on the research, a range of rational ratios of gas suspension flows through the channels in an apparatus with a rotating annular layer of dispersed material was established, corresponding to the stable existence of the ring, which ensures high drying efficiency (up to 25 seconds with a number of pseudocells of 6-8 and a change in moisture content to 0.1 %) and trapping (not less than 99% with a pore size over 60 Angstroms). An engineering method has been developed for calculating the drying process with simultaneous trapping of dispersed materials in the apparatus when implementing the mode of a rotating annular layer of dispersed particles in it. For industry, a typical scheme of a drying plant of increased efficiency for finely porous dispersed materials has been proposed, providing a capacity of 5 t/h for the finished product [1, p. 544; 4, p. 776; 5, p. 506].

It should be especially noted that in the established scientific and engineering practice, devices with controlled (variable) hydrodynamics were mainly called those where the change in the interaction of flows in the apparatus was achieved only by a constructive change in the apparatus, for example, when the introduction of partitions (sectioning) of common fluidized bed apparatuses tried to use it advantages with the leveling of a frank disadvantage - the heterogeneity of the dried finished product. The fundamentally new mode of interaction of flows proposed by us in the apparatus is controlled without the introduction of structural changes - only by changing the operating parameters of the installation [5, p. 506]. The VMFA device provides high gas flow rates (5-25 m/s) without reducing the efficiency of moisture capture. One of the main advantages of the vortex apparatus is the presence in the working volume of the apparatus of a highly developed heat exchange surface, including drop, film, and foam interfaces [1, 8-11]. High relative phase velocities and highly developed phase interfaces ensured high efficiency of the devices. The heat and mass transfer coefficient of the apparatus is an order of magnitude higher than in known industrial apparatuses used for the same purposes. This made it possible to obtain the required effect of heat utilization with minimal overall dimensions and metal consumption. The mixing heat and mass transfer apparatuses available so far had significant overall dimensions, high metal consumption and, consequently, high cost. In addition, some PVA heat utilizers had

rotating spray devices to increase the intensity of heat and mass transfer processes, which significantly complicated the design and maintenance of the installation, and also reduced its reliability. In order to obtain a mathematical description of hydrodynamics and heat and mass transfer in VMFA-type apparatuses, a physical model of the transfer processes in such an apparatus was developed, which was based on the following assumptions.

On the basis of the adopted model, equations for the intensity of heat transfer processes (1) and mass transfer (2) were obtained.

$$\Delta_T = \Delta t_{\text{т.м}} / \Delta t_{0\text{м}} = e^{-k_{\text{м}} \cdot m_{\text{м}} \cdot V_{\text{а}}}, \qquad (1)$$

where $\Delta t_{\text{о.м}} = t_{1\text{м}} - t_{\text{ж.н}}$; $\Delta t_{\text{т.м}} = t_{2\text{м}} - t_{\text{ж.к}}$; $k_V = \sigma \cdot dF_T / dV_{\text{а}}$, where k_{MV} - is the volumetric heat transfer coefficient; F_T – is heat transfer surface; V_A – is the volume of the device's working space.

$$\Delta_C = \Delta C_T / \Delta C_0 = e^{-\beta_V \cdot m_{\text{м}} \cdot c_{\Gamma} \cdot V_{\text{а}}}, \qquad (2)$$

where β_V – is the volumetric mass transfer coefficient.

Taking into account the analogy of the processes of heat and mass transfer

$$\frac{\Delta t_{T.M}}{\Delta t_{0\text{м}}} = \frac{\Delta C_T}{\Delta C_0} \text{ или } \Delta_T = \Delta_C. \qquad (3)$$

Based on the analysis of the components of equation (1), expression (4) was obtained, which is more convenient for calculating the intensity of the heat and mass transfer process, since it excludes one of the unknown quantities, namely, $t_{ж.к}$.

$$Km_V = \frac{t_{æ.í} - t_{2ì}}{t_{æ.í} - t_{1ì}} = \left(1 + \frac{k_V \cdot m_{ì} \cdot V_A}{Bm + 1}\right) \cdot e^{-k_V \cdot m_{ì} \cdot V_A}, \qquad (4)$$

where $Bm = \dfrac{G_{\text{Ж}} \cdot c_{P\text{Ж}}}{G_{\Gamma} \cdot c_{P\Gamma}}$.

An analysis of the parameters included in equation (4) made it possible to obtain a criterion dependence for calculating the heat and mass transfer process in the form

$$Km_V = A \cdot \text{Re}^b \cdot Bm_V^c \cdot K_1 \cdot K_2. \qquad (5)$$

where Re – is the Reynolds number; Bm_v – is the number of thermal equivalents; K_1 и K_2 –coefficients, respectively, taking into account the multiplicity of flow – K^* (i.e. the ratio of the ascending and descending gas

flows) and the ratio of the flow rate of liquids for the descending and ascending gas flows.

On the basis of the studies carried out, the designs of pilot-industrial samples of vortex multifunctional devices with controlled hydrodynamics for heat recovery and purification of exhaust air from dust and some gases, designed for various typical operating conditions, as well as engineering methods for their calculation, were developed. Calculations show that the heat and mass transfer coefficient in multifunctional apparatuses is an order of magnitude higher than in conventional scrubbers [12-15].

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SECTION V. Economics

УДК 338

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CHANGING PRIORITIES OF MACROECONOMIC POLICY

Abstract. The article highlights the processes of reorientation of global economic trends and their causes at the present time, in the world as a whole and in Russia.

Key words: technological progress, development strategy, state economy, environment

The study of long-term trends has become a traditional approach for specialists of every state in the world. Analyzing the current situation in the world allows us to identify the following global trends in economic development both in Russia and in the world.

Technological progress has been among such trends for many decades. It has an impact on economic models, on the structure of the world economy, and on social development. The role of knowledge is growing. It is knowledge that occupies an increasing share of production costs today and is becoming the most expensive commodity in modern markets. The world is entering the era of knowledge-intensive and knowledge-intensive production. This main trend determines all the others - the movement towards automated production, the need for NBICS integration, digitalization.

In addition, the goal of any national socio-economic development strategy is not just growth or development, but the solution of global problems, including climate change, the growth of inequality, and these tasks need to be addressed.

The tasks follow from the global trends mentioned above. This is primarily the formation of knowledge-intensive production - in particular, the reindustrialization and reintegration of production, science and education, the active development of fundamental science, intensive promotion of innovations in production.

This is the transformation of property relations underlying the foundation of the economy in the direction of its so-called "diffusion" based on the development of institutions of broad economic partnership, co-ownership, sharing and other forms. And finally, the solidarity of social strata and - based on the solution of the above-mentioned tasks - the socialization of the economy, the transition to its socially oriented model, ensuring the gradual elimination of poverty, reducing the level of economic and social inequality, equal starting socio-economic conditions for the development of each member of society and the realization of his creative potential.

This requires strategic planning and an active industrial policy aimed at creating a new technological basis. It will allow, on the one hand, to create the foundations of Russia's technological and economic security, on the other - the foundation of the stability of the Russian economy and the basis for solving social problems. It is necessary to develop public health, education, culture in unity using mechanisms close to a guaranteed basic income, to form a system of relations that reduce inequality in access to development resources, and not only in income distribution, because only in this way is it possible to ensure the solidarity of society, which is the most important social basis for the country's security. In my opinion, Russia has everything necessary to propose a strategy for moving towards a new state of society, despite all the deep geopolitical and economic contradictions of the current moment.

Climate change should also not be overlooked when drawing up a long-term strategy for Russia's economic development. Firstly, this is due to political circumstances - Russia's international obligations, primarily within the framework of the Paris Agreement, which directly provides for solving the problem of climate change. Secondly, the relevance of the global problem of climate change itself. The above fully applies to Russia, where the damage from dangerous

hydrometeorological disasters, melting of permafrost soils and other natural risks already amounts to about 1% of GDP.

Taking into account the climate factor in the socio-economic development strategy is relevant not only in the long term (2030 and beyond), but also in the medium term. The end of the "hot" phase of the current geopolitical and geo-economic crisis, it seems, will be accompanied by the replacement of hybrid confrontation with fierce competition in the economic and especially scientific and technological fields, one of the main arenas of which is the "green economy".

Russia can offer a strategy for moving towards a new state of society, despite all the geopolitical and economic contradictions

Russia should be ready for this. Despite the complexity of the current socio-economic situation, our country is actively working on the implementation of the Federal Scientific and Technical Program adopted in 2021 in the field of environmental development and climate change until 2030, as well as the most important innovative projects of national importance, two of which are directly related to the climate and "green" agenda - on high-precision monitoring of climatically active substances and the development of low-carbon energy.

Now the leading developed countries are trying to actually cut off the Russian economy from the global monetary and financial system. At the same time, the general degree of uncertainty in the global economy is growing, which calls into question many previously seemingly unshakable foundations of the global monetary and financial system: the absolute dominance of the dollar in the global monetary system, the policy of accumulating foreign exchange reserves.

Apparently, there may be a movement towards the formation and development of alternative national and regional systems of international settlements, including in national currencies, increasing the role of digital currencies (both private - cryptocurrencies and stablecoins, and the emergence of digital currencies of central banks), limiting international capital flows.

In conclusion, we can say that the process of globalization is gradually receding into the background and now the priority of states is to strengthen the national wealth and the state of countries.

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ESSENCE OF FINANCIAL AND BUDGETARY STABILITY OF THE STATE: THEORETICAL ASPECT

The theory of financial stability can be defined as a research paradigm, since it cannot be reduced to a private discipline, but studies the interaction of socio-economic relationships. The study of sustainability issues in the socio-economic aspect affects the complex structural relationship, including the study of issues of financial and budgetary sustainability, providing a material basis for government initiatives and reforms.

As a result, financial stability should be understood as the absence of a crisis with the dynamic development of financial markets and financial intermediation institutions, or, in a broader sense, the crisis-free and efficient functioning of all components of the financial system corresponding to each of the sectors of the economy (private, individual-family, public-non-commercial and public sectors).

To support economic growth and ensure the successful socio-economic development of the country, it is necessary to maintain financial stability in a multifaceted aspect. It is important to note that financial stability cannot be absolute; it is a phenomenon that is expressed in the degree of its severity. The condition for the functioning of the socio-economic system is both its stability and the dynamism of development, which determines the internal balance and stability of all spheres and links of the financial system of the state.

In economic theory, sustainability is considered in a logical relationship with the concepts of equilibrium, balance and stability, which in practical achievement for the economic system is a priority macroeconomic task.

For the first time, the issues of economic equilibrium and sustainability were considered by the Swiss economist L. Walras in his work «Elements of a Pure Economy».

From the point of view of «the theory of economic equilibrium, economic actors seek to transfer the economic system to an optimal state», considering it as an equilibrium that is expedient to develop in the context of sustainability.

The concept of sustainability has no clear boundaries in its definition and reflects the dynamic nature of the problem in the process

of evolution of the institutions of the functioning of the financial system. Likhachev M.O. , Makarova E.V., Kolotova N.S., Petrova V.K., Selivanova S.G. , Andriyanova V.D., Vorobieva I.P., where definitions and factors of economic stability, stability and balance are considered. From the point of view of economic theories, the features of each of the factor estimates are revealed.

«Stability» is a state of the system in which it is possible to resist, from our point of view, not only the aggressive influences of the exogenous environment, but also endogenous adverse development factors. The economy of an individual state can be considered stable if it is able to withstand fluctuations in world prices, the shadow economy and possible external risks.

«Stability» - the state of the economic system, which determines the preservation of its features and parameters in any situations of external and internal development. The stable state of the system is assessed through certain parameters and indicators. For the economic system, this is the stability of budget revenues, the exchange rate, etc.

«Balance» - the state of the system, in which the main proportions and relationships between its spheres, links and elements are preserved.

A sustainable economic system is a system capable of absorbing internal and external problems and risks, while maintaining the parameters of holistic development. Sustainability can be defined as the ability of a system to maintain its qualitative content in a changing institutional environment and internal transformational changes.

The sustainability of the economic system depends on many factors and institutional changes. A change in the balance of the system can be justified by many factors: exogenous influences (external risks), violations of institutional relationships in the economic environment (institutional gaps), changes in the parameters of the economic system associated with bifurcation: the branching of the economic system and socio-economic development.

Thus, in our opinion, within the framework of the policy aimed at achieving financial stability, the method of quantitative and qualitative assessment of the state of the financial sector, its exposure to risks, and the ability to absorb shock effects, which must be regulated through macroprudential indicators (Table 1), acquires practical significance. microprudential indicators aggregated to them to identify potential dangerous risks in the financial environment.

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HUMAN RESOURCE MANAGEMENT AS THE MOST IMPORTANT FACTOR ENTERPRISE DEVELOPMENT

The process of human resource management in an enterprise will be effective only if there is a strategy, as well as the relationship between strategy, policy and management system. At the same time, it is important that the goals are set correctly and the human resource management system is built in such a way as to work towards achieving this goal [1].

The word «strategy» comes from the Greek «stratis» - an army and «ago» - I lead or «strategos». Strategy is the art of the general. It was the strategy that allowed Alexander the Great to conquer the world.

To quickly understand what the mission and strategy of the enterprise are and how important they are, you can imagine the Enterprise as a ship that travels through the troubled waters of the economy, and certain economic processes are underwater reefs and currents.

The mission and strategy of the enterprise is the course of the ship, and how long this ship will sail depends on the competent and well-coordinated actions of the captain and his team. And every sailor, every member of the team, makes an undeniable contribution to this voyage.

Man has always been the key and most valuable resource in all spheres of life. Medicine, architecture, art, construction - there is no such area that would develop without the participation of a person in it. And the economy is no exception. World crises, cash flows, global financial organizations are the results of people's activities. Behind all global and local events in the economy there is a person. The whole process of developing new products is the process of using the knowledge, skills, abilities, and potential of each employee of the enterprise. Enterprise management is the competent use and distribution of human, financial and material resources. But the key ones are still human. They set in motion, organize the interaction of all other systems. In production, all resources are interconnected, but only their interaction means financial efficiency. In order for each employee, individually or collectively, to contribute to the achievement of the enterprise's goals, the enterprise must have a clearly formulated human resource management strategy.

Human resource management is aimed at helping to acquire and retain the necessary qualified, committed and motivated workforce, developing the internal abilities of people, establishing a practice focused on recognizing the value of employees by managers, creating an environment conducive to teamwork. The main part of the life of every person takes place in organized labor activity. In this situation, the organization's personnel management becomes especially significant, since it has a direct impact on the processes of formation and development of the personal potential of employees, ensures its professional implementation, adaptation to external and internal conditions of the production environment.

The relevance of studying the strategy of human resource management is due to the fact that the situation that has arisen in our country of changing the economic and political systems simultaneously brings both great opportunities and serious threats to each individual, the sustainability of his existence, and introduces a significant degree of uncertainty into the life of almost every person. Human resource management in such a situation is of particular importance: it allows you to generalize and implement a whole range of issues of human adaptation to external conditions, taking into account the personal factor in building an organization's personnel management system. It includes several elements. The most important element of the human resource management strategy is a clearly defined mission of the enterprise. The mission of the enterprise is the main goal of the enterprise, expressed in the form of a single document. A correctly formulated mission, which is understandable and believed in, will be a powerful incentive to achieve strategic goals. The mission may include the following:

- Declaration of beliefs and values.
- Markets in which the enterprise will operate.
- Technologies that the enterprise will use.
- The company's policy to achieve goals.

A clearly formulated mission inspires and motivates, enables the employees of the enterprise to take the initiative, forms the main prerequisites for the success of the enterprise's activities under various influences on it from the external and internal environment.

The subject of human resource management are the employees of the enterprise. Management objects are the goals and objectives of the strategy, the potential of personnel, time, personal qualities of each employee working at the enterprise. Also, the subjects of management can be relations and labor. In this case, the objects of management will be the internal psychological satisfaction of each employee,

relationships in the team, relationships in the labor process and the product, processes, means of production, infrastructure, respectively.

The conditions and patterns that ensure the development and implementation of a human resource management strategy in accordance with the overall strategy of the organization are what every manager who wants to unleash the production potential of an enterprise should understand.

Thus, the generation of managers in the era of globalization is faced with the fact that in addition to experience, it is necessary to be able to clearly formulate the mission of the enterprise, formulate a development strategy and a human resource management strategy. The manager needs to be aware that the future of the system depends on his vision and understanding of the goals of the enterprise, on the ability to formulate them into a strategy and "communicate" to each employee, all elements of which work in close relationship with each other.

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THE IMPACT OF DIGITAL CURRENCY ON THE MONETARY POLICY OF CENTRAL BANKS

Abstract. The concept of digital currencies was defined in this article. It reflects the impact of digital currencies on the future of financial transactions, as well as their impact on monetary policy instruments. The most important procedures required by the central bank to work with virtual currency types have been identified in order to avoid problems in the future.

Keywords: digital currency, financial transactions, financial technologies, money laundering

The development of financial technology had a clear and evident impact on all aspects of economic and financial life, represented in the speed of completion of transactions and the reduction of their costs [10]. Cryptocurrency is one of the applications that this technology has spawned, which has posed a major challenge to central banks. Since the emergence of these virtual currencies during the past two decades, questions are still being raised about their capabilities and ability to influence the local and international economies, their pros and cons, which prompted central banks and economic organizations to conduct studies and research to determine these negatives and risks that are expected to be generated by trading this type of currency. Currencies are outside the control of central banks [4].

Of these risks, which must be prepared for, are the risks of counterfeiting, counterfeiting and money laundering, in addition to their impact on monetary policy, which is one of the most important tools of the Central Bank to achieve economic stability, as monetary policy is one of the main pillars in building macroeconomic policy, and virtual currencies have an impact on tools Monetary policy and its objectives, that is why it is necessary for central banks to develop a unified framework for organizing virtual money and setting controls for its issuance and circulation [1].

Therefore, the identification of virtual currencies and their impact on the monetary policy of central banks, as well as the position of central banks in relation to this type of financial technology are necessary to avoid many future problems.

THE CONCEPT OF DIGITAL CURRENCIES

Although digital currencies are not seen by the eye and are not touched by the hand, they have caused a boom in the digital economy around the world; Rather, it came to the tendency of many central banks around the world to link their national currency to stable digital currencies, in an attempt by these banks to keep pace with the development in the world of online payments in a new economic era that depends on symbols and numbers on a computer screen [8].

It is also called digital money, electronic money or electronic currencies, and it is a type of currency available in digital form only and does not have a physical presence such as banknotes or coins, yet it has the same characteristics in other financial currencies, so instant transactions and transfer of ownership are carried out without border; It can even be used to purchase various goods and services; It is a financial balance electronically recorded on a card with a value stored on another

device and circulated over the Internet, and it can also have a central point of the money supply that makes it stable digital money, and there are some decentralized currencies and the money supply is controlled through different sources [7].

Digital currency can also be defined as a form of currency or a means of exchange of utility that offers characteristics similar to physical, tangible currencies, but is digital rather than tangible, and allows instant transactions, buying and selling like tangible currencies

Digital currency can also be defined as a form of currency or a useful medium of exchange that has characteristics similar to physical, tangible currencies, but is digital, not tangible, and allows instant transactions, buying and selling, like tangible currencies [3].

THE IMPACT OF DIGITAL CURRENCY ON MONETARY POLICY TOOLS

The development of digital currencies and their solutions to legal or paper money affect the tools used by central banks to implement monetary policy, including:

1. The impact of digital currencies on open market operations

The open market policy is based on the intervention of the Central Bank in the sale and purchase of private and government securities in the money market, and this method is intended to ensure financial stability and control inflation rates [9]. Therefore, dealing with economic units in digital currency gradually pushes them to abandon legal money, which leads to Commercial banks return excess cash to the Central Bank in order to increase their cash reserve ratio, and this leads to limiting the ability of central banks to sell securities in order to absorb part of the liquidity in the commercial banks and thus affect their ability to grant credit. This depends on the extent of the spread of dealing with digital currencies by economic units, the greater the deal with digital currency, the greater its impact on the effectiveness of the open market policy and vice versa. As we know that the intervention of the Central Bank in the open market operations also affects the trends of interest rates, and this has effects on the volume of investment and other economic variables [2].

2. The effect of digital currency on legal reserves

The spread of dealing with digital currency leads to an increase in the volume of deposits and then excess reserves, and this leads to an increase in the liquidity ratio of commercial banks, then the demand for reserves at the Central Bank will decrease, hence the spread of dealing

with digital currency has a negative impact on the effectiveness of the legal reserve policy [5].

3. The effect of digital currency on the rediscount rate

Individuals can buy and sell digital currencies in exchange for legal currency issued by the Central Bank, and this money enters the treasury of commercial banks because digital currency issuers deposit the money they obtained from selling digital currency in commercial banks, and the latter increases its reserves with the Central Bank due to its increased liquidity, which leads to an increase in the reserves of commercial banks in excess of the desired size. In this case, the banks choose between two things: first: Purchasing assets from non-bank institutions and granting more loans; second: buying more assets from the central bank [6].

PROCEDURES REQUIRED BY CENTRAL BANKS TO DEAL WITH VIRTUAL CURRENCIES

Monetary policy aims to achieve monetary balance in order to avoid inflationary effects, by controlling the money supply and the demand for money. Since virtual currencies have become a reality, their spread and dealing with them is increasing day by day at the level of dealers, and the implementation of cross-border transactions, away from the control and authority of central banks. For this reason, the central banks must deal with this currency with all professionalism, so that the central banks do not become a spectator, and a state of reactions.

Hence, central banks must deal with financial technology, and use its same tools, to work on controlling and regulating them in a way that maintains the financial stability of the state, and so that the central banks do not become a spectator. Accordingly, central banks should work to issue their own digital currencies, under their supervision and control, develop DLT technology, and deal with Block Chain technology to store and preserve data. These steps will have a significant impact on enhancing the role of central banks and their ability to Performing its functions and controlling the monetary policy instruments.

In addition to the above, central banks are required to develop legislation and regulations for FinTech-based operations, in order to ensure that central banks play their role in supervising and controlling the emerging and financial technology-based operations.

CONCLUSION

1. Cryptocurrencies are those that are traded over the Internet and do not have a physical presence.

2. The necessity of developing mechanisms and mechanisms that guarantee the rights of the transaction parties on the one hand, and on the other hand, control over illegal transactions.

3. The international bodies responsible for monetary matters in the world, especially the International Monetary Fund and central banks, should take the initiative to take steps that provide individuals and the business sector with the rules and controls to integrate this new technology with the rules of the working monetary system, so that it contributes to providing and developing effective solutions that do not weaken the growth of markets. Emerging businesses, monetary and financial innovations.

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HR BRAND AS AN İNTEGRATOR OF THE İDENTİFİCATİON ADVANTAGES OF A COMPANY: PROBLEMATİC ASPECT

A strong HR brand determines in large part the financial success of an organization and its ability to gain a strong foothold in the labor market. The common component of an employer's brand is a certain set of advantages (psychological, functional, and economical), provided by the employer and identified with him, which attracts and retains highly qualified specialists, mobilizes the brand ambassadors, promotes the company as the preferred employer, and ensures its competitive ability. However, despite the vast amount of research and practical studies it should be admitted that not many companies have a unique advantage of the brand with regard to attracting and retaining the needed personnel. Currently, there is still the problem of the effective combination of the communicative and substantive components of the employer's brand which leads to significant costs for its development and promotion. Numerous investigations have drawn the increasing attention to several problematic aspects of identification of the HR brand advantages and its seamless integration into the unified organization field, which may resolve the dichotomy issue of the HR brand by making it a total complex of the communicative information as the result of the substantive targeted activities reflecting the value variety of the preferred image of the employer.

The art of offering the target audience the most attractive and distinctive brand advantages and messages, that meet the audience's needs, represents the leading technology of branding and forms the brand name as the identifier of a particular employer. The employer's brand is represented as the key part for attracting talent and also as the perception, which the organization creates in the minds of current and future employees. This points out the necessity of coordination of the management practice with the experience in identification of the company's advantages on a personal level. Strong brands are based on the positive associations, which determine the company's image by creating the points of contact for identification with it. The only way to reach such associations and succeed in the competition for talent is to have a strong, clear, distinctive, real, and valid proposition of what the

brand means and what benefits it provides. At the same time, companies frequently cannot stand out against the background of the same EVP (employee value proposition), and also give promises that do not correspond to reality. It is the brand distinctiveness that represents its universal imperative, inspiring talented employees to join and become a part of the organization, and shapes the employer's brand choice [2]. The employer's brand determines the identity of a firm as an employer through a set of advantages, aimed at the development of the distinctive identity of each employer and flowing from the company's values, systems, and policies, covering its specific relations and behavior patterns. As the selected employer the company should personalize its benefits, which being reflected in the contexts of the working practices, policies, and value proposition, attract, retain, and motivate those exact workers that the company needs. Such advantages form the brand name that identifies the unique employees, growth culture, and superior experience of working with the organization, which makes the company special [2].

On the other hand, the umbrella structure of the HR brand semantic field is complicated by the problem of determination of its "possessions", thus blocking the "points of contact" between the marketing, the corporate communications, and HR [1]. Focusing on the marketing communications and strong product, companies often disregard the employees, who while determining the company's identity as an employer, are the true ambassadors of its brand. This basically prevents the active integration of the HR brand into the unified organization field. The experts emphasize that in order to become a part of their clients' life, the company's product and brand should be "lived through" by its workers first. A successful employer's brand integrates the whole organizational context in order to create the sustainable values for a single person, the organization, and society as a whole [2].

For achieving success companies need *a person-integrated HR brand*, enshrining and supporting the general corporate strategy, covering all the aspects of the organization's functioning, and uniting the personnel's efforts for the consistent demonstration of the company's advantages. The integration component explains the effectiveness of convergence and achievement of the internal unity, as well as the synergy between an employer and employee, and determines the strategy of creating, development, and promotion of an HR brand based on the company's values and target priorities. Adding the personal component explains the result of identification of the employee's and company's strengths; gives the sense of belonging and general identity of the

employer and employee; unites, enshrines, and supports the employee's values, priorities, and preferences in the organization; contributes to establishment of the long-term strong relationship with the current and future employees of the company, who are ready to see its advantages as their own in advance. Acting as the guide in the human resources market the person-integrated HR brand ensures the creation of positive associations in all of its consumers, improvement of the corporate image, increase of commitment and engagement of the current personnel, reinforcement of the employer's value, as well as contributes to retaining the key workers and attracting new "perfect" candidates.

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SECTION VI. Architecture and Construction

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RECOMMENDATIONS FOR RECYCLING CONCRETE SCRAP

Abstract. The article provides recommendations for recycling concrete scrap in construction in the North-West region. The use of heavy concrete scrap will make it possible to switch to a practically waste-free technology for the production of reinforced concrete structures.

Keywords: recycling, concrete scrap, secondary crushed stone, waste disposal, waste-free technology, North-West region

The problem of recycling and recycling of scrap reinforced concrete structures formed during the demolition of buildings and

structures is becoming more and more urgent every year. This is due to an increase in the number of construction structures for which the standard service life has ended. In addition, the number of buildings whose repair and operation are impractical for economic and other reasons is growing. In addition to the demolition of buildings, the source of concrete scrap is also enterprises for the production of precast reinforced concrete structures, where marriage and technological waste can amount to 1.5% [13].

In Russia, more than 6 million tons of concrete and reinforced concrete waste are generated annually, and in the near future, the increase in the volume of concrete scrap from the dismantling of buildings and the accumulation of substandard structures will reach 15-17 million tons per year. Construction debris clutters the sites, hindering restoration work.

In order to reduce the impact of construction industry waste on the environment, the areas in which it is advisable to reuse the material have been identified. One of the directions is the use of scrap concrete as a filler for cement-concrete mixtures [10].

In recent decades, much attention has been paid in our country and abroad to the reuse of construction and demolition waste. In some countries, for example, in Germany and Denmark, the volume of waste reuse reaches more than 80%. In other European countries, this figure does not exceed 10%, so the disposal of construction industry waste remains relevant. The most effective solution to this problem is the introduction of waste-free technology.

From foreign experience [11, 12] it can be seen that concrete scrap is actively used in construction. For example, scrap formed after the destruction of buildings and structures during the Second World War was used as a large aggregate for the preparation of a concrete mixture in England and Germany. It is worth noting that in the UK [11] a document has been approved stating that for the production of new concrete, it is allowed to replace the aggregate with a secondary one by 20%.

As a result of the use of secondary raw materials, the volume of imported aggregates for concrete can be reduced by 15-30%. The advantage of using it is also a reduction in the cost of work and cost-effectiveness. In industrialized countries, there has been a noticeable increase in interest in the reuse of concrete scrap in construction production.

Due to the need for the widespread introduction of complexes for the destruction of substandard reinforced concrete products by

mechanical means and the production of crushed concrete from crushed concrete, the issues of its rational use in construction as a filler in the production of concrete work are undoubtedly relevant.

Tens of millions of cubic meters of unused reinforced concrete products and structures have accumulated in large cities and industrial areas of the country after the transition to the construction of new series of houses and buildings.

The disposal of construction waste would allow to involve more than 3.2 million tons of metal and about 50 million tons of concrete scrap into economic turnover. In some cases, the replacement of natural resources with construction waste allows you to save up to 50% of the latter.

Positive results of the processing of construction waste are achieved in several directions, so they need to be disposed of, not stored.

In this regard, the development of measures for recycling concrete scrap in construction in the North-Western region is an urgent task.

Extensive research in the field of the use of technogenic waste in the practice of building materials science is devoted to the work of the scientific schools of Y.M. Bazhenov, V.I. Solomatov, P.G. Komokhov, T.M. Petrova, P.P. Budnikov, V.D. Glukhovsky and other Russian scientists, as well as foreign authors D.M. Roy, G.R. Gouda, etc. [3]. Despite the close attention in the scientific field to the issues of recycling concrete scrap in construction, many theoretical and practical issues are insufficiently developed. The importance of developing recommendations for recycling concrete scrap in construction in the North-Western region predetermined the relevance of scientific research, its goals and objectives.

Table 1 summarizes the main technological techniques for obtaining and optimizing secondary crushed stone and its applications. Analysis of literature sources has shown that using optimal methods of processing and activation of concrete scrap, it is possible to produce concretes of various types: heavy, fine-grained, self-compacting, as well as solutions in a wide range of applications with strength classes from B7.5 to B40.

Based on the criteria of the strategy of socio-economic development of the Vologda and Leningrad regions for the period up to 2030 in the field of ensuring environmental well-being and creating the foundations of a «green» region, one of the main tasks is to reduce the volume of waste disposed by involving the generated waste in economic turnover.

Table 1

Applications of secondary crushed concrete crushed stone

Type of placeholder	Technology of obtaining	Application areas
Secondary crushed stone fractions of 5-20 mm	Single-stage crushing	Concretes of classes up to B30
Secondary crushed stone of fractions 5-10 and 10-20 mm	Multi -stage crushing according to the "soft" mode with separation by fractions	Self-compacting concrete of class B40 inclusive
Screening of concrete scrap crushing fractions < 5 mm	Mechanical activation of the mixture (separate mixing and multi-frequency vibration compaction of the mixture)	Fine-grained concrete up to and including B25
Secondary crushed stone of fractions 0-20 and 0-40 mm	Single-stage crushing with separation by fractions	Foundation wall blocks and small-piece products
Secondary crushed stone fractions 5-10, 10-20, 5-20 mm	Single-stage crushing with separation by fractions. Mechanical activation in a ball mill	Road slabs, strip foundation slabs
Secondary crushed stone fractions of 5-20 mm separately and mixed with natural crushed stone in an amount of up to 30 %	Single-stage crushing	Road slabs, strip foundation slabs
Secondary crushed stone of fractions 5-10 and 10-20 mm	Single-stage crushing with separation by fractions	Reinforced concrete lintels
Screening of concrete scrap crushing fractions < 80 microns	Single-stage crushing, sifting	Building solutions

Having analyzed the experience of processing construction waste in the city of Cherepovets and Vologda, it can be concluded that large enterprises of the region are practically not engaged in the processing of substandard reinforced concrete. The tendency of growth of construction waste in the territory of the region, associated with an increase in waste during reconstruction, demolition waste of buildings and structures leads to the formation of unauthorized landfills. Solving environmental problems is an important and urgent problem for an industrial city, which can be solved by developing recommendations for recycling concrete scrap in construction in the North–Western region. Its solution will help

not only to solve environmental problems, but also to save raw natural resources.

Recommendations for recycling concrete scrap in the North-West region

General provisions

1. These recommendations should be guided when organizing at construction enterprises in the North-Western region, recycling points for concrete scrap that are formed directly during their production, have served their operational life, as well as having mechanical damage.

2. On the territory of the Vologda Region, taking into account local conditions, the processing process includes several technological stages:

I. Destruction of large-sized substandard concrete, directly with the extraction of metal inclusions (fittings / embedded parts).

II. Removal of destroyed waste to enterprises or stationary centers engaged in the processing of solid construction waste.

III. Crushing and fractionation of crushed concrete.Obtaining placeholders of the required quality. A variant of the technological scheme for the North-Western region is shown in Figure 1.

3. Waste products in the form of concrete scrap – crushed concrete of various fractions, reinforcing steel.

4. Crushed stone from concrete scrap can be used as a large aggregate for concrete mixes.

5. Metal inclusions (grids, rod fittings, embedded parts) are disposed of by delivery to the receiving point of the metal reception.

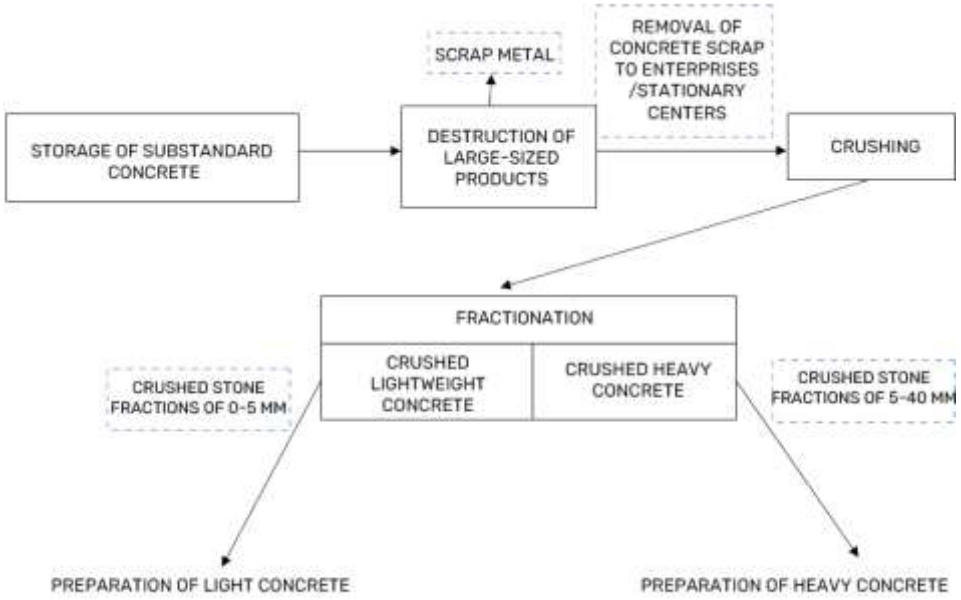

Figure 1. The scheme of the technological line for the processing of substandard concrete in the North-West region

Concrete manufacturing technology

The technology of preparing a concrete mixture based on secondary concrete crushing products includes the operations shown in Figure 2.

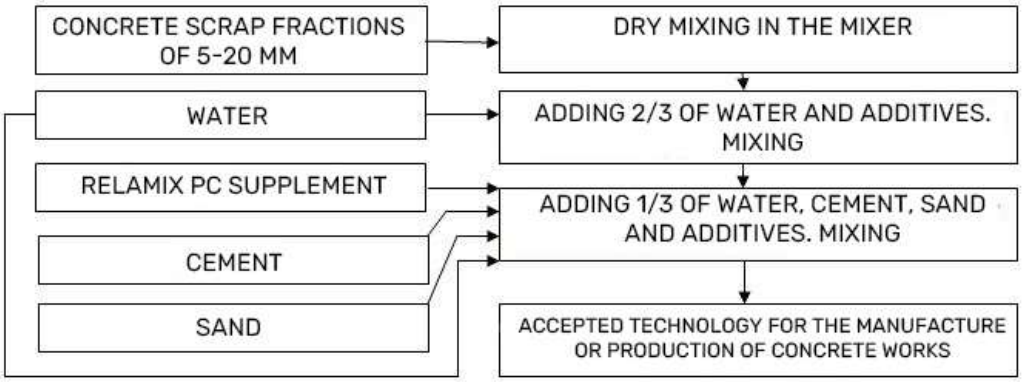

Figure 2. Technology of concrete mix production based on crushing products

Dry mixing in a mixer of concrete crushing products of 5-20 mm fraction for one minute.

1) Adding 2/3 of the mixing water and the Relamix PC additive. Stirring for one minute;

2) Adding 1/3 of the mixing water, cement, sand and the "Relamix PC" additive.

3) Using concrete mix according to the required technology. Scope of application

1. Represents crushed stone obtained as a result of crushing from demolition of concrete, reinforced concrete and brick materials. It is used as a filler for reinforced and non-reinforced concrete of prefabricated and monolithic structures of industrial and civil buildings and structures, as well as for the manufacture of special concretes, in particular in road construction.

2. The use of aggregates from concrete scrap in the production of concrete is provided in accordance with GOST 26633-91 Heavy and fine-grained concrete. Technical conditions.

3. Crushed stone from concrete scrap can be used as a large aggregate in concretes of classes up to B15 (grades up to M200), for except for the manufacture of prestressed structures, as well as reinforced concrete elements exposed to repeated repetitive loads.

Quality indicators of crushed stone from concrete scrap

1. Quality indicators of crushed concrete scrap: grain composition, grain shape, strength, content of impurities, density: true (without pores), medium (including pores), bulk (including pores and intergranular voids), porosity, voidness, water absorption.

2. The use of mixed fraction fillers is allowed. The shape of coarse aggregate grains from crushed concrete is characterized in accordance with the requirements of GOST 8267-93 by crushed stone and gravel from dense rocks for construction work.

Technical conditions

3. The grain composition, density, porosity, voidness and water absorption of crushed stone should be determined according to GOST 8269.0-97 Crushed stone and gravel from dense rocks and industrial waste for construction work. Methods of physical and mechanical tests.

4. Strength is determined by crushing capacity by testing crushed stone in an air-dry state by compression (crushing) in a cylinder by GOST 8269.0-97 Crushed stone and gravel from dense rocks and industrial waste for construction work.

Methods of physical and mechanical tests

5. The presence of foreign impurities should be determined visually and their content should be assessed by weight analysis by sampling as a percentage by weight.

6. Aggregates from concrete scrap should be stored in fractions separately from natural stone materials in conditions that exclude direct humidification and protect against the ingress of clogging and polluting impurities.

Selection of the composition

1. The selection of the composition of concrete on crushed stone from concrete scrap should be carried out in accordance with the requirements of GOST 27006-2019 Concrete. Rules for the selection of the composition, as well as the provisions of these Recommendations.

2. In the manufacture of concrete mixtures using crushed stone from concrete scrap, cements, fine aggregates, water and chemical additives that meet the requirements of relevant standards and specifications can be used.

3. Dosing of aggregates from concrete scrap should be carried out by weight in accordance with the requirements of GOST 7473-2010 Concrete mixtures. Technical conditions

4. The increase in the flow rate of the mixing water to obtain equally mobile concrete mixtures is due to the increased amount of

absorption of crushed stone from concrete scrap, compared with natural stone material.

Preparation of a concrete mixture on crushed stone from concrete scrap should be carried out in accordance with the requirements of SP 130.13330.2018

Production of precast reinforced concrete structures and products and SNiP 52-01-2003 Concrete and reinforced concrete structures. The main provisions.

5. To increase the efficiency of using crushed stone from concrete scrap, special techniques should be used.

6. The introduction of additives that improve the rheological characteristics of the concrete mixture provides the greatest effect in the case of step-by-step mixing of the mixture: at the first stage of mixing of the concrete mixture – pure mixing water, at the second – a solution of the additive.

7. The preliminary dry mixing of crushed stone from concrete scrap in concrete mixers before the preparation of the concrete mixture is carried out within 40-80 seconds.

8. Transportation and laying of concrete mix on crushed stone from concrete scrap should be produced according to the technology adopted for concrete on natural stone materials according to GOST 7473-2010 Concrete mixtures. Technical conditions.

9. Preliminary exposure of concrete and care for it should be carried out in accordance with the requirements of SP 70.13330.2011 Code of Rules. Load-bearing and enclosing structures. Selection of the composition of the concrete mixture: The stages of selecting the composition of a concrete mixture with a filler from concrete scrap (see Figure 3):

1) Determination of the granulometric composition of crushed concrete with a maximum grain size of up to 20 mm in order to establish the ratio between sand and crushed stone in it;

2) Taking as a basis the composition of the concrete mixture of the required workability for the manufacture of concrete of a given strength class;

3) Calculation of the consumption of crushing products required for replacement crushed stone in the composition (the amount of crushed stone in crushed concrete should be equivalent to the amount of crushed stone in the mixture taken as a basis);

4) Determination of the amount of sand in the mixture of crushing products adopted to replace crushed stone. Calculation of the amount of "clean" sand needed to be added to the concrete mix.

5) Trial mixes of concrete mix with aggregates from concrete scrap and the additive "Relamix PC" in order to adjust the water-cement ratio.

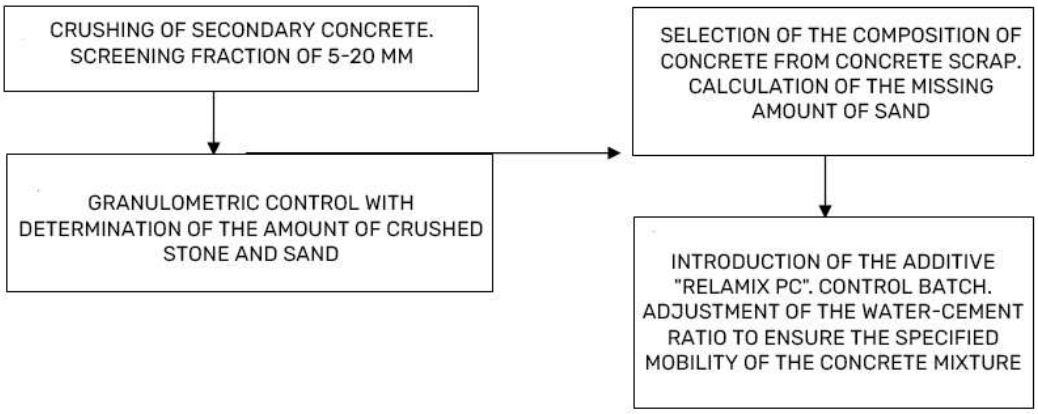

Figure 3. Stages of selection of the composition of a concrete mixture with a filler from concrete scrap

Studies have shown that on the basis of crushed stone from concrete scrap, it is possible to obtain widespread classes of concrete B15-B25. These concretes can be used for most non-responsible structures of modern buildings and structures, which will solve, first of all, the environmental problem in the North-Western region. To solve it, recommendations have been developed for recycling concrete scrap in construction in the North-Western region.

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SECTION VII. Ecology

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STUDYING THE PROPERTIES OF A DUST SUPPRESSOR BASED ON CARBOXYMETHYLCELLULOSE

The aim of the scientific work is to study the properties of carboxymethylcellulose (CMC) as a dust suppressor and compare CMC with water.

Water, although it is a simple and effective remedy, does not give a long-term effect due to evaporation, which forces the use of various binding and fixing additives [1, 2, 3].

One of the most environmentally friendly and inexpensive binders is carboxymethyl cellulose. Carboxymethylcellulose (CMC, cellulose glycolic acid, $[C_6H_7O_2(OH)_{3-x}(OCH_2COOH)_x]_n$, x = 0,08–1,5) — is a cellulose derivative in which the carboxylmethyl group (–CH_2–COOH) is connected by hydroxyl groups glucose monomers [4,5]. CMC is a crystalline light powder, colorless in solution, completely biodegradable. In industry, as a rule, sodium salt of CMC is used ($[C_6H_7O_2(OH)_{3-x}(OCH_2COONa)_x]_n$, x = 0,02-1,50) - sodium carboxymethylcellulose, aqueous solutions of which are viscous, have pseudoplasticity. CMC has a good binding effect and water retention, forms a film on the surface of the trapped pollutant, thermal stability and environmental safety also allow the use of CMC in dust suppression conditions [6,7].

In the course of work to measure the concentration of dust in the air, the following measuring instruments were used:

- meteometer MES-200A - designed to measure atmospheric pressure, relative air humidity, air temperature, air flow velocity inside the room or in ventilation ducts.

- dust meter DustTrak 8533 - designed to measure the mass concentration of aerosol particles in the atmospheric air by fractions.

Progress:

1. The walls and base of a special dust suppression bin (a collapsible box with dimensions of 1000x1200x1150mm) were coated

with antistatic in order to avoid dust particles from settling on them in the future, in addition, the metal elements of the bin were connected to ground to remove static charges;

2. The main meteorological indicators were measured using the MES-200A meteometer. To do this, the sensor of the device was placed inside the installation through a technological hole;

3. A branch pipe of the wind speed simulation device is installed in the hole in the bottom of the hopper, the device is started;

4. Using the MES-200A meteometer, the wind speed was set, corresponding to the maximum speed with 5% frequency for the region under consideration (5 m/s);

5. For 10 minutes, the background concentration of suspended solids in the bin was measured using a dust meter DustTrak 8533 through the technological hole in the roof of the bin

6. A sample of coal dust weighing 5 g was prepared. The dust was distributed in the center on the base of the hopper with a thin layer in the form of a square 5x5 cm.

7. After starting the wind simulator, measurements of the concentration of suspended particles in the bunker were carried out for 10 minutes.

8. The background concentration value was subtracted from the values obtained at each time point.

9. The bunker was completely cleaned with a vacuum cleaner, after which the following experiment was carried out.

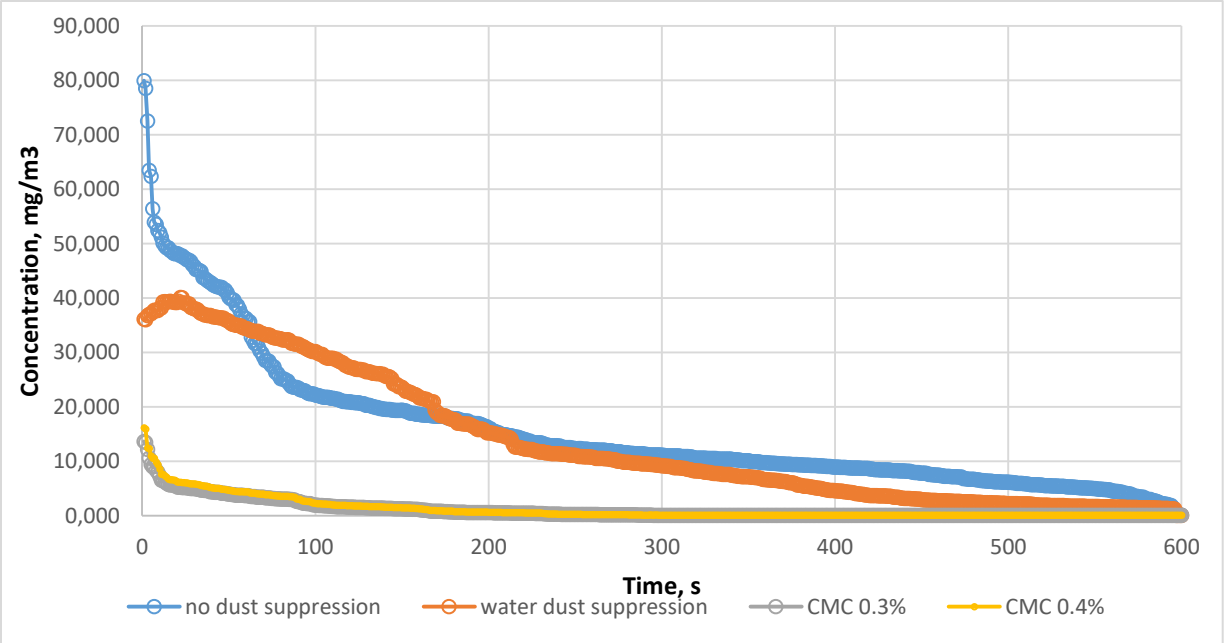

Figure 1 - The result of measuring concentrations over time minus the background.

Thus, a series of experiments were carried out averaging over three typical experiments using coal dust samples without dust suppression, with surface aerosol treatment with water (2 g), with surface aerosol treatment with carboxymethylcellulose solvents 0.3% (2 g) and 0.4% (2g). The graph of measuring concentrations over time in the volume of the dust suppression bin is shown in Figure 1.

Based on the results obtained, the following conclusions were drawn:

1. Clean water that meets household and drinking standards is an ineffective dust suppressor in the case of surface treatment of the test sample;

2. CMC solution 0.3% and 0.4% practically do not differ in dust suppression efficiency and have high rates of fixing the dusty surface layer;

3. From the point of view of obtaining a scientific result, it is advisable to continue a series of experiments with a decrease in the concentration of CMC in a solution, from the point of view of economic indicators, a further decrease in the concentration of CMC in a solution is of little use due to the extremely low cost of CMC;

4. The result obtained can only be valid for the tested coal dust; for other dusty samples, clarifying experiments are required;

5. Solutions of CMC 0.3% and 0.4% during the measurement showed a dust suppression efficiency for dust PM2.5 of 95.67% and 94.35%. Water showed the effectiveness of dust suppression is 22.55%.

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