



ABOUT THE MINING OF BASALT AND WAYS TO IMPROVE THE QUALITY OF BASALT PRODUCTS

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doi: [10.48047/ecb/2023.12.si4.868](https://doi.org/10.48047/ecb/2023.12.si4.868)

Annotation. This article analyzes the current state of mining and processing of basalt in Uzbekistan, the quality of manufactured basalt products, as well as the range of manufactured products and the state of the machine park of basalt processing enterprises. The reasons for the low volume of mining and processing of basalt rock, including the low production potential of the machine park of processing enterprises and a small assortment, and low quality of products, have been identified. Ways are proposed to increase the volume of extraction of basalt rock and improve the quality of products by cleaning the rock from sludge, hydroxides, salts, ash (hereinafter referred to as sludge). The possibilities of expanding the range of manufactured products due to the typification and introduction of new technologies for processing basalts are considered.

Keywords. Basalt rock, mining, processing, product quality, product range, basalt cleaning.

Introduction.

The need of the national economy of the Republic of Uzbekistan for materials from local raw materials is largely determined by the widespread use of composite and refractory materials based on glassy, carbon and ceramic substances, as well as other substitutes. Although not all of the above materials are produced in our republic, products from them are widely used in household appliances, automotive, aircraft construction, industry, etc. In this regard, in the 20th century, scientists from a number of countries pro-

posed an environmentally friendly and harmless to human health material obtained from rock - basalt. The successes achieved by scientists and specialists from Russia, Germany, USA, Japan, India, China, etc. on the use of basalts have been successfully applied in practice for a long time. Currently, the possibility of obtaining various kinds of valuable materials that are of great importance for humanity has been proven [1-3].

Uzbekistan is one of the leading countries in the world that has rich basalt natural resources. In Uzbekistan, more than ten non-state basalt-processing enterprises are engaged in the extraction and processing of basalt. However, two or three of them can be considered more or less permanent. Therefore, the volume of basalt processing in Uzbekistan in one day, on average, is approximately no more than 25÷30 tons [1].

It should be noted that the basalt processing enterprises of Uzbekistan are mainly specialized in the production of basalt fibrous materials, which are used as a heat-insulating material. These enterprises are characterized by poor technical equipment of workplaces and the lack of effective methods for obtaining basalt products. As a rule, labor-intensive methods of basalt mining are used, which are associated with high costs, and practically no technological solutions are applied to improve the quality of products, which limits the expansion of the range of basalt products.

At present, the needs of the national economy of our country for heat-insulating fibers are not fully satisfied. The requirements for these materials in terms of the main quality criteria, such as fire resistance and fire safety, temperature stability, water resistance and acid resistance, the absence of gas evolution during heating, low density and durability under conditions of variable thermal and climatic loads, etc. do not meet modern standards.

The area of use of basalt products in the world market is expanding very intensively. Day after day, new basalt products appear, such as basalt slabs and mats, pipes and fittings, cardboard and sound absorbers, reinforcing and composite materials, metal substitutes and balls, ball mills, etc. However, in Uzbekistan - as it was noted above, the capacity of existing basalt processing enterprises, the quality of raw materials and products do not meet the requirements of the domestic market.

Thus, the urgency of the problem of increasing the volume of production and improving the quality of basalt products is due to the growing demand for basalt products and the steady demand for it not only in our Republic, but also on the international market. Therefore, the efficiency of using the wealth of basalt deposits in Uzbekistan by increasing the volume of mining of basalt rocks, improving the quality and expanding the range of basalt products, developing new currency-

saving methods for processing basalts today is especially in demand. This will improve the quality of rock processing; will contribute to the economic development of the basalt processing enterprises of the Republic and the creation of additional jobs.

In the nature of Uzbekistan, mainly surface deposits of basalt rock are observed, the average diameter of which varies between 250÷300 mm. [1,4]. Therefore, basalts are mined only by open pit mining using low-power blasting. After that, the rock is transported to the location of the enterprises, where the basalts are crushed to the size of the required fractions.

Materials and methods.

Mining of basalts. In the nature of Uzbekistan, mainly surface deposits of basalt rock are observed, the average diameter of which varies between 250÷300 mm. [1,4]. Therefore, basalts are mined only in an open way using low-power blasting. After that, the rock is transported to the location of the enterprises, where the basalt materials and methods are used. birth. In some cases, this distance reaches 700 km or more, which increases the cost of transporting raw materials and affects the cost of the final product. The share of participation of other vehicles and other equipment for the extraction and processing of basalt is not very large. Reasons for this situation include:

- frequent use of manual labor for unloading or loading operations;
- use of technical means with low productivity;
- use of non-standard melting or other equipment;
- small investments to increase the productivity of basalt processing enterprises;
- lack of experience and lack of highly qualified specialists.

The frequent use of manual labor for unloading or loading operations and the use of non-traditional equipment for stripping operations, business leaders argue for their cheapness, low capacity of the enterprise, lack of funds to organize semi-automated or automated loading and unloading operations on the ground. In turn, the high cost of equipment, their delivery and installation, as well as the low attractiveness of this industry and the lack of investment from outside explain the use of non-standard melting furnaces or other equipment that hinders the growth of productivity of enterprises.

Studies have shown that not a single advertising agency has been engaged in advertising basalt products of domestic manufacturing enterprises over the past 10-15 years. Placing a basalt processing plant near a basalt deposit is indeed an expensive process. Delivery of fuel and energy resources to the mountain slopes and

across the terrain, and back to the location of the enterprise is not an effective solution to the issue.

At the same time, the development of the volume of mining and production for the processing of basalt is impossible without the creation of powerful bases of loading and unloading vehicles and their introduction into practice. Basalt processing enterprises, due to lack of financial resources, cannot solve such a problem yet. Therefore, the best option for resolving the issue is the use of modern methods of mining, transportation and processing of basalt rock. It is also necessary to ensure the interchangeability of covering their costs and improving the quality of products.

Based on the foregoing, it is proposed to apply the following solutions in the production of basalts:

- locate basalt-processing enterprises near basalt deposits;
- search for alternative production solutions to increase the volume of extraction of local basalt raw materials;
- use modern methods of basalt processing;
- introduce new technologies, including the initial processing of the breed on the spot;
- apply methods that improve the quality of raw materials and, ultimately, finished products, allowing reducing the cost of products.

Improving the quality of basalt rock. As a result of a study of the production activities of basalt processing plants in Uzbekistan, it was revealed that after crushing, the rocks undergo melting. According to the existing technologies of enterprises, cleaning and sorting of the breed is not provided.

An analysis of technological processes in this industry shows that manufacturers of basalt products in our country consider sorting to be an unnecessary process, since crumbs after crushing into fractions are sent to a melting furnace, and ultimately low-quality basalt-fiber-heat-insulating material is obtained from basalt. Factors such as: grain composition and shape of rock grains; the content of dust-like and clay particles on basalt; content in the composition of weak rocks; the content of harmful impurities in basalts; radioactivity and salinity of basalts, typifications of basalts and properties are not taken into account.

In the technical literature, no information was found on the effects of sludge on the quality of basalt fibrous materials, which can cause premature corrosion of an isolated object. Manufacturers of basalt products believe that the wettability of basalt chips does not affect its further processing, the raw material does not deteriorate, and atmospheric precipitation does not affect it. As a result, basalt chips are

stored even outdoors. There is no evidence that the remaining salts on the thermally insulating basalt fibrous material cannot cause premature corrosion of an insulated object. At the same time, it has been established that basalt fibrous materials intensively absorb water, damp air and get wet in an aggressive environment [4].

When studying basalt fibrous heat-insulating materials, after their use for a number of years, corrosion was found on the surface of metal pipelines. This phenomenon can be explained by the fact that the basalt rock was subjected to melting without purification of sludge from it.

Corrosion can be seen on the surface of pipes located underground and on the surface of the earth. The reason for the occurrence of corrosion can be explained by the high water absorption of basalt fibrous materials and the content of salts in the cotton wool.

As a rule, the presence of sludge on basalts can be explained by the salinity of the soil of basalt deposits and rocks. According to known data, the degree of salinity of irrigated lands of the Republic of Uzbekistan is high, including those lands where large reserves of basalt deposits are located. For example, the average salinity of the lands of the Namangan region (the location of the Gavasay field) reaches 28%, the Jizzakh region (the Asmansay field) - 85.4% and the Navoi region (the Aydarkul field) - 92.9% [5-7].





Fig. 1. Typical variants of corrosion during long-term use of basalt fiber materials for insulation.

The influence of salts on the quality, performance and durability of basalt heat-insulating materials was studied by monitoring the state of pipelines in the city of Navoi region, where basalt-fiber heat-insulating materials of various thicknesses produced by local enterprises were used. In this case, heat-insulating materials were used. Data and results of observation are given in table. 1.

A larger corrosion layer was observed at the surface of pipes, on which basalt heat-insulating material is traditionally wound, the thickness of which was 50÷80 mm. It was revealed that the corrosion layer under the basalt heat-insulating material, 100 mm thick, reached 0.5 mm.

Table. 1

The results of the study of the corrosion resistance of the pipe surface

№	Thickness of basalt heat-insulating material, mm	Relative air humidity of the surrounding area, 68÷90%		
		Thickness of the corrosion layer, after 5 years, mm	Thickness of the corrosion layer, after 8 years, mm	Thickness of the corrosion layer, after 10 years, mm
1	50	0,33	0,87	1,3
2	80	0,19	0,41	0,92
3	100	0,11	0,27	0,51

The study and analysis of the consequences of using heat-insulating materials obtained from unrefined basalts showed that they are prone to causing corrosion. It was revealed that in heat-insulating materials, along with sludge, such salts as NaCl, KCl, CaCl were found. Such impurities, remaining on basalt fibers, easily interact with the environment or with water. The high hygroscopicity of cotton wool causes corrosion. This reduces the terms of use of finished

products and objects of their use, which contributes to the premature loss of useful properties of basalt fibers and causes equipment destruction.

For the final assessment of the quality of the rock, the state of basalts was studied experimentally. For this, the rock of the deposits was randomly selected: "Gavasay", "Asmansay" and "Aydarkul" weighing 200 kg from each. Rock samples were divided into two variants of 100 kg each. In one variant, 100 kg of a sample of each deposit was washed to clean the rock from cuttings.

After that, the raw basalts were processed first, and then the experiment was subjected to "clean" - basalt rocks cleared of sludge. Then the resulting heat-insulating materials were placed on the experimental parts of the pipelines and they were monitored. The experiment lasted for 12 years - until the appearance of a visual detection of a corrosion layer. The parameters of the experiment are listed in table 2.

Table 2
The results of studies to determine the corrosion time of metals using "basalt wool" obtained from basalts of various deposits

№	Name of indicators	Field		
		Gavasay	Asmansay	Aydarkul
1	Time of occurrence of corrosion on pipelines (basalt without flushing), year	6-8	5-6	2-4
2	Time of occurrence of corrosion on pipelines (basalt after flushing), year	12	10-12	10-12
3	Time of occurrence of corrosion on the surface of the working parts of the equipment, year	5	3	1
4	The degree of salinity of the soil of the basalt deposit, %	28	85,4	92,9
5	Time of occurrence of corrosion on the surface of the working parts of the equipment, year	12	12	12

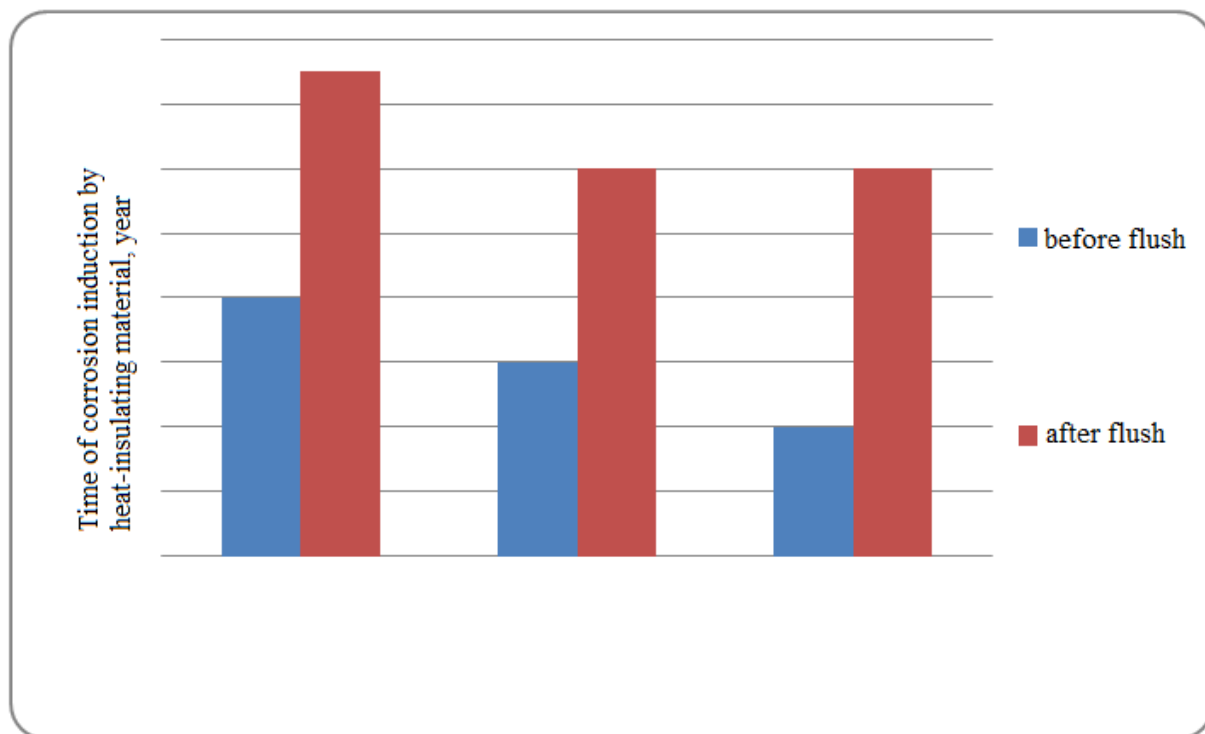


Fig. 2. Histograms of the service life of objects using basalt wool as a heat-insulating material before and after rock washing: 1 - indicators of basalts from the Gavasai deposits, 2 - indicators of Asmansai basalts and 3 - indicators of Aydarkul basalts.

It was revealed that more slimes by weight were removed from the Aydarkul rock. A long period of use was observed for materials obtained from the basalts of the Gavasay deposit, which corresponded to the salinity of the soil in the areas where the basalts are located. The results are presented in the histogram shown in fig. 2. Histograms show that the earliest occurrence of corrosion is observed in objects where wool is used, obtained from the basalts of the Aydarkul deposit, i.e. after a maximum of 4 years and "Asmansay" - after 6 years. The results of the study showed a reduction in the time of occurrence of corrosion by an average of 3.5 times, which proves the effectiveness of cleaning basalts from sludge.

Thus, it was found that it is promising to remove sludge from the surface of basalts by washing on a specialized machine - butare. Thus, a reduction in the time spent on the technological cleaning cycle is achieved. Such an approach to performing operations is easily achieved with the help of the grating wall of the butara, which in this case plays the role of a sieve, the size of which is adjusted to the size of the crumbs in a very simple way.

In this case, the qualitative indicators of basalts and their heat-insulating materials are of practical interest, which extended the service life of pipelines by about two times, as evidenced by the data shown in the histogram, Fig.3.

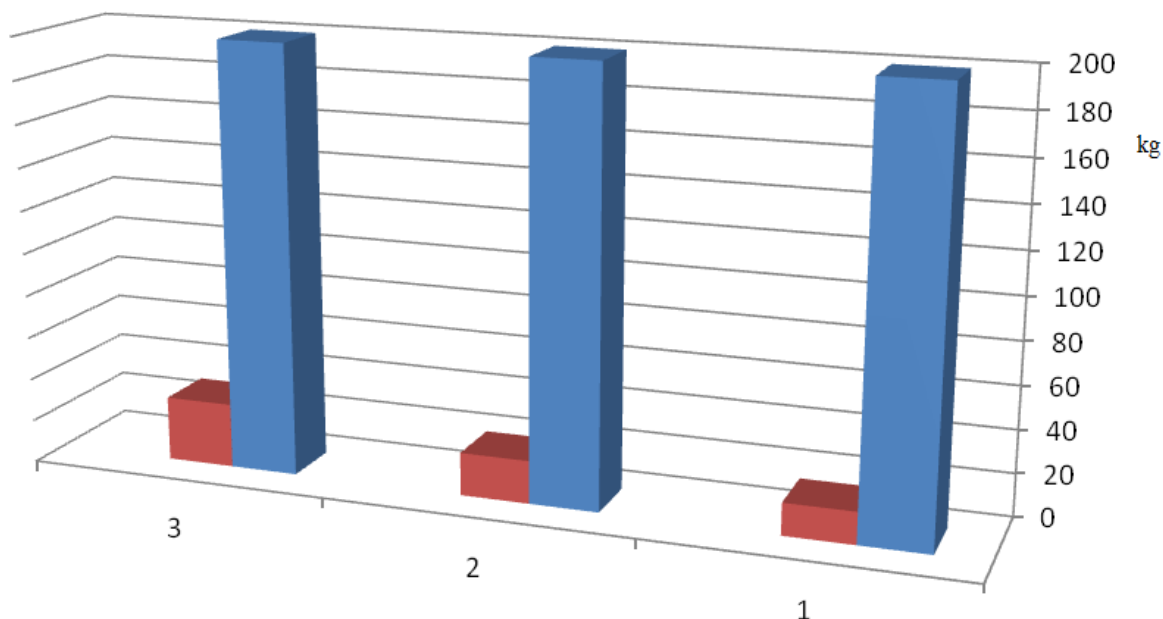


Fig.3. Indicators of mechanical cleaning of basalts from the Gavasai, Asmansay and Aydarkul deposits.

It has been established that quantitative assessments of the content of sludge from the basalt deposits "Gavasay", "Asmansay" and "Aydarkul" are relevant. It was revealed that each separately considered 200 kg basalt rock, each of the deposits, has slimes: basalts "Gavasai" -1%, basalts "Asmansai" -1.5% and basalts "Aydarkul" -2%. If you want to increase the volume of processing of raw materials, these indicators will be of great practical importance.

An analysis of the volume of demand for basalt products from processing plants showed that heat-insulating products from basalt are used in: energy, construction, road and automobile construction, etc. [2,4]. At the same time, due to the difference in properties and material composition of basalts from different deposits, there is no possibility of direct use of foreign technologies in Uzbekistan. Therefore, one of the possible options for increasing the efficiency of using basalt raw materials and organizing the production of environmentally friendly products is to develop a rational technology for processing local basalts, taking into account the salinity of the soil of the deposits.

In general, new technologies for processing basalt rock and new directions for using various products manufactured on the basis of basalt rock show their inexhaustible possibilities. Therefore, a promising direction for using the basalt raw materials of Uzbekistan and obtaining conditioned products is to conduct a comprehensive study of basalts and expand the production potential of enterprises

based on the specified parameters of properties, material composition and concentration of impurities of basalts. Thus, to achieve the production of high-quality products for various purposes and saving the republic's foreign exchange funds.

Conclusion.

The current state of mining and quality of basalt products produced in Uzbekistan has been studied. As a result, unprofitable use of the potential of basalt raw materials, low quality of basalt products and a limited range of manufactured products have been established. At the same time, inexhaustible possibilities of using local basalt rock have been revealed.

It has been established that the volume of basalt extraction can be increased in the following ways:

- improvement of the equipment of the machine park on the basis of the existing one;

- improvement of existing basalt processing technologies and modernization of existing equipment;

- an increase in the volume of production for the processing and production of basalt products using new technologies based on the creation of controlled industries in general, which will allow for the careful and economical use of energy resources and contribute to the waste-free processing of basalt raw materials;

Expansion of the range of manufactured products based on basalt can occur by:

- typification of basalts based on the given parameters of properties, material composition and purification of basalt rock from sludge;

- rock sorting at the processing stage, which will improve the useful properties and durability of basalt products;

- development of a rational technology for obtaining basalt products in a wide range and with specified physical and chemical parameters and their implementation to solve various, urgent problems;

- creation of new types of basalt products with improved properties: fire resistance, corrosion resistance, dielectric constant, hygroscopicity and moisture loss, acid resistance, alkali resistance, porosity, density, hardness, etc.

- development of new methods and recommendations for the study and use of basalt products for their practical application in the national economy of Uzbekistan, in the CIS countries and, in particular, in the enterprises of the mining and metallurgical industry.

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