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PAPERS IN ENGLISH

METALLURGY AND MATERIALS SCIENCE

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Uzbekistan, Navoi.*РАЗРАБОТКА ТЕХНОЛОГИИ ОБОГАЩЕНИЯ ВЕРМИКУЛИТОВЫХ РУД
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ABSTRACT

The article indicates the main properties of natural vermiculite, analyzes the analysis of the mineralogical and technological features of vermiculite of sungulite raw materials. Information is given that the first appeared vermiculite ores of the Karauzyaksky deposit, as well as the development of a beneficiation scheme, the purpose of which is to obtain raw materials for heat-insulating and facing tiles.

АННОТАЦИЯ

В статье указаны основные свойства природного вермикулита, рассмотрены анализы минералогических особенностей вермикулитового сырья. Приведены сведения о вермикулитовых рудах Караузякского месторождения. А также рассмотрены вопросы разработки схемы обогащения, целью которой является получение сырья для теплоизоляционных и облицовочных плиток.

Keywords: minerals, vermiculite, effluent separator, pneumatic separator, crushing, screening, drying, thermal insulation, temperature, extraction.

Ключевые слова: минералы, вермикулит, выхретоковой сепаратор, пневматический сепаратор, дробление, грохочение, сушка, теплоизоляция, температура, извлечения.

Introduction. In the Republic of Uzbekistan, the production of vermiculite and materials based on it is just beginning to develop. High porosity, low volumetric weight and low coefficient of thermal conductivity, as well as a mineral composition that provides high fire resistance and biostability, put it in one of the first places among other heat-insulating materials. Dry construction mixtures are prepared from it, fire-retardant boards and paints are produced, it is used to insulate heating units, to soundproof rooms, when pouring steel, etc. In the industry of economically developed countries, vermiculite is used for the production of more than a hundred types of products [1].

Research methods and results. Vermiculite ores of the Karauzyaksky deposit are typical formations of the weathering crust. In the near-surface part, they are represented by loose fine - medium-grained rocks, often with a lumpy structure. The lumps are 3-7 cm in size and easily crumble into small particles. At depth, the rocks are denser, but also poorly cemented [2].

The granulometric composition of the ores is variable (Table 1). In general, the fraction of less than 5 mm prevails (from 55 to 98%, on average about 83%). The content of the fraction more than 10 mm (mostly soft lumps) is from a few percent to 15-30%, the fraction of 5-10 mm is mainly at the level of 2-5%, the content of fractions 5-0.6 and 0.6-0 mm is approximately equal.

Table 1.

Granulometric composition of ores of the Karauzyaksky deposit

No. p/p	Sample No.	Fractions, mm, %					
		+10	-10+5	+5	-5+0	Including	
						-5+0,6	-0,6+0
1	S-01t	31,2	24,8	56,0	44,0	39,5	4,5
2	S -02t	0,7	1,2	1,9	98,1	42,9	55,2
3	S -03t	2,0	2,8	4,8	95,2	45,9	49,3
4	S -04t	2,2	4,0	6,2	93,8	52,8	41,0
5	S -35	-	-	33,6	66,4	41,6	24,8
6	S -36	-	-	2,2	97,8	62,1	35,7
7	S -41	-	-	14,9	85,1	58,2	26,9
8	S-49	-	-	45,0	55,0	40,7	14,3
9	S-48	-	-	22,5	77,5	42,1	35,4
10	S-50	3,3	2,3	56	94,4	46,1	48,3

The main minerals of the ores are vermiculite, pyroxene, amphibole, minor ones - carbonate, titanomagnetite, iddingsite, hydrochlorite, montmorillonite, chrysotile - asbestos, gypsum, iron oxides. Titanomagnetite is largely martitized. Its content ranges from 0.5-1.0 to 5-10%, less often 15-20%. In terms of mineral composition, ores are predominantly vermiculite-pyroxene with a pyroxene content of 60 to 90% [3].

The chemical composition of ores (Table 2) largely inherits the composition of ore-forming unweathered rocks, differing only in the higher content of Fe₂O₃, CO₂ sulfate sulfur and loss on ignition, which is typical for the hypergenesis zone.

Table 2.

The chemical composition of vermiculite ores

Components	Content, %	Components	Content, %
SiO ₂	41,13	Na ₂ O	1,0
TiO ₂	1,11	K ₂ O	0,62
Al ₂ O ₃	6,25	P ₂ O ₅	0,03
Fe ₂ O ₃	7,36	SO ₃	0,29
FeO	3,76	п.п.	6,18
MgO	15,04	H ₂ O	1,31
CaO	17,7	CO ₂	2,55

X-ray phase analysis of the crushed vermiculite sample was carried out on an X-ray diffractometer DRON-3. Radiation - $\text{CuK}\alpha$, detector - scintillation counter. The recording was carried out in the range of angles 2Θ – 5–70 °C with a step of 0.1°. The X-ray diffraction pattern of crushed vermiculite is shown in Fig. 1. A difference has been established in the behavior of finely ground vermiculite and relatively large aggregates of vermiculite concentrate selected in the sample, the diameter of which is about 2 mm, and they are folded in a number of tightly adjacent layers.

According to the analysis data, the main role in the composition of vermiculite is played by mica of the intermediate stage of hydration, represented by mixed layered formations with alternating layers of hydrobiotite and vermiculite. Actually, vermiculite sometimes consists of only small flakes of mica. By the nature of the exchangeable cations, magnesium is noted, magnesium - calcium vermiculite and sodium vermiculite and hydrobiotite. In large micaceous scales, their sodium varieties predominate, in small magnesium - calcium ones.

Figure 1. Diffraction pattern of crushed vermiculite

The content of vermiculite in ores is extremely uneven - from the first tenths of a percent to 35-38%, in vein-like accumulations up to 50-65%. A clear pattern of distribution of vermiculite to depth is not observed.

The vermiculite content was determined by rock firing and air separation of expanded vermiculite. Most of the samples were analyzed using special equipment (tubular vibroelectric furnace LHE TP-1, vibro-jet air separator VEP-1), which significantly increased the accuracy of analyzes.

According to the vermiculite content, ores can be conditionally subdivided into 3 types: lean ores with a content of 5-10%, medium (10-20%) and rich (more than 20%). However, the delineation of ores with different

vermiculite content due to the unevenness of its distribution is not possible.

Given the relatively low content of vermiculite in the ores, laboratory tests were carried out to determine the possibility of their preliminary enrichment on a jig. The tests were carried out on two samples weighing 7.1 and 8.1 kg with a vermiculite content of 8.12 and 11.62%. The content of vermiculite in the obtained concentrates (light fractions) was 18.49 and 28.35%, respectively, with a yield of 25.7 and 27.6%. Extraction of vermiculite in concentrate 58-67%. Bulk bulk density of expanded vermiculite is 166-178 kg/m³. The research results are shown in Fig. 2.

Figure 2. Dependence of the extraction of vermiculite into concentrate on the pulsation frequency of the jig

With an increased content of titanomagnetite in ores, it is possible to simultaneously obtain its concentrate by magnetic separation of ores at the head of the technological process. According to laboratory tests, the content of Fe_2O_3 in magnetite concentrates is 24.7-50% and they can be used as an iron additive in the production of cement.

As can be seen from the data presented, when enrichment on jigging machines, the enrichment indices

are low. To create an optimal beneficiation scheme, the vermiculite ore of the Karauzyaksky deposit with a vermiculite content of 10.16% was tested for washability according to the developed scheme (Fig. 3).

The technological scheme includes one-stage crushing, extraction of iron-containing, non-ferrous metals and other impurities from ores, sorting on screens into the resulting fractions and air separation.

Figure 3. Technological scheme of dry concentration of vermiculite ores

To separate the fraction over 4mm, the ore was screened. Fraction over 4mm is fed to the crusher for crushing, followed by the return of the crushed product to screening. Under mechanical action, vermiculite grains easily unfold along cleavage planes, forming very thin, weakly swelling scales, therefore, during crushing, excessive splitting of vermiculite must be excluded.

In its structure and properties, vermiculite differs significantly from other natural stone materials, crushing of which can be successfully carried out on hammer, jaw and roller crushers. The ability of vermiculite to stratify into thin plates and, in some cases, a rather high viscosity does not allow the use of existing crushing plants for crushing it. The physical properties of vermiculite, as well as the above requirements for

crushed material, require that vermiculite be crushed not by impact or crushing action, but by cutting or simultaneously acting by cutting and impact.

The process of crushing vermiculite ore of the Karauzyaksky deposit was carried out in jaw, roll and hammer crushers in order to study the crushing performance.

The studies carried out on crushing vermiculite made it possible to establish that good results can be obtained when using hammer crushers with cutting blades. Their use makes it possible to reduce the degree of crushing, increase the thickness of the crushed vermiculite grains and reduce the specific work, thereby increasing the crushing performance.

To remove moisture, before electromagnetic separation, the $-4 + 1$ mm fraction was dried in a drying drum with a cyclone at a temperature of 150°C . The removal of nonferrous metals was carried out in an electromagnetic field using an exhaust current separator. From there, the vermiculite product goes for classification in screens for sieving into fractions $-4 + 2\text{mm}$, $-2 + 1\text{mm}$, and -1mm .

Further, vermiculite concentrate was obtained in air separators (Fig. 4.) by dry dressing. To increase the enrichment indicators and the efficiency of the separator, each size class was separated separately. The experiments were carried out on a CAD-4 air separator with a change in the air flow rate.

When separating vermiculite ore, minerals are separated by specific gravity. Minerals with a large specific

gravity enter the first receiver (Fig. 4.), vermiculite, the fact that it has a small specific gravity compared to other minerals in the ore, is carried away by the air flow and enters the distant receiver. The results of the study show (Fig. 5.) that the initial speed of the main air stream for separating vermiculite grain from waste rock should be in the range of $25\text{--}30\text{ m/s}$. From Figure 5 it can be seen that with an increase in the speed of the air stream, the extraction of the class $-4 + 2\text{ mm}$ and $-2 + 1\text{ mm}$ into the concentrate increases. With enrichment of class $-1 + 0.5\text{ mm}$, the extraction of vermiculite grain into concentrate increases with an increase in the air stream velocity up to 20 m/s , further increase in the flow velocity negatively affects the recovery, since fine particles are carried away with the exhaust air stream from the separator

Figure 4. Trajectory of movement of minerals by specific gravity inside the separator: 1 – base module; 2 – feed hopper; 3 – vibrating tray; 4 – main fan; 5 – jet generator; 6 – working chamber; 7 – collection of fractions (1- for heavy fractions, 2,3 - for fraction of intermediate density, 4,5 - for light fractions); 8 – swivel shutters; 9 – aspiration unit; 10 – cyclone. a – collection of major fractions; б – collection of intermediate fractions

Figure 5. Dependence of the extraction of vermiculite into concentrate on the air flow rate of the air separator

Table 3.

Distribution of vermiculite concentrate by fractions

Fraction	Concentrate yield, %	Vermiculite content in concentrate, %	Extraction of vermiculite into concentrate, %
-4+2 mm	4,0	85,0	33,46
-2+1 mm	3,97	85,0	33,21
-1+0 mm	3,50	85,0	29,28
Total	11,47	85,0	95,95

Thus, as a result of the studies carried out according to the developed scheme, a vermiculite concentrates of fractions -4 + 2mm, -2 + 1mm and -1mm with extraction of vermiculite in concentrate 95.95%, concentrate yield

11.47% and vermiculite content in concentrate 85%. The distribution of vermiculite concentrate by fractions is shown in table 3.

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**DEVELOPMENT AND IMPROVEMENT OF TECHNOLOGY FOR EXTRACTION
OF PRECIOUS METALS FROM TECHNOGENIC RAW MATERIALS*****Bahriddin Vokhidov****PhD, assistant professor,
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БЛАГОРОДНЫХ МЕТАЛЛОВ ИЗ ТЕХНОГЕННОГО СЫРЬЯ*****Вохидов Бахриддин Рахмидинович****PhD, доцент,
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In this work, the effectiveness of methods for the selective extraction of platinum, palladium and rhodium is determined, and attention is also paid to the methods of dissolution, reduction of platinum metals and methods of their purification from various impurities. Based on the study of this topic and the analysis of the results of the research, the authors have developed a comprehensive method for extracting platinum, palladium and rhodium using selective methods in combination with hydro- and pyrometallurgy technologies.

АННОТАЦИЯ

В работе определена эффективность методов селективного извлечения платины, палладия и родия, а также уделено внимание способам растворения, восстановления платиновых металлов и методы их очистки из различных примесей. На основе изучения данной тематики и анализа результатов проведенных исследований, авторы разработали комплексный способ извлечения платины, палладия и родия с применением селективных методов в сочетании с технологиями гидро- и пирометаллургии.

Keywords: platinum metals, waste electrolyte solution, selective precipitation, aqua regia dissolution, washing, calcination.

Ключевые слова: платиновые металлы, сбросной электролитный раствор, селективная осаждения, царское водочное растворение, промывка, прокатка.

Introduction. The Republic of Uzbekistan possesses a reliable raw material base for the extraction and production of a number of noble, rare and trace metals. Some of them are concentrated in independent deposits, such as copper and molybdenum, others can be extracted as associated components from deposits of copper, uranium polymetals and other minerals. In Uzbekistan, the main reserves of platinum, palladium, rhodium and the radiogenic isotope of osmium - 187 are found in the porphyry copper deposits of the Almalyk ore region. In the Chatkal-Kuramin region, manifestations of gabbroid magmatism and associated MPG (most often palladium, platinum and rhodium) are known. [1].

Research methods and results. Waste electrolyte from the gold and silver refining shop of the copper-smelting plant of JSC "AMMK", obtained from copper-electrolyte sludge, was selected as the object of the study. When smelting copper and nickel sulphide raw materials, platinum metals are concentrated in the anodes, which, during further electrolysis, transforms into red mud, where their content, depending on the composition of the initial sulfide ores, varies widely, from tenths to several percent [2]. Chemical analysis of samples was carried out by atomic emission spectroscopy of red mud obtained by processing copper ores, rich in PGM, are given in table 1.

Experimental studies are carried out in a laboratory reactor with a stirrer. All hydrometallurgical processes royal vodka dissolution, precipitation, reduction and purification processes of palinodes are carried out in a titanium reactor [3].

Table 1.

Results of chemical analysis of copper sludge, %

Component	Copper sludge, %	Component	Copper sludge, %
Platinum	0,72	Silver	3,0-6,0
Palladium	3,1-3,45	Copper	14-18
Rhodium	0,023-0,034	Nickel	20-28
Iridium	0,015-0,009	Iron	0,5-1,2
Ruthenium	0,015	Selenium	2-5
		Tellurium	0,7-1,1
Osmium	0,012	Sulfur	2-4
Gold	0,33	Silicic acid	3-5

Tank equipment is designed to accumulate solutions obtained during the production of platinum, palladium and rhodium powder. The tank equipment (reactor) is made of VT-1 (R - II) titanium $V = 2\text{m}^3$. For filtration processes, it is used in laboratory suction filters, and for drying, firing and calcination processes, laboratory muffle furnaces with the Snol 1400 brand are used.

The study of spent electrolytes with the aim of obtaining palinodes, in particular, platinum, palladium and rhodium, was carried out by the JSC "AMMK", as a result of which it was necessary to examine many processes intended for the complex extraction of platinum metals from electrolyte solutions. Among them, the optimal operations are of the following order:

- accumulation of platinum-palladium solutions after electrolysis of gold, the content of platinum and palladium in solution is more than $> 100 \text{ mg/dm}^3$ and they are in chloride compounds: PtCl_2 and PdCl_2 ; - waste electrolyte solutions after electrolysis of gold with a platinum concentration of $10\text{-}80 \text{ mg/dm}^3$ are oxidized with hydrogen peroxide, while PtCl_2 passes over to PtCl_4 ;
- precipitation of palladium thiourea complex in thiourea solution, product filtration, cake roasting at $500\text{-}600^\circ\text{C}$. In this case, the firing time was 2-3 hours, where the resulting product is subjected to reduction

with a hydrazine solution. The recovered product is sent for washing with distilled water, after which it is dried at a temperature of $100\text{-}120^\circ\text{C}$ and dissolved in aqua regia.

With an increase in duration, the degree of solubility of metals increases, since aqua-aqua leaching of Pd and Pt is associated with the kinetics of solubility. It can be seen from the diagram (Fig.1) that the degree of dissolution of Pd is higher than the degree of solubility of Pt. This explains that the overall recovery of palladium is higher than that of platinum. Also, the main influencing parameter on the solubility is the concentration of the solution, the consumption of aqua regia and the duration of the dissolution process. It was experimentally determined that with an increase in the time of aqua-vodka dissolution, the consumption of the solution increases, as a result of which the concentration of palladium in the solution increases accordingly and is equal to 200 g/dm^3 at 120 minutes of the process duration with the consumption of reagent 2l per 100 g palladium product. The obtained result determined the optimal regime of aqua-vodka dissolution of the palladium product and described in the curve graph shows the growth of solubility of metals of the platinoids group, in particular, platinum and palladium [4].

Figure 1. Dependence of the degree of PGM solubility on the duration of the process

The dried palladium product is poured in small portions into a heated container $V=0,05\text{m}^3$ with a mixture of concentrated nitric and hydrochloric acid, the consumption of aqua regia is 2 liters per 100 g of Pd product. Dissolution is carried out with constant heating for 1-2 hours. The research results are shown in Fig. 1.

We extract platinum from the solution by selective methods. For this purpose, the selective precipitating reagent of ammonium chloride was chosen, which precipitates only platinum from solution, while palladium remains in solution. The solution is treated with a small amount of ammonium chloride and the process is carried out in a reactor with mechanical stirring. The results of these experiments - the basis for industrial implementation shows that tetrachloropalladium acid is a solution, ammonium hexachloroplatinate (IV) becomes a precipitate, which, without much effort, accurately separates palladium from platinum [5].

After filtration and washing, the chloropalladosamine is ignited. At $600-900^\circ\text{C}$, complex decomposes to metallic palladium. For complete purification of metallic powder, palladium is treated with formic and citric acid, then it is thoroughly washed with distilled water and the product is dried. In this case, Pd powder is formed with a purity of 99,5–99,9%. As a result of the experiments, a technological scheme for extracting precious metals from industrial waste was developed (Fig. 2).

Conclusions. As a result of extensive research, including a number of experiments and experiments, a new technological scheme was developed, consisting of 20 operations with a cycle time of 24-26 hours. At the same time, the cost-effective extraction of PGMs from solutions with a platinum content of 50 mg per 1 liter reaches more than 84%. The result is refined platinum powder with a mass fraction of 98,0-99,0% and palladium in powder 99,5-99,94% (Table 2 and table 3).

Table 2.

Results of chemical analysis of the obtained platinum powder

Name material	Content of elements, %										
	Pt	Pd	Rh	Ir	Ru	Au	Pb	Fe	Si	Sn	Al
Platinum powder	99,98	0,01	0,0012	0,0002	0,0018	0,002	0,002	0,0012	<0,002	<0,0001	0,002
	Content of elements, %										
	Sb	Ag	Mg	Zn	Cu	Ni	Mn	Cr	Co	Ca	
	0,002	0,002	0,0003	<0,0001	0,001	0,001	0,001	0,001	0,001	0,005

Figure 2. Technological scheme for obtaining refined platinum and palladium powder from industrial waste.

The method is also suitable from an environmental point of view, since the resulting acidic filtrates are neutralized with an alkali solution or alkaline filtrates

obtained during the reduction of palladium to metal with formic acid or hydrochloric acid hydrazine.

Table 3.

Results of chemical analysis of the obtained palladium powder

Name material	Content of elements, %										
	Pd	Pt	Rh	Ir	Ru	Au	Pb	Fe	Si	Sn	Al
Palladium powder	99,94	0,0022	0,0310	0,0003	0,0039	0,0032	<0,0001	0,0055	<0,0001	<0,0001	0,0003
	Content of elements, %										
	Sb	Ag	Mg	Zn	Cu	Ni	Mn	Cr	Co	Ca	
	0,0022	<0,0001	0,0001	<0,0001	0,0050	0,0012	0,0001	0,0006	0,0005	0,0004	

The introduction of this technology undoubtedly gives a positive economic effect due to the production of precious platinum and palladium, as well as the

additional extraction of rhodium and improves the ecological situation in the places of accumulation of industrial waste [6].

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INSTRUMENTATION, PRECISION AND ACCURACY, DATA MEASUREMENT TOOLS AND SYSTEMS

DISPLAY DATA IN HISTOGRAM FORM USING THE ARDUINO PLATFORM

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ОТОБРАЖЕНИЕ ДАННЫХ В ВИДЕ ГИСТОГРАММЫ С ИСПОЛЬЗОВАНИЕМ ПЛАТФОРМЫ ARDUINO

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ABSTRACT

In this article, the histograms, created on the Arduino platform, are presented in this shooting scene, as well as the exposure meter. He only offers an exhibition pair, which is in line with the understanding of the painting. And this is the most obvious example of light and light scattering in photography. To understand what the histogram is talking about, you need to understand that it is a graph.

АННОТАЦИЯ

В данной статье приведены гистограммы, созданные на платформе Arduino, которые дают представление о снимаемой сцене, как и экспонометр. Экспонометр предлагает только выставочную пару, что соответствует пониманию картины. Показано, что это наиболее очевидный пример света и светорассеяния на фотографии, чтобы понять, о чем говорит гистограмма, нужно понять, что указано на графике.

Keywords Arduino platform, histogram, exposure meter, tonal range, composition, contrast, pixels, gradation, camera.

Ключевые слова: платформа Arduino, гистограмма, экспонометр, тональный диапазон, композиция, контраст, пиксели, градация, камера.

A histogram is a graph that shows the current tonal range of an image, allowing it to be evaluated and corrected if necessary. The tonal range refers to the levels of brightness. The histogram describes which part of the image is darker and which part is whiter, as well as all the cases between these colors.

Histograms are also widely used when working with color images. Although we don't think of color as anything other than color, each of them has a level of brightness in the image. For example, yellows are usually very light in color, while blues are much darker. This difference in brightness has a big impact on the tonal range of the whole image. For example, we consider a photo to be somehow "incomplete". The subject of the picture is interesting, the composition is good, but in general it can not hold its own. This is because there is no contrast in the picture. The lights are a bit dim and the shadows aren't dark enough.

Now it may seem possible to spot such flaws with the naked eye, but you can't always rely on your own point of view. You will need to compare two side-by-side images. Easy, but looking at the same image can easily fool the user.

Also keep in mind that the monitor is not always able to display the colors as they are. If the user has set the screen brightness to full, then the picture will look great, but the user may not get the expected result when he prints it. A histogram helps to avoid this situation because it takes information directly from the image, always displays information in a clear tonal range, and helps identify contrast problems.

Now imagine a graph where the light along the horizontal axis is completely black - "0" - on the far left, to full white - "255" - on the right. (0 and 256 correspond to full black and full white on the 256 shade scale adopted). Therefore, no data is written around "0" other than darkness (no data). The brightness gradually increases to the right, until it reaches 255 - full white, where no details are obtained. The distribution of brightness pixels in the histogram is horizontal, from black (left) to white (right) axis. Light Distribution Histogram Arrows But only information about the distribution of brightness gives us some information. It is very important for the photographer to understand what the overall tone of the message is, that is, how many pixels are associated with a particular brightness shade. For example, an image of a winter snowy landscape will be mostly white, while the proportion of images with dark values will be very small. The pixels corresponding to the gradation of the horizontal axis, the vertical axis, are used to transmit information about the amount of data. The area occupied by a certain brightness of the image is "drawn" along the vertical axis of the histogram. The histogram tells us about two sides of the image: the brightness and the image area where the information is recorded with that brightness. Look at the histogram of the photo taken - does it fit your idea? Is the picture open correctly? In addition, the histogram provides information on data loss. In both film cameras, reflects the light intensity even in a digital matrix. The capabilities of both films and matrices are limited: they are only able to receive light in a certain intensity range. If there is not

enough light to fix it, the result will be black. If there is too much light, everything will turn white. These two boundary ranges are called Dynamic Ranges. When you capture a scene where the light intensity exceeds the dynamic range, you cut off one or both sides. This can be easily seen in the histogram of the captured image. the result will be black. If there is too much light, everything will turn white. These two boundary ranges are called Dynamic Ranges. When you capture a scene where the light intensity exceeds the dynamic range, you cut off one or both sides. This can be easily seen in the histogram of the captured image. the result will be black. If there is too much light, everything will turn white. These two boundary ranges are called Dynamic Ranges. When you capture a scene where the light intensity exceeds the dynamic range, you cut off one or both sides. This can be easily seen in the histogram of the captured image.

Therefore, in the histogram, first of all, it is necessary to pay attention to the right and left edges of the diagram. A graph with a lot of data adjacent to the right or left side of the histogram shows the loss of details (data) in the shadow or focus, respectively. Take a look at the photo taken at the cafe and its histogram. As can be seen, the left edge of the histogram is cut - the data is lost in the shadows. The histogram is cut in the shadows. The photo is completely blacked out, the data in it is lost, and the fact that it is not processed in graphics editors allows you to "pull" it. Data loss in the shadows A photograph of a steam locomotive can be an example of the opposite situation: the histogram is shortened to the right and the data in the focus is lost.

In the previous diagram, you can create a glowing histogram by adding an IR distance sensor. Several LEDs of different colors can then be used for clarity. A schematic diagram of a device with multi-colored LEDs and an IR distance sensor is shown in Figure 1.

Figure 1. Is a device diagram that implements the "Remote histogram" effect

Knowing the principle of operation of the analog sensor and the shift register, you can independently select the distance limits, the corresponding combinations of on and off LEDs (Fig. 2).

All decimal combinations of the histogram are stored in an array of nine elements. We limit the maximum distance and increase the values from 0 to 8. The list below demonstrates the histogram effect software.

```

// Remote histogram
const int SER = 8;           // Pin to connect the DATA pin
const int LATCH = 9;         // Pin to connect the LATCH pin
164 Part II. Environmental management
const int CLK = 10;          // Pin to connect the CLOCK pin
const int DIST = 0;          // Connection to connect the distance sensor
// Possible values of LED
int vals [9] = {0,1,3,7,15,31,63,127,255};
// Maximum distance value int maxVal = 500;
// Minimum distance value
int minVal = 0;
}}
void setup ()
{
  // Set the pins to exit (OUTPUT)
  pinMode (SER, OUTPUT);
  pinMode (LATCH, OUTPUT);
  pinMode (CLK, OUTPUT);
  void loop ()
  {
    int distance = analogRead (DIST);
    distance = map (distance, minVal, maxVal, 0, 8);
    distance = limitation (distance, 0.8);
    digitalWrite (LATCH, LOW);           // LATCH - low - start sending
    shiftOut (SER, CLK, MSBFIRST, waltz [distance]); // The most important bit is the first
    digitalWrite (LATCH, HIGH);          // LATCH - high
    delay (10);
  }
}

```

Download the app to your Arduino board, launch it, and move your hand back and forth in front of the distance sensor. You should see that the histogram responds to hand movements. If the device does not work properly, adjust the maxVal and minVal values to better adjust the distance sensor reading.

Figure 2 The combination of on and off LEDs and the corresponding decimal values

To track the values obtained at different distances, you can start the serial connection in the setup () header and call the Serial.println (dist) function immediately after the analogRead (DIST) step. Here's how sliding registers work, what's the difference between serial and parallel data transfer, what's the difference between decimal and binary data displays, and how to create light animation

with scroll registers seen. The more you work on creating new Arduino-based devices, the more often the question arises: "What happens when the Arduino board legs run out?" For example, in one popular project, an Arduino board controls many flickering LEDs. Light up your room! Light up your computer! decorate your appliances with LEDs!

But the problem persists. What if you want to replace 50 LEDs (or control another digital output) and all the input / output legs are already in use? Shift registers are useful here, which allows you to expand the capabilities of the Arduino board and avoid buying more expensive microcontrollers with additional input-output legs. This chapter discusses the software needed to work with shift registers and expand the digital output of the Arduino board. More detailed shift registers were introduced and help was provided to understand the design of devices with a large number of digital outputs. As in most of its predecessors, the Arduino Uno was used as a platform. Any other Arduino board is suitable for experiments, but the choice should always be reasonable and optimally suited to a particular project. This is the perfect way to implement devices that require a lot of connections. However, engineers should always keep all the nuances in mind when designing. If the performance of the Arduino Uno is sufficient, but the digital outputs are not sufficient, you can simply add a few shift registers. This is cheaper and more compact than choosing a more powerful board. However, the code is more complex and may take longer to extract.

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INFLUENCE OF THE PROBABILISTIC NATURE OF THE CHANGE IN THE MEASURED QUANTITY ON THE MEASUREMENT ERROR

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ВЛИЯНИЕ ВЕРОЯТНОСТНОЙ ХАРАКТЕРИСТИКИ ИЗМЕНЕНИЯ ИЗМЕРЕННОЙ ВЕЛИЧИНЫ НА ОШИБКУ ИЗМЕРЕНИЯ

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ABSTRACT

The results of an analytical study to determine the influence of the probabilistic nature of the change in the measured quantity on the measurement error of two-wave optoelectronic devices are presented. By minimizing measurement errors, expressions for the optimal parameters of two-wave optoelectronic devices are obtained. The conditions for choosing the value of the initial flows, as well as the conditions for choosing the wavelength of the reference and measuring channels, the observance of which ensures the minimization of the relative measurement error are given.

АННОТАЦИЯ

Представлены результаты аналитического исследования по определению влияния вероятностного характера изменения измеряемой величины на погрешность измерения двухволновых оптоэлектронных устройств. За счет минимизации ошибок измерений получены выражения для оптимальных параметров двухволновых оптоэлектронных устройств. Приведены условия выбора величины начальных потоков, а также условия выбора длины волны опорного и измерительного каналов, соблюдение которых обеспечивает минимизацию относительной погрешности измерения.

Keywords: two-wave optoelectronic device, reference and measuring channels, non-destructive testing, time and temperature instability.

Ключевые слова: двухволновое оптоэлектронное устройство, эталонный и измерительный каналы, неразрушающий контроль, временная и температурная нестабильность.

Introduction. In works, [1-15] two-wave optoelectronic devices for solving problems of non-destructive testing are considered. In all these works, to describe the operation of devices, the following mathematical model was applied based on the law Booger-Lambert-Beer:

$$F_1(\lambda_1, t, Q) = F_{1,0} \exp(-k_1 Q) = F_0 \exp(-k_1 Q)[(i+2) \bmod 2] \quad (1)$$

$$F_2(\lambda_2, t, Q) = F_{2,0} \exp(-k_2 Q) = F_0 \exp(-k_2 Q) \exp(-\frac{t}{\tau})[(i+2) \bmod 2] \quad (2)$$

Where Q is the measured parameter; k_1, k_2 are absorption coefficients at wavelengths λ_1 and λ_2 .

In works [16-24] it was assumed that the measured parameter Q is a deterministic quantity with an optoelectronic two-wave device and its measurement is reduced to measuring τ (the time of alignment of the signals of the reference and measuring channels of two-wave devices). In practice, one has to deal with random variables.

Main part. Based on the above, we assume that the measured random variable Q is distributed according to the normal law, which more accurately describes the real situation, i.e.

$$P(Q) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(Q-\bar{Q})^2}{2\sigma^2}\right) \quad (3)$$

We will look for the function of the relative measurement error from F_1 in the following form:

$$F(\Phi_1) = \left| \int_{-\infty}^{\infty} \frac{d\tau}{\tau} P(Q) dQ \right| \quad (4)$$

where

$$\begin{aligned} \frac{d\tau}{\tau} &= -\frac{\delta F_1}{F_1 k_2 \left(Q + \frac{1}{k_2} \ln \frac{\Phi_1}{\Phi_0}\right)} = -\frac{\delta F_1}{F_1 k_2} \cdot \frac{1}{Q+A} = \\ &= -\frac{\delta F_1}{k F_1} \cdot \frac{1}{Q+A+\Delta Q} = -\frac{\delta F_1}{F_1 k_2} \cdot \frac{1}{Q+A} \cdot \frac{1}{1+\frac{\Delta Q}{Q+A}}. \end{aligned} \quad (5)$$

Here

$$A = \frac{1}{k_2} \ln \frac{F_1}{F_0} \quad (6)$$

We expand the last factor in a series in powers of $\frac{\Delta Q}{Q+A}$ and, limiting ourselves to five terms of the series, we obtain the following:

$$\frac{d\tau}{\tau} = -\frac{\delta F_1}{F_1 k_2} \cdot \frac{1}{Q+A} \cdot \left[1 - \frac{\Delta Q}{Q+A} + \frac{\Delta Q^2}{(Q+A)^2} - \frac{\Delta Q^3}{(Q+A)^3} + \frac{\Delta Q^4}{(Q+A)^4}\right]. \quad (7)$$

$$\begin{aligned} \psi(F_1) &= -\frac{\delta F_1}{F_1 k_2 (\bar{Q}+A)} \frac{1}{\sigma\sqrt{2\pi}} \int_{-\infty}^{\infty} \left(1 - \frac{\Delta Q}{(\bar{Q}+A)} + \right. \\ &\quad \left. + \frac{\Delta Q^2}{(\bar{Q}+A)^2} - \frac{\Delta Q^3}{(\bar{Q}+A)^3} + \frac{\Delta Q^4}{(\bar{Q}+A)^4}\right) \exp\left(-\frac{\Delta Q^2}{2\sigma^2}\right) dQ \end{aligned}$$

After some changes we have:

$$\psi(F_1) = \left| -\frac{\delta F_1}{k_2 \Phi_1 \sigma\sqrt{2}} \left(\frac{1}{\bar{Q}+A} + \frac{\sigma^2}{(\bar{Q}+A)^3} + \frac{\sigma^4}{(\bar{Q}+A)^5} \right) \right| \quad (9)$$

In order to find the minimum of the function of the relative measurement error $d\tau/\tau$ from F_1 , we differentiate it by F_1 and equate it to zero:

$$\frac{d\psi(F_1)}{dF_1} = \frac{1}{k_2 F_1^2 \cdot \sigma\sqrt{2}} \cdot \left(\frac{1}{(\bar{Q}+A)} + \frac{\sigma^2}{(\bar{Q}+A)^3} \right) = 0$$

$$\begin{aligned} &+ \frac{3\sigma^4}{(\bar{Q}+A)^5} + \frac{1}{k_2 F_1 \sigma\sqrt{2}} \cdot \left(\frac{1}{(\bar{Q}+A)^2} + \frac{3\sigma^2}{(\bar{Q}+A)^4} + \frac{15\sigma^4}{(\bar{Q}+A)^6} \right) = \\ &= \frac{1}{k_2 \cdot F_1^2 \cdot \sigma\sqrt{2}} \cdot \left(\frac{1}{(\bar{Q}+A)} + \frac{1}{(\bar{Q}+A)^2} + \frac{\sigma^2}{(\bar{Q}+A)^3} + \frac{3\sigma^2}{(\bar{Q}+A)^4} + \frac{3\sigma^4}{(\bar{Q}+A)^5} + \frac{15\sigma^4}{(\bar{Q}+A)^6} \right) = 0 \end{aligned} \quad (10)$$

or

$$\begin{aligned} \frac{d\psi(F_1)}{dF_1} &= (\bar{Q}+A)^5 + \frac{1}{k_2} (\bar{Q}+A)^4 + \\ &+ \sigma^2 (\bar{Q}+A)^3 + 3\sigma^2 \frac{1}{k_2} (\bar{Q}+A)^2 + 3\sigma^4 (\bar{Q}+A) + 15\sigma^4 \frac{1}{k_2} = 0 \end{aligned} \quad (11)$$

After some transformations we have:

$$\begin{aligned} \frac{d\psi(F_1)}{dF_1} &= x^5 + \alpha x^4 + Vx^3 + 3\alpha V^2 x^2 + 3V^4 x + 15\alpha V^4 = 0, \end{aligned} \quad (12)$$

where

$$x = 1 + \frac{1}{k_2 \bar{Q}} \ln \frac{F_1}{F_0}, \quad (13)$$

$V = \frac{\sigma}{\bar{Q}}$ - coefficient of variation of the measured parameter, and:

$$\alpha = -\frac{1}{\ln \beta} = \frac{1}{k_2 \bar{Q}} \quad (14)$$

Solving equation (12) by the method of dividing the interval in half for all values of β and V , which are of practical interest, with respect to x , we obtain the optimal ratios F_1/F_0

$$\frac{F_1}{F_0} = \exp(-k_2 \bar{Q} \cdot (1-x)) = \beta^{(1-x)} = \beta \cdot \beta^{-x} \quad (14)$$

$$\text{For } Q = \text{Const} \quad \frac{\Phi_1}{\Phi_0} = \beta \cdot e^{-1} \quad (15)$$

We normalize (14) to (15) for the convenience of the estimate:

$$\frac{\beta \cdot \beta^{-x}}{\beta \cdot e^{-1}} = \frac{e}{\beta^x} = c \quad (16)$$

The C factor shows how different the optimal ratio is.

$$\frac{F_1}{F_0} \text{ (at } Q = \text{Const) from } \frac{F_{11}}{F_{01}} \text{ (at } Q = \text{Var)}$$

In fig. 1 and fig. 2 shows the dependencies respectively:

$$\frac{F_1}{F_0} = f(\beta, V), \quad (17) \quad c = f(\beta, \gamma) \quad (18)$$

Thus, using (17) and (18) for the given average values of the measured parameter Q and, accordingly, β , it is possible to determine the effective value F_0 for the selected measuring and reference wavelengths for the two-wave measurement method.

Conclusion: 1. A mathematical model is proposed for studying the processes of transformation of primary information. 2. Analytical studies were carried out to minimize the relative error of two-wave optoelectronic devices.

Figure 1. The curve of the optimal flow ratio taking into account the coefficient of variation of the measured parameter

3. The conditions for the choice of the magnitude of the initial flows and the wavelength of the reference and measuring channels are obtained, the observance of which ensures the minimization of the relative measurement error in the near-IR range. 4. The results obtained

allow us to conclude that the use of LED parameters in two-wave optoelectronic devices makes it possible to improve the metrological characteristics in general.

Figure 2. The degree of influence of unevenness (coefficient of variation) of the measured parameter by the value of the optimal ratio of flows F_0 and F_1 .

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PROCESSES AND MACHINES OF AGROENGINEERING SYSTEMS

FEATURES OF INTRODUCTION OF INNOVATIVE TECHNOLOGIES IN AGRICULTURE OF UZBEKISTAN

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ОСОБЕННОСТИ ВНЕДРЕНИЯ ИННОВАЦИОННЫХ ТЕХНОЛОГИЙ В СЕЛЬСКОМ ХОЗЯЙСТВЕ УЗБЕКИСТАНА

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ABSTRACT

The article describes the use of innovative technologies in agriculture and its development on the example of leading countries in the world, and the possibilities of using this technology in Uzbekistan.

АННОТАЦИЯ

В статье описывается использование инновационных технологий в сельском хозяйстве и его развитие на примере ведущих стран мира, а также возможности использования данной технологии в Узбекистане.

Keywords: innovative technologies, management, database, agriculture, precision farming, smart agriculture

Ключевые слова: инновационные технологии, управление, база данных, сельское хозяйство, точное земледелие, умное сельское хозяйство.

In accordance with the Decree PF-5853 of the President of the Republic of Uzbekistan dated October 23, 2019, in order to widely introduce market mechanisms in agriculture from 2020, complete digitization, increase the interest of farmers and peasants, cancel the state order for cotton and grain and procurement on market principles a gradual transition to the system was made. Collection, analysis and collection of statistical data through the development of a system

of science, education, information and consulting services, the widespread introduction of modern information technologies, including the use of effective forms of knowledge and information dissemination integrated with the production of research, education and consulting services in agriculture creation of a transparent system of network statistics, which provides for the introduction of reliable methods of distribution.

Development of a system of science, education, information and consulting services, including the use of effective forms of knowledge and information dissemination integrated with the production of research, education and consulting services in agriculture. Creation of a transparent system of network statistics, which provides for the introduction of reliable methods of collection, analysis and dissemination of statistical data through the widespread introduction of modern information technology.

At present, a new paradigm of world economic development is being formed on the basis of the use of innovations. Uzbekistan cannot deny these processes and must ensure the intensification of innovation processes in all sectors of the economy, including agriculture. The transition to an innovative path of economic development is associated not only with the need to address the problems that have accumulated in the agricultural sector of the Uzbek economy, but also the main tasks facing this sector. In the current situation, innovative activity is a key factor in agricultural development. Making the most of this factor is the only way to ensure the sustainable development of the agro-industrial complex in our country.

It should be noted that the scientist N.D. Kondratev, who developed the models of conjunctural cycles, based on the theory of large cycles with a duration of 50-60 years, made a significant contribution to the implementation of innovations. He proved that the transition to a new cycle is associated with the expansion of the stock of capital goods, which allows to create conditions for the introduction of accumulated inventions. N.D. Kondratev connected the transition to a new cycle with the development of technology: These changes are usually reflected in one or another combination, in technical inventions and discoveries, in profound changes in production and exchange techniques. According to N.D. Kondratev, scientific and technical innovations play an important role in changes in the economic life

of society. Given the need to ensure the cost-effectiveness of innovation, a number of Russian economists viewed innovation as "innovation in a new product or service, production method, organizational, financial, research and other areas that provide cost savings or create conditions for such savings." In the research of economists of our country, the term "innovation" began to be widely used in connection with the transition to market relations. A number of economists who studied the problems of innovative development of the agricultural sector, including A.A. Abduganiev, A.V. Vahobov, A.M. Kadyrov, S.S. Gulomov, Yo.A. Abdullaev, Ch. Murodov, T.H. Farmonov, O.P. Umurzakov, N.S. Khushmatov, A. Mukhtorov and others have carried out important scientific research. Thus, summarizing the above definitions, the concept of innovation can be defined as follows. Innovation is the introduction of a new or significantly improved product (product, service) or process, a new method of marketing, a new organizational style in the organization of workplaces or in external relations.

The main goal in the introduction of innovative technologies in Uzbekistan is the development of technology for the creation of software products for remote control of farms on indoor land plots and a system for remote control of agricultural production. In this case, indoor air temperature, air humidity, pH content in the air, soil temperature, soil chemical composition and soil composition are determined by detectors and transmitted to the sensors every minute. The indicators are displayed on the sensor monitor. The created device can be used for optional agricultural crops. Advantages of the device we create from the automation system of the 5th generation greenhouses, in which plant growth and development, plant demand for fertilizers is controlled on the basis of an automated system, all the work performed: drip irrigation, door and window opening and closing, climate control, crop ripening enters the main function and is under control.

Picture 1. Sensor-based control systems

In advanced agricultural systems, various "smart technologies" (smart sensors) are installed based on crop and environmental conditions. For example, climate control includes measuring temperature, humidity, nitrogen, potassium, phosphorus levels, nutrient supply, fruit ripening, and irrigation equipment. Their application guarantees an increase in productivity of at least 30%. In addition, improved systems will be introduced in the production and sales chains of agricultural products, which will eventually enable the collection of large amounts of electronic data.

As a result of the application of innovative technology, real-time remote control of agricultural production, irrigation, land parameters, fertilizer requirements, drip irrigation management and fruit ripening through mobile applications, and sensors and sensors based on the intelligent system can not only grow crops, but also it also helps to keep the crop full. In advanced systems in agriculture, various "smart technologies" (smart sensors) are installed on a single purpose, based on crop and environmental conditions. For example, pest and disease prediction, climate control - measuring temperature, humidity, carbon dioxide levels, nutrient supply and irrigation devices. The use of satellite data and remote sensing technologies will be tested in the rapid and accurate assessment of the

condition of agricultural lands and crops grown on them. This will allow to cultivate all types of agricultural crops in the country and assess the area. Satellite data will serve to form an information and analytical base for "accurate farming" in the country, and will allow farms to use automated systems.

In conclusion, there is an opportunity to modify the software for additional modules depending on the needs and desires of the innovative technology farm, created during many years of study and research above. Plant growth and development, which plant's demand for fertilizer is controlled under an automated system, all the work performed: drip irrigation, climate control, ripening of the crop is also part of the task of the device being created and controlled.

The main task of such systems is to create a database (DB), develop and use the necessary software, and manage the operation of the system. The convenience of the electronic system is that it is used in the process of processing, packaging, cleaning, sorting and delivery of the product even after harvesting. Intelligent farming technologies also play an important role in achieving high productivity and quality, reducing water consumption and production costs, and crop planning and forecasting.

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THE NEED FOR PORTABLE PUMPS TO IRRIGATE GARDENS WITH SNOW AND RAINWATER IN THE FOOTHILLS

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НЕОБХОДИМОСТЬ ПОРТАТИВНЫХ НАСОСОВ ДЛЯ ОРОШЕНИЯ САДОВ СНЕГОМ И ДОЖДЕВОЙ ВОДОЙ В ПРЕДГОРЬЯХ

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ABSTRACT

The article discusses the creation of export-oriented plantations of Manchurian walnut (*J.manshurica* Maxim), Siebold (*J.sieboldiana* Maxim), black (*J.hydra*) and gray (*Y.cinerea*) in the foothills, as well as the selection of fruit seedlings in cold-resistant wetlands, the importance of portable pumps for irrigation with snow and rainwater is emphasized.

АННОТАЦИЯ

В статье обсуждается создание экспортно-ориентированных плантаций ореха маньчжурского (*J.manshurica* Maxim), зибольда (*J.sieboldiana* Maxim), черного (*J.hydra*) и серого (*Y.cinerea*) в предгорьях, а также селекции саженцев плодов в холодоустойчивых заболоченных землях, подчеркивается важность переносных насосов при орошении снегом и дождевой водой.

Keywords: floods and melted snow, vegetation period, flat relief, rocks, ridges, steep slopes, irrigation rate.

Ключевые слова: паводки и талый снег, вегетационный период, равнинный рельеф, скалы, гребни, крутые склоны, поливная норма.

Increasing the volume of agricultural production to provide the population with food and industrial raw materials will be achieved by increasing the productivity of crops on these lands by improving the reclamation of existing irrigated areas. As a continuation of this work, we can say that the importance of rain and snow water is incomparable. Due to the natural climatic conditions of the regions of the country, the introduction of modern technologies for the creation of high-yielding, disease-resistant, fast-ripening varieties of water crops, water conservation, soil fertility, almond, handon in farms located in the foothills. Experiments have shown that planting trees such as pistachios and walnuts can lead to a positive change in the reclamation of their lands through the establishment of intensive orchards [6].

But floods and melting snow wash away these fertile soils, which is also a sensitive issue. All kinds of fruit can be grown on dry lands in the mountains and hills, as well as on the plains. It is desirable to grow almonds, walnuts, pecans, large fruit hawthorn, unabi and handon pistachios. The fruits that bear fruit in the foothills and foothills live 200 years, walnuts, almonds, hazelnuts and pistachios 60-80 years. One walnut tree yields 100-200 kg, almonds 15ts and more, pistachios and hazelnuts 20ts [1].

There are peculiarities of growing fruit trees in the foothills and foothills. First of all you need to choose the right fruit varieties. These varieties should be as drought-resistant as possible, ripen quickly and have a short growing season. Varieties that are transferred to higher climbs should also be more resistant to frost. On the slopes of the mountains, ie in areas with a rainfall of 350-400 mm, it is possible to grow pistachios and unabi from very drought-resistant varieties. When planting these fruits, it is advisable to choose lands with as flat a terrain as possible, without cliffs and ridges, without large stones. It is good that the slope of the slopes on which the garden is built is up to 15 0. For almonds, steep slopes with a slope of 30-350 are preferred [6].

The walnut tree ripens in the second half of September, early October. The fruit contains 40-50%, in rare cases 60% of the core. The walnut tree is long, with some bushes living up to 300 years. Nuts are usually propagated by seeds. The twigs that grow from the root take better root than the cuttings. The twigs from the stems also grow well and come into fruition in the third year. The walnut tree is a warm and light-loving plant, but its cold-tolerant varieties are also found.

Of these, Manchurian walnut (*J.manshurica* Maxim). This walnut is grown as a forest tree and ornamental

tree. Relatively drought and winter hardy. Used as a graft for ordinary nuts. Other species of walnut include Zibolda (J.sieboldiana Maxim) and Y.cordiformus, which grow in Japan, and black (J.hydra) and gray (Y.cinerea), which grow in the United States.

The average annual rainfall and snowfall per square meter in the world is 100 mm in vertical height. from 800 mm. This means that every square meter of land receives an average of 100 liters to 800 liters of rain and snow per year. This figure is confirmed to be about 200 mm to 300 mm for our Republic, based on long-term data, and this figure is 240 mm for Andijan region. are shown in the statistics [7].

As we have all witnessed, some of the rain and snow that falls on the ground can be swallowed up on the ground and some can evaporate. This issue is one of the most pressing issues of today, which is the need for fresh water and will help to solve the problem, at least in part, as it grows day by day.

It is no secret that in many parts of the country the amount of unused land is a large part of the total land area, especially in the foothills and foothills, where it is impossible to cultivate or irrigate.

Therefore, in such places, an accumulator device for collecting rain and snow water was created in the future. in this case, it will be possible to select a pump in order to fill the device and continue watering again by pumping the water flowing from the canal, or ditches passing through the low slopes of the area.

It is enough to water almond, walnut fruit seedlings over three years old, without losing their condition, at least 3 times a year from 5 liters to 10 liters for 1 seedling during the hot summer months of the year [2].

Irrigation norms are determined by the age of fruit trees, the mechanical composition of the soil, the level of groundwater, high and low yields, and other factors.

The irrigation norm used for young gardens varies from 500 m³ per hectare, and for irrigated gardens the irrigation norm varies from 800 to 1000 m³ / ha.

In areas with gravel, groundwater, this norm is reduced to 300-500 m³ per hectare. The water supply rate is 1200-1500-2000 m³ per hectare [5].

To do this, assume that the height of the selected location of the device is 30-35 m, and the length of the ditch or canal in the flowing low to the location of the device is 2000 m. The selection of the pump type for the selected test site is done as follows. We determine the water transfer of the pump by filling the water storage tank over time [4].

$$Q = \frac{W}{t} = 500 \setminus 21000 = \text{m}^3/\text{c}$$

where W - is the reservoir volume, t - is the water transfer time, s

$$t = 6 \cdot 3600 = 21600$$

$$\text{Pump pressure: } H = H_r + \sum h_w [1]$$

$$\text{Here: } H_r = \sqrt{V_{\text{Occ}_{\text{max}}}} - \sqrt{V_{\text{Mcc}_{\text{min}}}}$$

$\sqrt{V_{\text{Ucc}_{\text{max}}}}$ - geodesic marking of the maximum water level in the cuv reservoir

$\sqrt{V_{\text{Mcc}_{\text{min}}}}$ - the minimum geodesic mark of the water in the muv source

$\sum h_w$ - the sum of the pressure losses due to the local and longitudinal resistances of the pump in the pipes

$\sum h_w = h_l + h_m$ - pressure losses along the length of the pipe, m

$h_l = i \times l$ - where l is the length of the pipe, m;

i - the hydraulic slope is assumed in the initial calculations to be $i = 0.003-0.004$. The pressure loss to local resistances is assumed to be $h_m = 0.7 \div 2.0$ m. Once the dimensions of the suction and pressure pipes are determined, the actual values of the pressure losses in them are found on the basis of hydraulic calculations [3].

Based on the water transfer Q and pressure H of the pump defined above, we select the pump type.

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TRANSPORT

IMPLEMENTATION OF PUNCHING MACHINES FOR UZBEKISTAN

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ВНЕДРЕНИЕ ПРОФИЛЬНЫХ МАШИН ДЛЯ УЗБЕКИСТАНА

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ABSTRACT

Nowadays, each field is moving up day by day, particularly, machine-building, automobile-building and agriculture and other areas in Uzbekistan. Punching machine is one of the most important process of automobile production and all of the factories widely use these tools in our country. Hence, if it is produced in Uzbekistan, this will not only supply automobile industry but it also will be useful for manufacturers of furniture and the crafts with help of new technologies will become much easier. In addition to this, it will lead to the increase of the competitive ability of the companies.

АННОТАЦИЯ

В настоящее время каждое направление развивается день ото дня, в частности, машиностроение, автомобилестроение, сельское хозяйство и другие области в Узбекистане. Вырубной станок - один из важнейших процессов автомобильного производства, и все предприятия нашей страны широко используют этот инструмент. Следовательно, если он будет производиться в Узбекистане, это будет важно не только для автомобильной промышленности, но и для производителей мебели, а ремесла с помощью новых технологий станут намного проще. Кроме того, это приведет к повышению конкурентоспособности компаний.

Keywords: Press machine (pressing forms), workpiece, Hydraulic press, hydraulic cylinder, energy.

Ключевые слова: Пресс-машина (пресс-формы), заготовка, Гидравлический пресс, гидроцилиндр, энергия.

Uzbekistan has its political, economical and social independence. Many changes have occurred in all spheres. Naturally, by increasing the number of human being things like making discoveries and developing moral intellectual aspects in our society is no wonder. Nowadays, each field is moving up day by day, particularly, machine-building, automobile-building and agriculture and other areas in Uzbekistan. It is planned to establish some number of joint-ventures which will develop the automobile industry, eliminate the import from abroad and also will create the regular occupation. Many factories and companies will be provided with new modern technologies, hence, this in our commonwealth will expand the automobile industry and also will help to create regular occupations to local people. Assuredly, the development in manufacture gives good results for the country as well. For instance, machine building industry does make a great contribution for increasing the economy of Uzbekistan [1].

Punching machine is one of the most important process of automobile production and all of the factories

widely use these tools in our country. For instance, "UZ Auto Motors co", "UZ SeamYung co", "UZ HANWOO" and others. Almost all press machines and dies (pressing forms) are brought from South Korea, Germany and China. According to the internal demand and export abilities, these tools should be produced in Uzbekistan and that means to establish manufacturing punching and pressing machines and dies. So, the country will be able to supply the demanded tools to the automobile, furniture and other technical industries. If we produce punching and pressing machines, dies, and tools conjointly oriented on International Standard Organization (ISO), this will reduce the quantity of import and create regular job for population as mentioned above.

Hence, if it is produced in Uzbekistan, this will not only supply automobile industry but it also will be useful for manufacturers of furniture and the crafts with help of new technologies will become much easier. In addition to this, it will lead to the increase of the competitive ability of the companies.

Press machine is a devise equipment that changes the shape of the work-piece by the application of pressure. Hydraulic press machine is a machine which uses a hydraulic cylinder to provide for a compressive power which Liquid does not absorb any of the supplied force capable of moving much higher loads and provides much higher energy due to the incompressibility, the hydraulic working fluid is mainly incompressible, leads to a minimum of spring action. When hydraulic fluid flow is stopped, the slightest movement of the load releases the pressure on the load, there is no need to bleed off pressurized air to release the pressure on the load. Pneumatic press machine has pneumatic systems, that are used widely in industry, and companies, commonly plumbed with compressed air or compressed inert gases. This is due to the obviously located and electrically powered compressor. Because of the simplicity of design, control-machines are easily designed using standard cylinders and other components, and work via simple on-off control.

The punch press, the punching of holes is often accomplished with die sets that also perform folding and forming, a punch press is designed specifically for making different shaped holes and cutouts on sheet metal and materials. The punch press is fitted with punches and dies of the size and form of the hole required. For irregular and non-standard holes, the modern punch press is capable of gnawing. This refers to a series of successive hits following a predetermined pattern that creates the cutout [2].

The punching action is accomplished by a vertical moving ram, hence, the energy of the punch through the material and a die through where the resulting slug is ejected. Additionally, a tool to hold the material in place as the punch is with drawn, call a stripper, is often an inseparable part of the punch tool. The press ram may be moved manually, mechanically, or hydraulically. The manual press, usually a tabletop model, is capable of generating about four tons of power. Mechanical punch presses use a system of flywheels, gears, and eccentrics to hit the ram. Hydraulic presses use liquid pressure to put in the force the punching action. These last two types can generate 60 tons of force with some larger models creating over 150 tons. Mechanical presses can operate faster than hydraulic models but the later can exert more punching pressure more uniformly on the thicker work-piece.

The equipment required to convert raw material into a required shape is commonly referred to as tooling. The process of manufacturing the equipment that aids in the conversion of a raw material into a required shape is commonly referred to as tool, die and mold making. Materials converted include that are metals, aluminum, polymers. Tooling is found in almost all manufacturing industries including automotive, rail and marine, mining, defense, aerospace, leisure, Agri processing, packaging mineral beneficiation. The manufacturing industry is up to the availability of a good tool, die and mold making industry. Tools, dies and molds are the obvious quality

standard, lifecycle cost, manufacturing output ability, cost competitiveness of the product produced.

A machine tool is a powered mechanical device, typically used to supply metal components of tools by machining, which is the selective removal of metal. The term machine tool is usually reserved for tools that use energy source other than human action, but they can be powered by people if separately install. Many historians of technology consider that the true machine tools were born when direct human involvement was removed from the forming or stamping process of the various kinds of tools. Machine tools can be powered from a variety of sources. Human and animal power are options that can be replaced by the energy captured through the use of waterwheels. However, machine tools really began to develop after the development of the steam engine, leading to the Industrial Revolution. Today, most are powered by electricity [3].

A die is a specialized tool which is used in manufacturing industries to cut, shape and form a wide variety of products and components. Like molds and templates, dies are generally customized and uniquely matched to the product they are used to create. Products made with dies range from simple paper clips to complex pieces which are used in advanced technology. Forming dies are typically made by tool and die makers and put into production after mounting into a press. The die is a metal block that is used for forming materials like sheet metal and plastic. For the vacuum forming of plastic sheet only a single form is used, typically to form transparent plastic containers for goods. Vacuum forming is considered as a simple molding thermoforming process but it uses the same principles as die shaping. For the forming of sheet metal, such as automobile body parts, two parts may be used, one, called the punch, performs the stretching, bending, or blanking action, while another part, called the die block, securely clamps the workpiece and supplies similar, stretching, bending, and blanking operation. The workpiece may pass through several stages using various tools or actions to success the final form. In the condition of an automotive component there will commonly be a shearing operation after the basic shaping is done and then additional crimping or rolling operations to ensure that all sharp edges are hidden and to add hardy to the panel [3].

As a conclusion, we may suggest the basic intent of producing Press machines and dies, to provide new tools and technologies in machine building, automobile building and crafts. Furthermore, indigenization these machines to Uzbekistan's joint-ventures can give opportunities to create new occupations to the population, eliminating quantity of import and there will be no need any engineers-specialists from foreign countries, we will have enough intellectual engineers here. Punch and press machines can be manufactured at high rate with the available machines. Particularly, manufacturing normally requires hydraulic press machines and pneumatic press machine to operate at a very high quality.

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DEVELOPMENT OF METHODS FOR DETECTING AND PREVENTING FAULTS IN THE BRAKING SYSTEM OF CARS

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РАЗРАБОТКА МЕТОДОВ ОБНАРУЖЕНИЯ И ПРЕДОТВРАЩЕНИЯ НЕИСПРАВНОСТЕЙ В ТОРМОЗНОЙ СИСТЕМЕ АВТОМОБИЛЕЙ

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ABSTRACT

This article lists the most common failures in the brake systems of cars produced by UzAuto Motors, identifies the causes and develops solutions.

АННОТАЦИЯ

В данной статье перечислены наиболее частые отказы тормозных систем автомобилей производства UzAuto Motors, определены причины и разработаны решения.

Keywords: car, brake system, active safety, traffic accident, reliability, fault, malfunction, tire, wheel mounting angles, resource.

Ключевые слова: автомобиль, тормозная система, активная безопасность, дорожно-транспортное происшествие, надежность, неисправность, неисправность, шина, углы крепления колес, ресурс.

INTRODUCTION

It is impossible to create the basis of a developed society without modern transport, which is highly developed. Because transport is an integral part of any

productive force. The role of road transport in the transportation of goods in the national economy and agriculture is enormous. Vehicles play an important role in the transportation of natural resources, internal and external cargo turnover of the economy, etc. In addition,

transport plays an important role in the rational use of labor resources, increasing the state's defense capabilities.

The number of cars on the country's roads continues to grow steadily. Modern cars have very high dynamic properties, making them high-hazard objects. Despite the measures taken by the state to improve road safety, the number of road accidents is not decreasing.

Automobile plants and engineering companies are constantly improving the design of vehicles and, above all, improving their safety. Much attention is paid to improving the braking control system of the vehicle as a means of creating active safety.

Thus, due to the increase in energy intensity of cars and the increase in the number of cars, the increase in braking in cars leads to an increase in the demand for car brakes, both in the design of brakes and in the use of materials.

METHOD

Based on the above, the development of scientific and practical research and innovation on constantly produced cars is a requirement of the times.

In order for our cars manufactured in our country to have a place in the world market, their design and operational reliability must meet international standards.

During the use of UzAuto Motors in our country, that is, during its operation, there are operational failures in cars, especially in the brake system of cars.

RESULT

The reliability of the brake system is of great importance during the operation of vehicles. Therefore, it is necessary to ensure the reliability of the brake system of domestic cars during operation. Faults in this system can reduce the safety of passengers in the car. This can lead to adverse events. In order to prevent such incidents, it is necessary to identify, study and eliminate faults in the brake system.

External factors affecting the operation of the brake system.

Tires

The brakes of the tires that make different contacts and adhesions on the road are different. Therefore, it is recommended that the tire pressure be kept within the normal range. The tread depth and shape of the tires on the same axle should be approximately the same.

Car loading

If the car is not loaded evenly, more braking torque is required than other wheels to brake the heavier wheels. To brake a fully loaded vehicle, you need to apply the brakes with great force.

Wheel mounting angles.

Violation of the mounting angles will cause the vehicle to pull sideways when braking.

Fault information. Damage to the car and loss of performance can affect its reliability. In the event of a malfunction, the vehicle will lose all or part of its ability to operate and will not be able to perform the specified number of transport operations. Reliability is determined by the parameters that determine the performance of the car over time. Considering the performance of the car or its components from the point of view of reliability, the

following factors can be distinguished: the average work performed before failure, the time of recovery after failure, the distance traveled to the final state, a certain distance the number of failures from the time they are accounted for until they are written off. For non-repairable elements of the car, the first failure is the last failure, and the condition of the element is the last. Factors affecting the reliability of the car are very diverse and multifaceted, such as different processes or climatic conditions of use during the production of the car, operating mode, quality of fuels and lubricants, quality of maintenance, we can say that the above parameters are random variables at the expense of driving skills and so on. The reliability of a car as a whole is equal to the sum of the reliability of its components and parts. That is, the reliability of the car as a whole or in individual units and parts can be assessed. There are a number of ways to determine the reliability of a vehicle, including: theoretical calculations, experiments, and experimental determinations. The reliability of cars should be calculated on the basis of probability theory and the general laws of mathematical statistics, based on the observation of cars in operation, the collection and processing of data on defects, repairs. In addition to the average value of the indicator, the distribution laws and the confidence limits must be determined for a given probability. A failure is a condition in which a vehicle meets the performance requirements, but does not meet the secondary technical requirements. Examples of faults include headlight breakage and body crush [1].

DISCUSSION

In general, the causes of disorders can be divided into three types:

- constructive, ie the imperfect structure of the car, its units and mechanisms, the inadequacy of the materials selected at the time of design, and so on;
- technological deficiencies in the technology of production of the car or its parts, errors and the like;
- poor quality or untimely maintenance of the vehicle during operation, ie bad climate and road conditions.

This means that the quality of the car depends mainly on its high reliability, and reliability is ensured during the design and production processes. In order to increase the reliability of the car, it is necessary to pay attention to the design factors that affect it during design. It is known that 80-85% of car breakdowns are caused by wear and tear of parts due to friction. Therefore, during the design phase, great attention should be paid to the conversion of slippery friction into rolling friction, reducing the load on the friction surface, protecting the surfaces of the friction pairs from contaminants, and compensating for wear. the rate of slippage and pressure on the surfaces of friction pairs varies widely over time [2].

In addition, the following brake failures are observed during the operation of Uz Auto Motors:

- Weakness of the brakes,
- the wheels are not free of braking or do not turn,
- The brakes on the same axle do not work the same
- air intake and brake fluid leakage into the hydraulic drive system,

Weakening of the brakes is observed when the brake mechanisms and drive adjustments are broken, the brake pads are dirty or lubricated, air enters the drive system, and the volume of brake fluid is reduced. Decreased braking efficiency in vehicles with a hydraulic booster can also be caused by the booster not working properly.

The main reasons why the wheels are not free from braking are the fact that the brake mechanism parts increase their volume due to heat due to excessive braking and the friction surfaces stick to each other.

Uneven brakes on the wheels can cause the car to slip sideways during braking. This condition is often caused by a misalignment of the brakes, as well as the reasons given above.

When air enters the hydraulic drive system, the braking efficiency decreases. This is especially true when the brake pedal is depressed. In this case, you have to press the pedal several times for better braking. If the brake fluid leaks from the system due to a leak, the brake system will fail or one of the circuits will fail in two-stroke drives.

According to scientific researches of domestic and foreign scientists, 80-85% of car breakdowns are caused by friction and wear of parts.

An analysis of the problem situation in Central Asia shows that the service life of vehicles operating in high temperature and dusty conditions is very short, and their reliability and performance are low. In particular, road and climatic conditions have the greatest impact on brake system details [3].

CONCLUSION

Uzbekistan has a hot climate. The geographical location, relief, natural-climatic and hydrogeological conditions of the territory of Uzbekistan are different and unique.

High temperatures and solar radiation have a significant negative impact on the performance and service life of rubber and plastic parts. Plastic parts lose their shape and material properties. High levels of dust in the air can lead to rapid wear of brake parts.

Having thoroughly studied the topic of the dissertation, based on the road climate in Central Asia, the following recommendations were developed to improve the performance of the brake system of Cobalt cars:

- Due to the hot, dusty climate of Central Asia, the parts of the car brake system are made of materials resistant to abrasive particles;

- In hot climates, the brakes of cars should be well protected, mainly from dust;
- Due to the hot and dry climate, the brake parts of cars should be made of heat-resistant rubber;
- Brake fluids should not evaporate or change their properties as a result of heat in hot climates;
- Lubricant parts must be well sealed;
- Brake parts must not change their size under the influence of heat and must be made of materials that dissipate heat well;

In addition, given that most of the cars produced by UzAutoMotors are exported to Russia, due to high humidity in Russia, not only the brake system parts, but all car parts must be made of corrosion-resistant materials;

The latest active safety systems in cars should be used to increase the safety of these cars:

As a result of the study of the topic, the main technological measures to increase the strength and durability of the brake system were included:

- Production of corrosion-resistant materials for various operating conditions of car brakes and production of high-quality semi-finished products close to the finished parts in terms of size;
- Development of technological methods that allow to produce parts that are stable in a given accuracy and size, as well as physical and mechanical properties;
- The use of quality control methods for materials, blanks and finished products that meet the relevant indicators of reliability;

The use of reinforcing machining processes (high-frequency current, seminitiating, cyanidation, chromium plating, etc.) that ensure the required quality of the working surface of brake system parts with high resistance to corrosion and breakage in different operating conditions.

In addition, the causes of the disorder in general are divided into three types:

- constructive, ie the imperfect structure of the car, its units and mechanisms, the inadequacy of the materials selected at the time of design, and so on;
- technological deficiencies in the technology of production of the car or its parts, errors and the like;
- poor quality or untimely maintenance of the vehicle during operation, ie bad climate and road conditions.

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FOOD TECHNOLOGY

ROOT REMNANTS OF SECONDARY CROPS

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КОРНЕВЫЕ ОСТАТКИ ВТОРОСТЕПЕННЫХ КУЛЬТУР

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ABSTRACT

After each crop, a certain amount of root residue remains in the soil layers. They are converted into various forms of nutrients under the influence of microorganisms over a period of time and have an effect on the maintenance or increase of soil fertility.

АННОТАЦИЯ

После каждого урожая в слоях почвы остается определенное количество остатков корней. Они превращаются в различные формы питательных веществ под воздействием микроорганизмов в течение определенного периода времени и влияют на поддержание или повышение плодородия почвы.

Keywords: nutrients, soil fertility, root residues, humus, planting rate.

Ключевые слова: элементы питания, плодородие почвы, корневые остатки, перегной, норма посева.

INTRODUCTION

The country is expanding the cultivation of non-traditional crops, including the modernization of the agricultural sector through the strengthening of agricultural reform, increasing the share of diversified farms, processing of agricultural products in rural areas, introduction of modern technologies, directing foreign investment to rural areas. the volume of diversification is increasing. With this in mind, the country pays great attention to expanding soybean cultivation.

REVIEW OF LITERATURE

After each crop, a certain amount of root residue remains in the soil layers. They are converted into various forms of nutrients under the influence of

microorganisms over a period of time and have an effect on the maintenance or increase of soil fertility. In this case, the effect of humus on the maintenance of soil fertility is large, and humus synthesizes the biomass in the soil and increases its amount. This, of course, is directly related to the amount of organic residue left in the soil by plants, such as roots.

METHOD

However, it should be noted that the amount of roots left in the soil depends not only on the type of crop, but also on their planting norms.

In our study, we also determined the amount of roots left in the soil by field crops at the end of each plant's application period (Table 1).

Table 1.

The amount of roots and stems left in the 0–50 sm layer of soil at the end of the period of validity of repeated crops (average three-year)

Option serial number	Planting norms, pcs	Root residue, t / ha	Mouth residue, t / ha	Total root residue, t / ha
Moss				
1	60 thousand	0,92	0,32	1,25
2	80 thousand	1,02	0,34	1,35
3	100 thousand	1,10	0,45	1,55
4	120 thousand	1,14	0,48	1,62
Corn				
5	60 thousand	3,43	0,87	4,30
6	70 thousand	3,50	0,85	4,35
7	80 thousand	3,51	0,91	4,42
8	90 thousand	3,60	0,95	4,55
Tariq				
9	1,5 million	1,94	1,30	3,24
10	2,0 million	2,03	1,43	3,46
11	2,5 million	2,20	1,51	3,71
12	3,0 million	2,24	1,56	3,80
Soy				
13	180 thousand	1,73	0,74	2,47
14	220 thousand	1,81	0,79	2,60
15	260 thousand	1,90	0,90	2,80
16	300 thousand	1,96	0,93	2,89

The results show that the increase in planting norms in all crops also has an effect on the increase in the amount of roots remaining in the 0-50 cm layer of soil. However, the data obtained once again confirmed that crop types are also directly related to the amount of root residues remaining in the soil.

For example, in options 1, 2, 3 and 4, where moss is planted, the amount of roots and furrows in the 0-50 cm layer of soil also varies depending on the planting norms. Left an organic residue of 32 t / ha. Although the total amount is 1.25 t / ha, it is the lowest of these options.

The data obtained in Option 2 of the experiment (80,000 units) were also slightly different from Option 1, leaving a total of 1.35 t / ha of organic residue, of which 1.02 t / ha was root and 0.34 t / ha was organic. formed the mouth. In variants 3 and 4, where seedling thickness was maintained at 100 and 120 thousand / ha, the highest values of 1.55 and 1.62 t / ha were achieved without significant differences.

RESULT AND DISCUSSIONS

Corn is also a crop that leaves a large amount of root residues in the soil, of course, the amount of roots and stems left depends on soil types, crop varieties, planting norms and many other factors.

In our study, too, the data obtained in the variants in which corn was planted (5, 6, 7, and 8) confirm that after

this crop, the largest amount of root and root remnants remained in the 0–50 cm layer of soil. However, due to the fact that this crop absorbs a lot of nutrients from the soil, the remnants of roots and stems from it only provide some preservation of soil fertility.

The fact that the millet crop also leaves a large number of roots has been confirmed in our research. Of course, this is due to the planting norms, with 1.5 million seedlings per hectare, which is the lowest (3.24 t / ha) of the planted varieties, of which the root residue is 1.94 t / ha and the root residue is 1.30. t / ha, in 10 variants planted with 2.0 million seeds per hectare, the root residue was 2.03 t / ha, the residual residue was 1.43 t / ha and the total amount was 3.46 t / ha. confirmed.

In variants 11 and 12 with a thickness of 2.5 million and 3.0 million seedlings per hectare, the amount of roots and furrows in the 0-50 cm layer of soil is the highest in these crop variants, ie roots in proportion to the experimental variants - 2.20 and 2, The total amount of 24 t / ha was 1.51 and 1.56 t / ha, respectively - 3.71 and 3.80 t / ha.

The nature of the soybean root and the presence of the endogenous bacterium (*Rhizobium Japonica*) in it leads to nitrogen enrichment of the soil, which accumulates 70-100 kg of biological nitrogen per hectare per year. That is why the remains of roots and stems left by this crop are also important (Atabaeva).

The three-year average of the results of our study confirms that in the shade-planted variants (13, 14, 15, and 16), the variant with the highest number of roots and seedlings collected was 16 variants with a seedling thickness of 300,000 bushes.

A total of 2.89 t / ha of organic residue was collected, of which 1.96 t / ha was due to roots and 0.93 t / ha was due to weeds.

The results obtained in Option 15, where 260,000 seedlings were stored, were similar to those in Option 16, with a root rate of 1.90 t / ha, a root rate of 0.90 t / ha, and a total of 2.80 t / ha. formed. The difference between these options is 0.06; The data obtained confirm that 0.03 and 0.09 t / ha.

If we analyze in terms of the type of crops planted in the study, among the secondary crops planted after winter wheat, corn is the crop with the largest number of roots and stalks, 2.93 t / ha compared to moss and 0.75 t / ha compared to tariq. e, 1.66 t / ha more rootstocks were collected than in the shade. It is worth mentioning that in our research, the amount of tariq is 1.99-2.18 t / ha relative to moss, 1.22-1.27 t / ha compared to soybean, and 1.22-1.27 t / ha compared to soybean. is characterized by the abundance of / e.

CONCLUSIONS

Of course, a certain amount of root residues left from these planted repeat crops are converted into nutrients necessary for the plant as a result of various biochemical processes that take place in the soil. This naturally increases the fertility of the soil and has a positive effect on increasing not only the yield of crops planted next year, but also its quality indicators.

In general, 90,000 bushels of corn, 3.0 million bushels of millet, 260,000 bushels of soybeans and 120,000 bushels of moss per hectare will be stored in the 0-50 cm layer of soil as a secondary crop. However, it should be noted that these root and root remnants can only have an impact on the optimal growth and development of the crop to be planted next year.

Therefore, it has been proved that it is expedient to cultivate the above-mentioned crops at a thickness of 100,000 bushes per hectare, 80,000 bushels of corn, 2.5 million bushels of millet and 260,000 bushels of soybeans. This is because the defined seedling thicknesses of crops have a positive effect not only on the increase in the amount of nutrients in the soil, but also on the increase in crop yields. We will dwell on the data related to these points in the sections on the growth and yield of subsequent crops, once again on the basis of more detailed data.

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CHEMICAL ENGINEERING**CHANGE OF THE AMOUNT OF HYDOXYLNITROGEN CONTAIN COMPOUND BASED
ON MONOETHANOLAMINE IN THE REACTION MEDIUM****Mirodil Janaev**

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Uzbekistan, TashkentE-mail: MGA1953@mail.ru**ИЗМЕНЕНИЕ КОЛИЧЕСТВА ГИДРОКСИЛАЗОТСОДЕРЖАЩЕГО СОЕДИНЕНИЯ
НА ОСНОВЕ МОНОЭТАНОЛАМИНА В РЕАКЦИОННОЙ СРЕДЕ****Жанаев Миродил Орифжон Угли**

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ABSTRACT

The reaction of aldehydes with amines, in particular amino alcohols, has been studied for a rather long time. The condensation of amino alcohols having a primary amino group with formaldehyde flows through the Schiff base and is characterized by the existence of tautomeric equilibrium [1]. In many cases, this equilibrium is shifted towards the cyclic product. It is noted that the interaction of monoethanolamine with formaldehyde leads to N, N', N'' - tris (β-hydroxyethyl) hexahydro-S-triazine or N, N-bisoxazolidine. The type of end product is determined by the reaction conditions and the molar ratio of amino alcohol: formaldehyde. The chromatogram of purified vacuum - distillation of the final product obtained at a molar ratio of monoethanolamine: formaldehyde = 1: 2 shows that this is an individual compound with a retention time of 4.173 s [2]. With an increase in the molar ratio of monoethanolamine: formaldehyde = 1: 2, the final product consists of only one product with a retention time of 4.187 s, which corresponds to methylene bisoxazolidine. A further increase in the molar ratio of monoethanolamine: formaldehyde to 1: 4 leads to the fact that the chromatogram of the final product distilled in vacuum contains a broad peak [3] with a retention time of 4.157 s and a gentle very wide peak with a retention time of 5.553 s. In this case, there are trace amounts of products that are apparently formed by side reactions involving formaldehyde, which is taken in large excess from stoichiometric.

АННОТАЦИЯ

Взаимодействие альдегидов с аминами, в частности аминспиртами, изучается достаточно давно. Конденсация аминспиртов, имеющих первичную аминогруппу, с формальдегидом протекает через основание Шиффа и характеризуется существованием таутомерного равновесия [1]. Во многих случаях это равновесие смещено в сторону циклического продукта. Отмечено, что взаимодействие моноэтаноламина с формальдегидом приводит к N, N', N'' - трис (β-гидроксиэтил) гексагидро-S-триазины или N, N-бисоксазолидину. Тип конечного продукта определяется условиями реакции и молярным соотношением аминспирт: формальдегид. Хроматограмма очищенного вакуум-перегонки конечного продукта, полученного при молярном соотношении моноэтаноламин: формальдегид = 1: 2, показывает, что это индивидуальное соединение со временем удерживания 4,173 с [2]. При увеличении молярного соотношения моноэтаноламин: формальдегид = 1: 2 конечный продукт состоит только из одного продукта со временем удерживания 4,187 с, что соответствует метиленбисоксазолидину. Дальнейшее увеличение молярного соотношения моноэтаноламин: формальдегид до 1: 4 приводит к тому, что хроматограмма конечного продукта, перегоняемого в вакууме, содержит широкий пик [3] с временем удерживания 4,157 с и пологий очень широкий пик с временем удерживания 5,553 с. В этом случае присутствуют следовые количества продуктов, которые, по-видимому, образуются в результате побочных реакций с участием формальдегида, который взят в большом избытке от стехиометрического.

Keywords: monoethanolamine, formaldehyde, hydroxy-nitrogen-containing compound, N, N', N'' - tris (β-hydroxyethyl) hexahydro-S-triazine.

Ключевые слова: моноэтаноламин, формальдегид, гидроксиазотсодержащее соединение, N, N', N'' - трис (β-гидроксиэтил) гексагидро-S-триазин.

Introduction: In recent years, the world's industry has been growing rapidly. The growth of the industry is due to various new developments and innovative projects. In particular, the attention paid to the chemical industry of our country has given another impetus to the development of the industry in our country. Extensive scientific and practical research proves that it is possible to produce some of the imported products and semi-finished products in our country [4]. Amino alcohols are heterofunctional compounds that exhibit chemical properties of both amines and alcohols. In this case, the mutual influence of functional groups leads to the manifestation of a number of features by them. In particular, due to the electron-withdrawing nature of hydroxyl groups [5], the basicity of amino alcohols and the nucleophilicity of the nitrogen atom of them are lower than in analogous aliphatic amines. In turn, the nucleophilicity of the oxygen atom of the hydroxyl group is also reduced due to the negative inductive effect of the amino group. The foregoing determines the moderate reactivity of the functional groups of amino alcohols in reactions characteristic of them, in particular, in nucleophilic addition reactions

Our studies were conducted on hydroxyl nitrogen-fixing (GAS) compounds. GAS compounds are widely

used in various industries. It is used in the purification of H₂S and various sour gases from oil and gas [6], in the production of polyurethane foam (KPU) [7] and in many other fields. Polyurethane foam (KPU) is used in many industries, including

Exsperimental part: It is widely used as the most effective insulating material in the construction of buildings and structures, in the production of sandwich panels, in household appliances. This, of course, gives it its own characteristics and convenience, depending on the area of application.

Monoethanolamine (MEA) and formaldehyde (FA) were synthesized in a 1: 1 mole ratio as the hydroxyl nitrogen preservative compound, and the azometin group preservative was obtained. Trimerization of the resulting substance produces N, N', N'' -tris- (b-oxoethyl) -hyxohydro-S-triazine (TOEGT) [8]. When we analyzed the TOEGT, it was found that it contained a hydrosil group and a tertiary nitrogen, which could allow it to be used as a catalytic binding agent. As evidence, the alternative catalytic activity of the catalyst lapramol-294 in the production of PPU-307 foam polyurethane, which is widely used in various industries, has been studied [9].

The study lasted from three to ten minutes. The results show that NCO Group percentages have increased at different times. The higher the NCO group, the better the sewing of our product. The graph below shows that the results increase over time. Add 0.05 normal TOEGT and 0.05 normal TDI reaction mixture separately to each

vessel and mix in a thermostat at 40 °C for three to ten minutes, then pour them into a vessel containing 0.1 normal DEA reaction mixture. When we titrated with HCL, we obtained the following results.

Change of NCO group% concentration in the reaction mixture. Fig-1.

Figure 1. Change of NCO group% concentration in the reaction mixture

In our study, we studied the reaction between the NCO group of toluene diisocyanate (TDI) between the hydroxyl groups in TOEGT and the change in concentration per unit time at 40°C. This, of course, proved that

TOEGT, synthesized from local raw materials, is sufficiently effective when used in place of lapramol-294.

Thus, a systematic study was carried out to study the composition of the reaction mixture and the direction of the reaction of monoethanolamine with formaldehyde.

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ENERGY INDUSTRY

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IMPROVING THE EFFICIENCY OF THE PYROLYSIS DEVICE
FOR THERMAL PROCESSING OF MUNICIPAL SOLID WASTE*Toshmamatov Bobir**Senior Lecturer**Karshi engineering-economics institute,**Uzbekistan, Karshi**E-mail: bobur160189@mail.ru*ПОВЫШЕНИЕ ЭФФЕКТИВНОСТИ ПИРОЛИЗОГО УСТАНОВКА
ДЛЯ ТЕРМИЧЕСКОЙ ПЕРЕРАБОТКИ ТВЕРДЫХ ОТХОДОВ*Тошмаматов Бобир**ст. преподаватель,**Каршинский инженерно-экономический институт**Республика Узбекистан, г. Карши*

ABSTRACT

This article proposes a mine-auger drum pyrolysis device for thermal processing of solid domestic and organic waste by the pyrolysis method. Based on the geometric dimensions of the auger-drum pyrolysis device, the material and heat balance equations are constructed. In the reactor with a working volume of 1 m³, it was found that 243,360 mJ of heat energy was used to thermally process solid waste with a density of 300 kg / m³ and a mass of 180 kg to obtain alternative fuels. It was shown that the reduction of moisture content of solid waste from 45 ÷ 60% to 10 ÷ 15% due to the heat of the flue gases was carried out in the auger drum part of the device mounted on the recycling chamber, and the efficiency of the device was determined.

АННОТАЦИЯ

В статье предлагается пиролизная установка для термической переработки твердых бытовых и органических отходов методом пиролиза. На основании геометрических размеров пиролизного устройства построены уравнения материального и теплового баланса. В реакторе рабочим объемом 1 м³ установлено, что 243 360 мДж тепловой энергии было использовано для термической переработки твердых отходов плотностью 300 кг/м³ и массой 300÷350 кг для получения альтернативных видов топлива. Показано, что снижение влажности ТБО с 45 ÷ 60% до 10 ÷ 15% за счет тепла дымовых газов осуществлялось в шнековой барабанной части устройства, установленной на рециркуляционной камере, а КПД устройства было определено.

Keywords: solid waste, alternative fuel, pyrogas, thermal recycling, thermal energy, pyrolysis reactor.

Ключевые слова: твердые отходы, альтернативное топливо, пирогаз, термическая утилизация, тепловая энергия, реактор пиролиза.

Today, not only in our country but all over the world, the problem of waste is becoming one of the most pressing environmental, energy, and economic problems.

The analysis shows that the volume of solid domestic and industrial waste has been increasing year by year in recent years [1,2]. Especially in the XXI century, the growth of municipal solid waste (MSW) has begun to have a major negative impact on environmental sustainability and human health. Toxic compounds released as a result of the decomposition of MSWs under the influence of heat and humidity penetrate into surface and groundwater, atmospheric air, soil, and plants. As a result, man is exposed to fresh drinking water and lack of fresh air, degradation of fertile lands, as well as new

outbreaks of various diseases. In recent years, the production of alternative liquid, gaseous and solid fuels using solid household waste for energy purposes has become more and more popular in our country, because MSWs are a source of cheap raw materials around the world. At the same time, the organization of the removal of MSW from the population in the cities and regions of the Republic of Uzbekistan is in an unsatisfactory state, practically in all cities the removal of solid household waste from the population is not carried out on a systematic basis, the material and technical base of specialized sanitary cleaning organizations is not equipped with special equipment [1-4]. In the required quantity, the existing landfills do not meet sanitary rules and regulations, in a number of places spontaneously formed landfills are used.

The problem of solid waste disposal is not only a technical problem but also a sanitary and ecological one.

MSW is divided into three categories:

1. Secondary raw materials that can be recycled. To do this, it must be separated from the general flow, separated, and put into further processing - 35%.

2. Biodegradable waste that can be put on compost - 35%.

3. Non-recyclable waste (tailings) - at present either cannot be processed into useful products, or the costs of such processing will be very high - 30%.

In 2017-2018, 13 state-owned unitary enterprises and their 172 branches in districts and cities, as well as 183 private and 9 clusters with a total capacity of 894 thousand tons of waste per year will be involved in improving the system of work related to MSW. This year, 20% of the waste generated in the country will be recycled, and the remaining 80% will be sent to landfills.

In Uzbekistan, about 200÷300 thousand tons of municipal solid waste are accumulated every day about 135÷150 million tons per year.

The accumulation of rotting solid waste in surface storage inevitably leads to the formation of biogas under the sun's rays, which is a product of the process of anaerobic decomposition, which pierces through the mass of waste collection. Biogas must be removed in order to prevent its migration from the landfill, as it is toxic and explosive. Its danger extends not only to the territory of the landfill but also beyond it due to the significant volume of education.

The methods of control and removal of biogas are currently quite developed and are widely used abroad. The gas is usually removed by suction and sent for combustion in an open flare or, in significant quantities and with appropriate quality, is utilized. Biogas is collected from vertical wells drilled at the site of already filled storages, or horizontal reservoir wells built in the process of waste storage.

The amount of biogas produced is influenced by:

- composition, age, density, temperature, and humidity of waste;

- area, depth, methods of operation and development of a solid waste storage facility;
- storage water balance.

More than a dozen methods for recycling solid household waste using a variety of methods are being implemented worldwide. The most common methods are direct combustion of MSW, anaerobic fermentation, pyrolysis, gasification, thermal processing, and so on [5]. One of the most effective methods of thermal processing of MSWs is the pyrolysis method, pyrolysis technology is an innovative solution for waste management and leads to a significant reduction in the area of landfills.

Pyrolysis is one of the most promising ways to recycle solid waste. It allows you to get useful products from both environmentally safe and secondary energy resources. As a result of heat treatment of KMCs on the basis of the pyrolysis method in the temperature range of 350-600 °С, alternative, gaseous (pyrogas), liquid, and solid (poly coke) fuels are obtained. The pyrogas and liquid fuels obtained during the pyrolysis process can be used for the special needs of the pyrolysis unit. From an economic point of view, the use of pyrogas and liquid fuels as fuels is beneficial.

However, the use of such fuels depends on the morphological composition of the MSW, the pyrolysis technology, and the composition of the working mass of the fuels obtained.

The author proposes a schematic of a mine-auger drum pyrolysis device for thermal processing of solid waste by pyrolysis and obtaining alternative fuels (Figure 3). The pyrolysis device for thermal treatment of solid household waste consists of a mine (1), a tubular pyrolysis reactor (2), a valve (3,10,12,21), an auger drum (4), an auger drum cover (5), mechanical auger (6), furnace (7), burner (8), gas holder (9), pipe (11,13), spiral heat exchanger (14), cold water inlet (15), hot water outlet (16), liquid fuel tank (17), filter (18), recycling chamber (19), smoke pipe (20) (1-Fig.).

Figure 1. The pyrolysis device for thermal processing of municipal solid waste

Pyrolysis device for thermal processing of MSW works in the following order:

Unsorted municipal solid waste is loaded through the cover (5) of the auger drum (4) by opening the valve (3) to the tubular pyrolysis reactor (2) installed inside the mine (1), and the auger (6) is rotated by hand. MSW is crushed and moved along the auger drum. After loading the solid waste into the tubular pyrolysis reactor and auger drum, the valve (3) and cover (5) are fastened. For the pyrolysis process to take place, the burner (8) mounted on the furnace (7) is opened by opening the valve (10 and 12) from the gas holder (9), the gaseous fuel is fed through the pipe (11) and ignited. The high-temperature flue gases generated during combustion heat the solid domestic waste loaded into the tubular pyrolysis reactor uniformly from 450 °C to 600 °C over the entire surface, resulting in a vapor-gas mixture. The resulting vapor-gas mixture passes through a pipe (13) to a spiral heat exchanger (14). In the spiral heat exchanger (14), cold water (at ambient temperature) is supplied from the cold water inlet (15) to separate the steam-gas mixture into pyrolysis fuels, and the steam-gas mixture is heated from the hot water outlet (16) due to secondary heat. Water comes out and is passed to the consumer. As a result of heat exchange in the spiral heat exchanger (14), the vapor-gas mixture condenses to separate the liquid fuel and the liquid fuel is collected in the tank (17), while the pyrogas is cleaned through a filter (18) and collected in the gas holder (9) and used for special needs. Exhaust fumes from the tubular pyrolysis reactor in the temperature range 120 °C to 125 °C pass into the recycling chamber (19) and dry the solid household waste placed in the auger drum at a humidity of 50% to 60% to the humidity of 5% to 10%. Which in turn leads to an increase in the energy efficiency of the device, the prevention of excessive heat loss in the device, the sudden onset of the pyrolysis process and shortens the time of the pyrolysis process. When the work is done, the flue gases are released into the atmosphere through the smoke pipe (20). In a time interval of 240 to 280 minutes, the pyrolysis process is completed and the residual mass is removed from the tubular reactor through a valve (21), and the cycle is thus continued.

A comparative analysis with the prototype of the proposed technical solution revealed the following specific features:

- In contrast to the prototype, the reactor of the device is made in the form of a tube and installed inside the mine, which leads to a uniform distribution of heat in the tube pyrolysis reactor, heating the raw material throughout the volume and increasing the amount of pyrolysis fuel;

- the upper part of the device is divided into a recycling chamber, which efficiently uses the secondary energy resources of flue gases and increases the energy efficiency of the device;

- The device is equipped with an auger drum and it is mounted in the recycling chamber, which dries the moisture of solid waste (from 50-60% to 5-10%) due to the secondary heat of the flue gases, which in turn reduces excess heat consumption in the pyrolysis reactor. accelerates start-up and saves fuel resources;

- the device is equipped with a spiral heat exchanger, which receives hot water through heat utilization and provides heat energy to consumers;

- the device will be installed in solid waste landfills and transport costs will be saved.

The proposed pyrolysis unit allows to process of almost all types of waste except building materials and to obtain alternative pyrolysis fuel, and provides solutions to the following problems:

1. Reduces the impact of waste on environmental sustainability and human health.

2. Waste-free disposal (recycling without sorting waste).

3. Production of fuels (synthetic oil, pyrolysis fuel, diesel fuel, etc.) that meet the requirements of the "yashil tariff" for the production of heat and electricity.

The obtained fuels are used to save natural fossil fuels through the use of industrial boilers and furnaces, consumers with autonomous heat supply, greenhouses, country houses, field sheds, heating systems, and dryers. Material and heat balance equations for different temperature regimes of the pyrolysis process were constructed to determine the operating parameters of the auger-drum pyrolysis reactor and to evaluate its efficiency. When constructing the heat balance equation, the following was taken into account: the formation of ash-carbon residue during the thermal processing of MSW in the device by pyrolysis method does not exceed 5% and the obtained pyrogas is used in the combustion chamber. The thermal calculation of the device was performed based on the obtained research results.

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INCREASING THE ENERGY EFFICIENCY OF AN AUTONOMOUS SOLAR PLANT WITH A STATIONARY CONCENTRATOR

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ПОВЫШЕНИЕ ЭНЕРГОЭФФЕКТИВНОСТИ АВТОНОМНОЙ СОЛНЕЧНОЙ УСТАНОВКИ СО СТАЦИОНАРНЫМ КОНЦЕНТРАТОРОМ

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ABSTRACT

The article discusses ways to increase the energy efficiency of a solar installation using automation, the choice of the optimal structural scheme, as well as accepted methods of orientation of the installation to the sun and the use of a convenient tracking system.

АННОТАЦИЯ

В статье рассматриваются способы повышения энергоэффективности солнечной установки с помощью автоматизации, выбор оптимальной конструктивной схемы, а также принятые способы ориентации установки на солнце и использование удобной системы слежения.

Keywords: solar installation, orientation, automatic tracking system, control signal, threshold, tracking schedule, differential sensor, improving device efficiency

Ключевые слова: солнечная установка, ориентация, автоматическая система слежения, управляющий сигнал, порог, график слежения, дифференциальный датчик, повышение эффективности устройства

I. Introduction. Humanity needs energy, and its needs are increasing every year. At the same time, the reserves of traditional natural fuels (oil, coal, gas, etc.) are finite. In connection with these problems, it is becoming increasingly necessary to use non-traditional energy resources, primarily solar, wind, geothermal energy, along with the introduction of energy-saving technologies.

At present, in Uzbekistan there is an acute problem of the development of energy-saving and environmentally friendly technologies and industries. At the same time, it is possible to achieve energy saving in production and at home not only by limiting energy consumption, but also by making optimal use of renewable energy sources.

Among renewable energy sources, solar radiation is the most promising in terms of the scale of resources, environmental cleanliness and ubiquity. The climatic and geographical conditions of our state are such that the sun is the most acceptable and promising source of energy.

The improvement of autonomous solar power plants (ASEU) primarily depends on the rational use of their technical capabilities. Therefore, when designing modern efficient autonomous solar power plants, the problem of system design of power plants should be solved in order to increase their energy efficiency.

To optimize solar installation it is advisable to use optical and software system for the tracking of solar concentrators. This allows to achieve the required

accuracy and the operational control of tracking systems, and therefore contribute to the energy efficiency hub for various purposes. As you know, there are developed various systems of power plants based on conversion of solar energy into thermal energy.

II. Improving the efficiency of energy systems.

The efficiency of energy systems in their long-term functioning, to a large extent depends on the chosen structural scheme, design, materials, accepted ways of exploitation and utilization of energy sources [1]. Currently widely used structural diagram energy systems and facilities without the implementation of extreme regulatory regime of its power [2]. In such stand-alone solar power plants are mainly used simple temperature controllers, current, voltage, charge and discharge the battery, and others. To increase the coefficient of energy efficiency of a solar power plant of not less than 30-50% is possible by the following main ways [3]:

- implementation of the mode of selection of hot water or power;
- implementation of continuous automatic tracking of a solar collector or photovoltaic panels with the Sun;
- optimization design of the solar cell with the aim of achieving a minimum heating of the solar cells.
- design optimization of heat sink and its thermal insulation to achieve minimum heat loss and maximum heat performance.

The effect of the implementation of the mode of power regulation of solar installations depends on the range of variation of the operating temperature of a solar power plant. Solar installations are used in widely varying operating conditions. They are strongly influenced by the environment. Their performance characteristics are nonlinearity and instability.

Implementation of automatic tracking solar plants follow the Sun, is the most effective way to improve energy efficiency of power plants.

From a preliminary analysis of energy efficiency of systems of automatic tracking of the Sun is that the efficiency for Fergana relative to the horizontal location of solar collectors is:

- when placing the solar collector at an angle equal to the latitude location where you are installing the solar installation – 40%;

- when using single-axis system for solar tracking 62 percent;

- if you use dual-axis tracking system the Sun is 71%.

The average for various regions of Uzbekistan energy efficiency through the use of systems for tracking the Sun increases by 11% for single-axis systems and 26% for biaxial.

The feasibility of optimizing the design of solar collectors with the aim of improving the energy efficiency ratio is due to the sensitivity of the heat of solar units to the temperature. With increasing temperature of the heat efficiency of solar installations, and most other solar plants, is reduced. It is therefore necessary to take all measures to optimize the operating temperature of the heat sink and its thermal insulation.

Stepping method of search of extremum power is most suitable for use in standalone solar power plants, since approval extreme regulator with automatic shut-off valve operating temperature of the coolant or the charger is carried out simply by a discrete adjustment of the feedback circuit to the channel voltage of the solar battery.

The regulator of any extreme performance (analog-to-digital, digital, microprocessor) hardly increases the weight control apparatus has small power consumption and increases the efficiency of the solar installation to a maximum value [1, 4].

III. The choice of optimal structural scheme of the automated system for solar power installations.

In Fig. 1 is a block diagram of the automated system for solar power installations.

This system includes two chains of independent control. In the first chain, an automatic tracking system for solar collectors based on the Arduino microcontroller was developed. The controller, receiving signals from photoelectric tracking sensors, generates a control signal in a discrete format. The generated signal is issued to the control unit, which, amplifying, controls the operation of the electric drive, consisting of a single-turn SEM electric motor (electric single-turn mechanism) with a gearbox. The tracking mechanism provides guidance of the solar collector in the sun. The permissible error (threshold) between the signals in the inclined planes of the sensor photocells, at which it is necessary to monitor the collector for the Sun, is 5% (this value can be set in the controller) [5].

Figure 1. Solar Collector Automation System

Once the optimal position is found, the microcontroller sets a timer and waits for the next cycle of work after a specified time. This process will continue until the

reset button is pressed. The tracking graph is shown in the following figure [6].

Figure 2. Schedule tracking solar installation for the sun

In the second chain, the microcontroller maintains the temperature parameter of the input and output of the heated water in the collector. The following instruments and devices participate in the automation chain:

- microprocessor meter regulator TPM 212 (analog output signal);
- narrowing device (washer) to create a differential pressure;
- differential sensor (differential meter (input signal 4-20 mA));
- temperature sensor - thermocouple (measuring range up to 850 degrees);
- electric valve (input signal 4-20 mA);
- A computer for recording and recording data.

The technical result of the second part of automation is to increase the efficiency and reliability of the solar power plant. Improving the efficiency of the device is achieved by improving the mode of thermal accumulation, since a portion of hot water not used by the consumer, making a repeated cycle of receipt in the solar thermal collector, transfers part of its energy to the heat accumulator. Improving the reliability of the solar device is achieved by increasing the rate of periodic heat removal of solar radiation in batches, by applying water selection over an automatically set temperature range, which prevents the accumulation of scale in the inner surfaces of the working channels of the solar thermal collector [7].

Conclusion

Thus, achieving the energy efficiency of a solar installation can be achieved in the following ways:

- it is advisable to track the solar collectors behind the Sun on the basis of the requirements to ensure accuracy of pointing to the Sun and the minimum consumption of electric energy by electric drives;
- in order to save energy, at the end of the cycle of pointing the solar collector to the Sun, it is necessary to turn off the drivers of the electric drive and organize the positioning mode, which can significantly reduce the consumption of electric energy.

- An analysis of the developed designs of orienting systems showed that for standard designs, the tracking error is of the order of 0.1-0.6 degrees, considered valid. However, it should be noted that the higher the tracking accuracy, the higher the efficiency of the solar power plant.

- increasing the reliability of the solar device is achieved by increasing the rate of periodic heat removal of solar radiation in batches, by applying water selection over an automatically set temperature range, which prevents the accumulation of scale in the inner surfaces of the working channels of the solar thermal collector.

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ANALYSIS OF SOLAR MODULES FOR SELECTING THE OPTIMAL OPTION

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АНАЛИЗ СОЛНЕЧНЫХ МОДУЛЕЙ ДЛЯ ВЫБОРА ОПТИМАЛЬНОГО ВАРИАНТА

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ABSTRACT

This article is devoted to the use of data-based extended matrix (tabular) characteristics of the SB, which allows reasonably, based on statistical analysis, to select the type of universal solar battery model compatible with the SimPowerSystems section in the Matlab program.

АННОТАЦИЯ

Данная статья посвящена использованию данных расширенных матричных (табличных) характеристик СБ, что позволяет обоснованно, на основе статистического анализа, выбрать тип универсальной модели солнечной батареи, совместимой с разделом SimPowerSystems в программе Matlab.

Ключевые слова: солнечная батарея, фотовольтаика, тонкопленочная технология, аморфный кремний.

Keywords: solar battery, photovoltaic, thin-film technology, amorphous silicon.

When simulating a solar system in the Simulink program, a universal solar battery model is required that is compatible with the SimPowerSystems section in the Matlab program, which makes it possible to simulate a power supply system taking into account changes in solar radiation and ambient temperature. The peculiarity of the model is that the current-voltage characteristic of the SB passes through three points: no-load voltage, short-circuit current, and the point of maximum power of the SB.

On the basis of the well-known publications [1], extended matrix (tabular) characteristics of the security system have been introduced, allowing reasonably, on the basis of statistical analysis, to select the types of security systems. The first group of photovoltaic converters includes crystalline SBs, the second - thin-film SBs.

Figure 1. Current-voltage characteristics for different types of SB

Figure 2. The theoretical limit for the specific short-circuit current of a solar cell

Table 1.

Current-voltage characteristics for different types of SB

SB type	IKZ (mA / cm ²)	U _{xx} (V)	I _{opt} (mA / cm ²)	U _{opt} (V)	R _{max} (mW / cm ²)	ξ (short circuit)	η (%)
C-Si	42.2	0.672	40.4	0.59	23.85	0.842	24
AsGa	28.2	1.034	27,422	0.942	25,826	0.886	26
poly-Si	38.1	0.644	36.409	0.564	20.54	0.837	20.5
a-Si	19.4	0.723	18.619	0.64	11,916	0.85	11.9
CuInGaSe2	35,7	0.66	34,120	0.58	19,791	0.84	nineteen
CdTe	25.9	0.726	24,882	0.643	15,995	0.851	sixteen

Table 1: I_{sc} - specific short-circuit current, U_{x,x} - no-load voltage, I_{opt} - specific optimal current, U_{opt} - optimal voltage, P_{max} - specific maximum power, ξ - fill factor, η - efficiency at the point of maximum power.

From the data table. 1 it follows that two types of SB have the highest efficiency: C-Si and AsGa. AsGa is more expensive than C-Si and is manufactured by special order, therefore crystalline C-Si SB was chosen for the PMT. The fill factor is the ratio of the maximum

The production of structures based on monocrystalline silicon is a technologically complex and expensive process. Therefore, attention was paid to materials such as alloys based on amorphous silicon a-Si: H, gallium arsenide and polycrystalline semiconductors.

Thin-film solar cells (SCs) can consist of several thin layers of photovoltaic materials. The thickness range of such layers is from several nanometers to tens of micrometers. Thin-film solar cells are of different types: they are produced on the basis of 1) silicon (TF-Si); 2) cadmium telluride (CdTe); 3) compounds of copper with indium and gallium selenide (CuInGaS); 4) titanium dioxide (TiO₂).

In fig. 1, Table 1 and Figure 2 show the I - V characteristics of various solar cells on the same scale.

power to the product of the short-circuit current and the open-circuit voltage of the solar cell (SC). This is a key parameter in assessing the efficiency of solar panels. Typical commercial solar panels have a duty cycle > 0.70, while cheap grade B solar panels have a duty cycle ranging from 0.4 to 0.7. A solar panel with a high fill factor has less losses due to series and parallel resistances. In fig. 3.3 shows the dependence of the output current and power of the solar cell on the voltage.

Figure. 3. Volt-ampere characteristic and power of the solar cell

In fig. 3, the power characteristic of the ESS $P = ISE \cdot U_{SE}$ is built, generated when the output voltage changes from U_{xx} to zero. It can be seen from this characteristic that there is only one point C, at which there will be the maximum generated power with the highest P_{max} value (point C). This point is called the optimal operating point of the I - V characteristic of the solar cell, and the voltage and current at this point are, respectively, the optimal voltage U_{opt} and the optimal current

I_{opt} . When designing an autonomous photomultiplier, they try to ensure the operation of the SB precisely at this point.

$$\xi = \frac{I_{opt} \cdot U_{opt}}{I_{кз} \cdot U_{хх}} = \frac{\text{площадь(A)}}{\text{площадь(B)}} = K_i \cdot K_u \text{ (one)}$$

Table 2.

Efficiency for different types of SB

SB type	Efficiency
Silicon	
Si (crystalline)	24.7
Si (polycrystalline)	20.3
Si (thin film transfer)	16.6
Si (thin film submodule)	10.4
Gallium arsenide	
GaAs (crystalline)	25.1
GaAs (thin film)	24.5
GaAs (polycrystalline)	18.2
Chalcogenide thin films	
OGS (photocell)	19.9
OGS (submodule)	16.6
CdTe (photocell)	16.5
Amorphous / Nanocrystalline silicon	
Si (amorphous)	9.5
Si (nanocrystalline)	10.1
Photochemical	
Based on organic dyes	10.4
Organic (submodule)	7.9
Organic	
Organic polymer	5.15
Multilayer	
GaInP / GaAs / Ge	32
GaInP / GaAs	30.3
GaAs / CIS (thin film)	25.8
a-Si / mc-Si (thin submodule)	11.7

where $K_i = \frac{I_{опт}}{I_{кз}}$, $K_u = \frac{U_{опт}}{U_{х.х}}$... For AsGa SB, the

relative value of the optimal current and voltage of the duty cycle is $\xi = 0.75 \div 0.89$.

For the selected C-Si SB $\xi = 0.8 \div 0.84$, which is taken into account in the future.

The efficiency is defined as the ratio of the power generated by the solar cell to the power of the incident solar radiation. The efficiency of the solar cell depends on the spectrum, the intensity of the incident solar radiation and the temperature of the solar cell. To compare two SCs, they need to be tested under accepted standard conditions. Ground-based solar cells are tested at an air mass of AM1.5 and a temperature of 25 °C, i.e. at mid-latitudes at the height of the Sun 41 49'. ESS intended

for use in space are measured with an air mass AM0, i.e. in near-earth space. Typically, the energy characteristics of the SB are determined under a nominal lighting condition ($PC = 1000 \text{ w / m}^2$). Panel efficiency is generally 1 ÷ 3% lower than solar cell efficiency due to glass reflections, frame, shading, higher temperatures, etc.

$$E = \frac{U_{хх} \cdot I_{кз} \cdot \xi}{P_c} \quad (2)$$

For different types of SB, the efficiency is given in table. 2 [2].

The variety of developed types of SB allows you to choose the most suitable SB for the conditions of Uzbekistan according to the criterion: cost, service life, efficiency, availability.

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**USE OF ENVIRONMENTALLY SAFE SOLAR ENERGY
FOR LOW POWER WATER SUPPLY IN RURAL AREAS****Sergei Pak**

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**ИСПОЛЬЗОВАНИЕ ЭКОЛОГИЧЕСКИ БЕЗОПАСНОЙ СОЛНЕЧНОЙ ЭНЕРГИИ
ДЛЯ ВОДОСНАБЖЕНИЯ МАЛОЙ МОЩНОСТИ В СЕЛЬСКИХ РАЙОНАХ****Пак Сергей Сергеевич**

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ABSTRACT

The article presents the results of the development of a universal solar power plant for individual use for the electrification of farms and water lifting, based in the Tashkent State Technical University at the Faculty of Physics and Engineering. The developed unit is designed to lift water from wells and boreholes, and has a capacity of 10 cub. meters per day.

АННОТАЦИЯ

В статье представлены результаты разработки универсальной солнечной электростанции индивидуального использования для электрификации фермерских хозяйств и подъема воды, основанной в Ташкентском государственном техническом университете на Инженерно-физическом факультете. Установка предназначена для подъема воды из колодцев и скважин, имеет производительность около 10 куб. м. в сутки.

Keywords: intellectual charge controller, lead-acid battery, sulfation, battery life, water pump.

Ключевые слова: интеллектуальный контроллер, свинцово-кислотный аккумулятор, сульфатирование, ресурс аккумулятора, водяной насос.

1. Introduction. It is undeniable that nowadays, the issues of transformation and the use of an inexhaustible and environmentally friendly solar energy are discussed more frequently than previously. Implementation of solar energy will facilitate or eliminate such problems as preservation of natural resources, improvement ecology, and reduction of carbon emissions and improving of living conditions. One of the potential areas of advantageous solar power implementation is getting electricity using photovoltaic (solar) elements. Moreover, it would be more beneficial, if photovoltaic cells were used in areas, where there is no access to a steady power supply. In these regions, the most perspective option is the electrification of power pumps to lift water from wells and lighting municipal buildings. Inasmuch as there is a very large number of potential consumers of low-powered water-lifting plant with a capacity of consumption less than one cubic meter of water per day. This is a rural farmstead, field camps, farmers, and other non electrified remote places of residence which are located in rural areas without constant electricity and water supply.

4 The prototype accomplishes small-scale water-lifting; it is versatile and has the function of small solar power plants.

PV part of the installation include:

- photovoltaic solar panels (100 watts or more);
- lead-acid battery;
- intellectual charge controller;
- inverter.

Water-lifting part of the installation includes:

- pump controller;
- submersible vibrating pump (capacity of about 300W).

Pump controller is used to adjust the water level in the water tank. The pump controller is installed after the batteries.

2. The existing technical solutions and their drawbacks. Batteries have a limited storage capacity for energy and once they are “full”, excess charge can begin to cause harm. There are two types of controllers: series and shunt. Series controllers stop the flow of current by opening the circuit between the battery and the PV array. Shunt controllers divert the PV array current from the battery, sometimes to an artificial load. Both types use solid, state battery voltage measurement devices and shunt controllers are 100% solid state. Several charge controllers on the market use a 3 stage charging approach with bulk, absorption, and float modes to ensure that voltage and current settings accurately match the batteries' actual state of charge. This reduces the time needed to bring the battery to full charge and can extend the life of the battery.

Stand-alone PV systems are very important for the rational choice of battery capacity and proper control of the battery charge and discharge. In this sense, water lifting units have significant differences. Mainly solar

power energy is consumed during evening and night time, and most of the time the batteries either are charged, or are discharged. In the water-lifting installations situation is different.

To reduce the required battery capacity and increase the efficiency of the water pump, solar power and battery are used simultaneously. By the end of a sunny day the battery is almost fully discharged. Therefore, all night it will be stored in a discharged state. However storage in the discharged state is unacceptable for lead-acid battery, since it leads to a rapid sulfation (crystallization of lead sulfate) of the plates and damage of the battery for a few months (<http://www.wmdsimxom/Batteries/BatteiyJFAQ.htm>).

Sulfation is a normal process that occurs in lead-acid batteries resulting from prolonged operation at partial states of charge. Even batteries which are frequently fully charged suffer from the effects of sulfation as the battery ages. The sulfation process involves the growth of lead sulfate crystals on the positive plate, decreasing the active area and capacity of the cell. During normal battery discharge, the active materials of the plates are converted to lead sulfate. The deeper the discharge, the greater the amount of active material that is converted to lead sulfate. During recharge, the lead sulfate is converted back into lead dioxide and sponge lead on the positive and negative plates, respectively. If the battery is recharged soon after being discharged, the lead sulfate converts easily back into the active materials.

However, if a lead-acid battery is left at less than full state of charge for prolonged periods (days or weeks), the lead sulfate crystallizes on the plate and inhibits the conversion back to the active materials during recharge. The crystals essentially “lock away” active material and prevent it from reforming into lead and lead dioxide, effectively reducing the capacity of the battery. If the lead sulfate crystals grow too large, they can cause physical damage to the plates. Sulfation also leads to higher internal resistance within the battery, making it more difficult to recharge.

Sulfation is a common problem experienced with lead-acid batteries in many PV applications. As the PV array is sized to meet the load under average conditions, the battery must sometimes be used to supply reserve energy, during periods of excessive load usage or below average insolation. As a consequence, batteries in most PV systems normally operate for some length of time over the course of a year at partial states of charge, resulting in some degree of sulfation/The longer the period and greater the depth of discharge, the greater the extent of sulfation.

To minimize sulfation of lead acid batteries in photovoltaic systems, the PV array is generally designed to recharge the battery on the average daily conditions during the worst insolation month of the year. By sizing for the worst month's weather, the PV array has the best

chance of minimizing the seasonal battery depth of discharge. In hybrid systems using a backup source such as a generator or wind turbine, the backup source can be effectively used to keep the batteries fully charged even if the PV array can not. In general, proper battery and array sizing, as well as periodic equalization charges can minimize the onset of sulfation (Don A. Gagon, 1999).

3. The proposed solution. In order to resolve the problem, there was developed a intellectual controller of battery charge-discharge, which works according to the principle of predicting the state of the battery and consequently prevents the rapid sulfation of the plates (Gumerov Yu., Zuev A., 2007).

In operation, the solar water-lifting plant is monitored current charge (from solar), current discharge (the current water pump) and the degree of battery charge (voltage and temperature on it). Using the information about the current charge and time of day you can predict the necessary time off for the pump (information about previous sunny day is also used). The remainder of the current solar time of the day should be sufficient to obtain the necessary degree of battery charge. Thus, the degree of battery charge at the end of a sunny day can be adjusted up to 100%, which is very constructive effect on their lifespan. In the intellectual charge controller is used microcontroller ATMegal6.

4. Results. The proposed technical solution of the controller of battery charge in water-lifting installation can reduce the required electrical capacity of batteries and increase their life (above 200%), and thereby obtain significant advantages in price and maintenance of costs (up to 30% of total costs during the product life cycle).

Figure 1. Photovoltaic solar panels with the developed intellectual charge controller

- Charge controller sense the level of charge in die batteries and will disconnect the solar array from the batteries as they reach full charge.
- The battery charger have MPPT function and can be used for low-power PV system applications [3]. For MPPT function current-sensing techniques are used.
- For effective miniaturization, the battery charger is designed with high frequency operation.
- The charge controller will display interesting information about the system, including battery voltage and the amount of energy being generated by the solar array.

Characteristics of solar water-lifting system (fig. 2) with intellectual charge controller are in table 1.

Table 1.

Solar water-lifting system characteristics

Parameter name	Parameter Value
The installed capacity of solar panels	Over 100 watts
Pump inverter,	Standard, 12/220 V, 50 Hz, 600 W
Battery charge controller	Intellectual, which uses the algorithm of the prediction.
Water pump controller	Standard
Battery capacity (starter type)	Not less than 100 A · h
Performance (with a lifting height of 15 meters)	Not less than 200 liters per hour
The duration of the pump (total during the day)	about 2 hours
Battery life	Not less than 400 cycles (or one year of operation)
The need for maintenance	Weekly check of the fan inverter, a monthly check of electrolyte level in batteries, seasonal check the electrolyte density, seasonal checks the pump, the seasonal removal of dust inside the case.
Valid values for air temperature daring operation	From -10 to +45 degrees Celsius
Degrees of protection provided by enclosures (code IP)	Performance - IP 22C

Figure 2. Preliminary tests of solar water-lifting installation in capacity to 100 W, with height of lifting of water of 15-20meters

Conclusions

The intellectual optimized charge profile, as presented in this paper, increase the battery, life more then

200%. It is makes installation very reliable and efficient, thereby obtain significant advantages in price and maintenance of costs (up to 30% of total costs during the product life cycle).

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WAYS TO IMPROVE THE RANGE AND QUALITY OF CERAMIC PRODUCTS

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ПУТИ УЛУЧШЕНИЯ АССОРТИМЕНТА И КАЧЕСТВА КЕРАМИЧЕСКИХ ИЗДЕЛИЙ

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ABSTRACT

The article presents the results of the analysis of the range of ceramic products and shows the ways to improve the range and quality of ceramic products for manufacturers.

АННОТАЦИЯ

В статье представлены результаты анализа ассортимента керамических изделий и показаны пути совершенствования ассортимента и качества керамических изделий производителей.

Keywords: assortment of ceramics, porcelain, faience, majolica, pottery, commercial expertise, quality indicators.

Ключевые слова: ассортимент керамических изделий, фарфор, фаянс, майолика, гончарные изделия, коммерческая экспертиза, показатели качества.

The organization of commercial activities in the prosperity of market relations, free competition and ensuring the well-being of the population, first of all, is based on the essence, content and direction of research in the commercial sphere, the importance of commercial expertise in the organization, management, planning and control of gross commercial activity-is manifested as one of the main features of modern commercial.

The high level of Organization of commercial expertise, their scale, the sum of the methods used in the analytical and processing processes, the initial stage in the design, implementation of the commercial strategy of the enterprise and the firm directly, is the "base point". In today's environment, where the consumer market is increasingly enriched with new goods and services, the importance of commercial expertise in identifying and using new opportunities is increasing day by day [1].

The importance of commercial expertise in the study of the scale of the consumer market, the position of the goods, the breadth of the commodity assortment, customer demand, the role of imported goods in the local market and information about competitors is paramount. On the basis of conducting commercial expertise, it is possible to study the movement of goods in the consumer market.

Research methodology: Several methods are used in the organization of commercial expertise of tokens. Especially widely used are the methods of observation, experiment, and survey and group discussion. However, information on their basis, weapons, the order of choice can be different.

In our study, we selected the selective tracking type of the method of tracking of commercial expert of tokens. Selective tracking is a more applicable technique in commercial expertise.

Based on selective observation, we conducted a commercial expert of the assortment of ceramic products sold in commercial stores. The conducted commercial expertise was carried out according to the factors that formed the assortment of ceramic products, namely the type of ceramic, the place of manufacture, the types of the work piece and the decoration given to the ceramic articles. These factors are the main factors that form not only the assortment, but also the characteristics of consumption [2].

Analysis and results: From the analysis of the commercial expert on the type of ceramics of the assortment of ceramic products, it is known that the ceramic products sold in commercial stores are 71% porcelain, 13% faience, 9% -pottery, 7% majolica (Diagram-1)

Figure 1. Analysis of the assortment of ceramic products by type of ceramics

One of the factors that form the assortment of ceramic products is the place of manufacture. 58% of the ceramic products sold in commercial stores-if they correspond to the products produced in local industrial enterprises, 42% - come from foreign countries and correspond to the items sold. 28% of ceramic products imported from abroad - products manufactured in China, 10% - products manufactured from the sides of Russian manufacturing enterprises, and the remaining 4% - ceramics imported from Ukraine, Turkey, Iran and sold.

The range of ceramic products of local manufacturers includes products of the Tashkent ceramic factory-30%, Samarkand ceramic factory "Asl Nafis" -18% and Kuvasay ceramic factory-10%.(Diagram-2).

Today, special attention is paid to the production of competitive, high-quality products in our country, filling the domestic consumer market with local, high-quality consumer goods. In particular, a wide range of tax incentives were introduced in order to stimulate the production of consumer goods in local conditions. Several important decisions were taken aimed at the regulation of wholesale and retail trade, the development of a network of wholesale trade markets, shops, catering and consumer service enterprises in the territory of the Republic. Nevertheless, still almost half of the ceramic products sold in the domestic consumer market are occupied by foreign products. This can also be seen from a commercial expert conducted at the place of manufacture of ceramic products.

Figure 2. Analysis of the assortment of ceramic products by place of production

The range of ceramic parts ensures the width of the item types. Each type of item has its own unique function. The assortment of ceramic products is divided into dishes, tea and velvet drinks, decorating the table top, storing dishes and various souvenir gifts according to their functional use. [2] Due to the culture of each people, the House will be a piece of cloth more used in fasting. For example, if the Uzbek people use a bowl for

drinking, then Russian and other European peoples use cups and bowls for drinking.

According to the analysis on the targeted use of the assortment of ceramics, which is sold in commercial stores, it is known that 42% -of ceramic products – are ceramic cutlery for eating, 36% - utensils for consumption drinking tea, 17% - ceramic coffee products, 5% - ceramic products for various purposes (souvenirs, lamps and others).(Diagram-3)

Figure 3. Analysis of the assortment of ceramic products by product type functional purpose

Each functional group of used items includes types of ceramic items with different shapes and structures. From the analysis of the assortment of tea and coffee products sold in commercial structures, it turned out that - 30% comprises of the sold tea and coffee products - bowls, 22% - kettles, 19% - coffee pots, 18% - glasses , 11% - cups.(4-Diagram.)

Analysis of the range of ceramic tableware sold in commercial structures showed that 32% comprises plates, 23% - kise, 16% - dishes, 12%- vases, 9% - oil cans, 8% other containers.

Analysis of the assortment of ceramic products by type showed that the assortment of such products as: tu-reens, vases for jam and vessels for milk are available in small quantities with other types of ceramic products.

Figure 4. Analysis of the assortment of ceramic products by item types

Another factor affecting the width, completeness, and structural structure of the assortment of ceramic products is the suitability of the items. According to the

analysis of the assortment of ceramic products sold in commercial stores, 60% of are sold in the form of piece goods, 30% - kits, 10% - sets.(5-Diagram.)

Figure 5. Analysis of the assortment of ceramic products by completeness

One of the factors that affect the aesthetic properties of ceramic items, that is, their purchase, are decorations. Decorations not only affect the assortment and consumption characteristics of items, but also affect the price of items. Ceramic items are mainly given decalco-

mania, trafaret, printing, ribbon, drawing by hand, photocopy, stamp decoration [3]. An analysis of the assortment of ceramic products by type of decor showed that 23% of ceramic products were printed with decal, 23%-ribbon, 22%-stencil, 12%-printing, 13% -hand painting, 4%-completely covered with paint, 3%-without décor.

Summary and suggestions. Proceeding from the results of the conducted research, we offer the following in order to improve the quality and increase the purchasing power of the assortment of ceramic products developed at local industrial enterprises:

- the main quality indicators of ceramic products are the level of whiteness, the given decorations, shape and structure, local industrial enterprises should constantly improve these quality indicators;
- items with high demand in the market are mainly decorated with decal, stamp decoration. Proceeding from this, it is recommended that the local industrial enterprises first of all give decal decorations to the ceramics that are being produced. Because, if the decoration of decalcomania does not require much cost from the economic point of view, on the second hand, the decoration of decalcomania allows to propagate the history

of Uzbekistan and its appearance by taking pictures of natural landscapes, historical monuments, great scientists, magnificent buildings;

If the products are decorated with decor, this will hide the poor whiteness of the ceramics, which is a big problem for the enterprise. At the same time, as a result of the use of such ornaments as "Atlas", "White Gold", "Suzane", "Grapes", it becomes possible to popularize national ornaments;

- as you know, it is the market that is one of the tools that shows the demand of consumers for ceramic products. If local industrial enterprises bring the range of produced ceramic products closer to the commercial one, then the filling of the market with local goods will lead to the fact that the population will meet their needs with goods, the prices of which are much lower.

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