International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Relevance to Produce of Heat Insulating and Fire Resistant Wall Building Materials

[1]X.M. Dosmatov, B. T. Ibragimov[2]

[1]PhD., Associate professor (independent researcher of the Academy of Ministry of Emergency Situations of the Republic of Uzbekistan),
[2]DSc., Full professor (Academy of Ministry of Emergency Situations of the Republic of Uzbekistan)

ABSTRACT:

This article analyzes the types and properties of refractory and heat-insulating wall materials, in particular, ceramic bricks, which are widely used in construction today. The article describes important properties of bricks, such as types, sizes, strength, water absorption, heat transfer coefficient, frost resistance. The article also provides information on the use of bricks in construction, their advantages and disadvantages.

Key words: *refractory materials, heat-insulating materials, wall materials, ceramic brick, porous stone, construction, properties, strength, thermal conductivity, water absorption, frost resistance.*

Introduction.

Today, the construction of energy-efficient houses, the use of environmentally friendly materials in construction is one of the most important issues in the world. Currently, the use of local energy-saving, fire-resistant and heat-insulating building materials in the construction of houses in our republic is considered convenient in every way and is developing.

Effective use of fire-resistant and heat-insulating wall materials in the construction industry ensures minimal damage from unpleasant situations that may occur in future emergency situations. As a result of the development of science and advanced technologies, modern types of fire-resistant and heat-insulating wall materials are currently being produced. The development of low-rise and single-family construction requires the development and organization of the production of effective building materials combining high technical and economic indicators as one of the main directions of work on increasing the housing stock [1].

Ceramic bricks have been used as wall materials since ancient times. Wall ceramics include ordinary clay bricks, functional ceramics - hollow bricks, porous-cavity, light hollow stone, blocks and slabs, as well as large-sized blocks and panels made of brick and ceramic stones. Today, the following types of masonry bricks are available, i.e. simple and effective bricks; facade calibrated brick; hollow ceramic brick and stone; double-layer external wall panels are used in construction.

Specification properties.

In the construction of the facade part of the building, bricks and ceramic stones of the correct shape and uniform color are used a lot. Made in 75, 100, 150 marks, facing bricks and stones are divided into rows and corners according to their shape and use. Their water absorption should be 8-14%, frost resistance should not be less than 25 cycles. The most commonly used in construction, simple and multi-hole masonry brick is mainly used in the construction of external and internal walls of buildings, brick blocks and panels. Bricks are produced in sizes 250x120x65 mm and 250x120x88 mm, the weight of the brick should not exceed 4 kg. Properties of construction brick are as follows: average density 1600-1800 kg/m ^{3}; water absorption at least 6%; heat transfer coefficient 0.7-0.85 W/(m ^{0}C); compressive strength 7.5-30 MPa; 1.8-4.5 MPa for bending; in some points, the strength is 20-50% smaller. Depending on the compressive strength, bricks are produced in grades 75, 100, 125, 150, 200, 250 and 300. Frost resistance is 15, 25, 35 and 50 cycles [2].

Because building a wall from ordinary bricks is extremely labor-intensive, large porous stones are used instead in many constructions. In construction, ceramic stones with a length of 250-290 mm, a width of 120-190 mm and a thickness of 138-288 mm will have a low volumetric mass due to many pores. Large porous clay stones are produced with vertical or horizontal porosity. Ceramic stones with straight pores are often used in construction. But the mixture for the wall made of such stones is spent a lot. Stones with vertical pores are produced in grades 150, 125, 100, 75. The density is greater than 1400 kg/m ^{3}.

Refractory bricks are made from refractory clay. The production process is similar to that of ordinary building bricks, and is fired at a very high temperature in special furnaces (Hoffman furnaces). The raw materials used for the production of firebricks consist of silica-rich soil and groga (burnt fireclay) as non-plastic materials. Refractory clay soils are pure hydrated silicates of aluminum oxide and contain large amounts of silicon 55-75%, aluminum oxide 20-35%, iron oxide 2-5%, lime, magnesia and about 1% of alkalis. The higher the percentage of alumina, the more soluble the clay. Refractory clay soils can withstand very high temperatures, up to 1700 °C, without melting or softening, as well as delamination. The presence of a small amount of lime, magnesium and alkali helps the clay particles to melt and solidify, while the presence of a large amount of lime and magnesium in the clay makes the clay soil prone to melting at low temperatures. Iron oxide or other alkalis reduce the refractory properties of clay soil [3].

In foreign countries, it is known that bricks designed for building walls without using admixture are produced with a groove on one side. Large-sized blocks, soundproofing bricks and other wall products are produced from such bricks. With its fire resistance and heat transfer properties, porous materials have an advantage over other materials. This material, with its construction properties, has advantages over many traditional heat-insulating materials, such as mineral and glass fiber cotton, polystyrene and polystyrene concrete, foam insulation, foam glass. Products made of such materials perform well in harsh climates and difficult economic conditions and have a number of important advantages: thermal conductivity, density, low water absorption, increased resistance to high temperatures, long service life, high durability, environmental friendliness.

Cellular concrete is an artificial stone material consisting of a hardened binder and filler, in which air pores are evenly distributed. There are many types of aerated concrete, which differ in terms of methods of cross-pore acquisition, types of binders, hardening conditions and other properties. Cellular concretes are divided into aerated concrete and foam concrete according to the methods of pore formation.

Cellular concretes can be simple cellular concretes and cellular-lightweight concretes. In ordinary cellular concrete, the pores are filled with air. Cellular lightweight concretes have 20-30% airy aggregates in the form of vermiculite, ceramisite, perlite or other expanded materials. According to the hardening method, cellular concretes have a natural and artificial hardening method. The first hardens it under atmospheric conditions, and the second hardens it under conditions of heat and moisture processing with water vapor. Heat-insulating cellular concrete can be used in construction both in monolithic form and in product form. It is more effective to use aerated concrete products. The most effective way to develop the direction of production of refractory concrete is the production of heat-insulating lightweight concrete. The use of single-story enclosing structures made of brick, wood and concrete blocks does not provide economically efficient construction, leads to a significant thickening of the walls and an increase in the weight of buildings [4].

On the other hand, the transition to multi-layer constructions using polystyrene foam, mineral fiber cotton and other heat-insulating materials is not always justified due to the fact that the operational service life of buildings significantly exceeds the normal service life. The expansion of the use of such structures is also limited by their fire resistance, the harmful effects of the environment on people, and a number of other factors. may be the solution.

In recent years, as a result of the increase in the construction of monolithic buildings, the consumption share of autoclaved aerated concrete, among other wall-building materials, has increased, while the construction of brick and panel houses has become a tradition. It should be noted that cellular concrete is more energy efficient than all types of walls; The moisture retention of aerated concrete is 4 times lower than walls made of wood materials, the radioactivity of aerated concrete is 5 times lower than brick walls, the vapor permeability is 3 times higher than wood, five times higher than brick, and 10 times higher than reinforced concrete three-layer panels.

Results.

The results of studies of houses with aerated concrete constructions that have served up to 60 years have shown the complete safety of this material and its suitability for further use. This proves that heat-insulating aerated concrete is an effective building material, and the development of technology for its production and use in construction as a wall product is of great practical interest [5].

The static approach is based on the fact that the failure of a solid body (breakage of bonds in the structure of a solid body) occurs instantaneously when the so-called "strength limit of the material" occurs or occurs under the influence of the "critical heating temperature" of the material (in the assessment of fire resistance).

Currently, standard test methods for determining fire hazard indicators, methods for studying the dynamics of combustion during full-scale tests are used in fire engineering research. Due to the strengthening of production processes and the development of new technologies, the operating temperature of heat units is increasing, the range of aggressive agents affecting the working temperature and materials is expanding and requirements for the quality of used materials are increasing. This trend is also observed abroad, so the development of new heat-resistant materials for construction and effective thermal insulation is very important. The latter is also related to the current difficult economic situation in the country, which requires the creation of cheaper materials [6].

Conclusion.

In world practice, the share of non-burning materials in the production of refractory materials is regularly increasing, and accordingly, the production volume of refractory products is decreasing. In the production of heat-insulating concrete, the consumption of materials is saved, the thickness and mass of the structures surrounding buildings and structures are reduced, the ineffective heat loss to the environment is reduced, and if we take into account the constant increase in energy prices, it is especially important from an economic point of view. The most heat-resistant light concrete the optimal type is cellular concrete. Depending on the type of binder used for cellular concrete, their maximum application temperature ranges from 700°C to 1600°C. In this case, it is not required to use refractory fractional pore fillers, temperature stresses do not occur at the border of cement stone and filler, heat transfer is lower [7] .

By the 21st century, as a result of the effective use of aerated concrete products in construction, the number of enterprises producing aerated concrete in foreign countries is increasing. In recent times, phosphate binders are increasingly used in heat-resistant concrete technology, because it significantly expands the scope of concrete's application, phosphate-based materials have high physical-mechanical and heat-resistant properties, and the maximum temperature index can reach 1800 °C. Accordingly, phosphate aerated concrete incorporates the best properties of existing aerated concrete. In recent years, researches have theoretically justified and implemented the possibility of obtaining porous phosphate compositions that harden in a few minutes due to the internal energy resources of the system consisting of orthophosphoric acid and dispersed metal aluminum. As a result, on the basis of orthophosphoric acid and various fillers used at temperatures of 1400-1600 °C at variable densities, compositions and methods of obtaining heat-resistant aerated concrete, solidification without heat treatment were developed.

References

1. Abdusamatov K.B., Tilavov E., Kholboev S., Norkulova S., Determination of thermal conductivity of aerated concrete samples obtained on the basis of local materials, SamDAQI. Architecture and construction problems, No. 1, Samarkand-2019, pp. 79-82.
2. Bakhodirov A., Bozorov I. , AbdusamatovK . B. , Industry waste based on prepared of fiberglass concrete mechanic property study , SamDAQI . Architecture and construction problems , Samarkand -2020 , p. 104-106 .
3. Kumar, D., Alam, M., Zou, P. X., Sanjayan, J. G., & Memon, R. A. (2020). Comparative analysis of building insulation material properties and performance. Renewable and Sustainable Energy Reviews, 131, 110038.
4. Abu-Jdayil, B., Mourad, A. H., Hittini, W., Hassan, M., & Hameedi, S. (2019). Traditional, state-of-the-art and renewable thermal building insulation materials: An overview. Construction and Building Materials, 214, 709-735.
5. Aditya, L., Mahlia, T. I., Rismanchi, B., Ng, H. M., Hasan, M. H., Metselaar, H. S. C., ... & Aditiya, H. B. (2017). A review on insulation materials for energy conservation in buildings. Renewable and sustainable energy reviews, 73, 1352-1365.
6. Pásztory, Z. (2021). An overview of factors influencing thermal conductivity of building insulation materials. Journal of Building Engineering, 44, 102604.
7. Okokpujie, I. P., Essien, V., Ikumapayi, O. M., Nnochiri, E. S., Okokpujie, K., & Akinlabi, E. (2022). An overview of thermal insulation material for sustainable engineering building application. International Journal of Design & Nature and Ecodynamics, 17(6), 831-841.

MAIN COMPONENTS OF RAW MATERIALS WIDELY USED IN OBTAINING HEAT INSULATION BUILDING MATERIALS

Abstract: *this article analyzes the measures implemented in the Republic of Uzbekistan to develop the building materials industry and increase the production of modern, high-quality building materials. The article examines the problems of production of modern building materials based on the localization program, reduction of imports and production of thermally resistant wall materials using industrial waste. The article also analyzes the types of raw materials used in the production of thermal insulation materials, their properties, and important technological issues in the production process of aerated concrete.*

Key words: *Building materials industry, Localization, Industrial waste, Thermally resistant wall materials, Heat insulation materials, Raw materials, Aerated concrete, Cement, Environmental cleanliness, Life safety.*

Annotation: *in this state, an analysis is carried out in the Republic of Uzbekistan for the development of construction materials and modern, quality construction materials. V state rassmatrivayutsya problemy proizvodstva sovremennyx stroitelnyx materialov na osnove programmy lokalizatsii, sokrashcheniya importa i proizvodstva thermostoykix stenovyx materialov s ispolzovaniem promyshlennyx otkhodov. Takje v state analiziruyutsya vidy syrya, ispolzuemogo pri proizvodstve teploizolyatsionnyx materialov, ix svoystva, a takje vajnye tehnologicheskie voprosy v protsese proizvodstva gasobetona.*

Key words: *promyshlennost stroitelnyx material, localization, promyshlennye otkhody, teplostoykie stenovye materialy, teploisolyatsionnye materialy, syre, gasobeton, cement, ecological cleanliness, bezopasnost jiznedeyatelnosti.*

Annotation: *this article analyzes the measures implemented in the Republic of Uzbekistan to develop the building materials industry and increase the production of modern, high-quality building materials. The article examines the problems of producing modern building materials based on the localization program, reducing imports, and producing heat-resistant wall materials using industrial waste. The article also analyzes the types of raw materials used in the production of thermal insulation materials, their properties, as well as important technological issues in the process of producing aerated concrete.*

Keywords: *building materials industry, localization, industrial waste, heat-resistant wall materials, thermal insulation materials, raw materials, aerated concrete, cement, environmental friendliness, life safety.*

In our republic, comprehensive measures are being implemented to further deepen economic reforms and rapidly develop the industry, to increase the production of new modern construction materials, constructions and products, and to expand their types, and certain results are being achieved. Expanding the types of building materials produced, increasing the share of production of modern, high-quality products based on the localization program, reducing the share of imports, obtaining heat-resistant wall materials based on canoat waste, using them in the construction of energy-efficient buildings is one of the important issues of today. The production of building materials using industrial waste helps to solve the problem of environmental pollution and allows the expansion of useful land areas occupied by waste. Despite the diversity of the raw materials used and their processing methods, there is one common and, at the same time, important technological issue in the production of all thermal insulation materials, which is to obtain a highly porous material [1].

All the above building materials are lightweight concrete products. A large number of types of natural raw materials and various wastes of other industries are the raw material base for the heat insulation industry. Minerals based on the following rocks serve as raw materials for the production of refractory and thermal insulation products: basalt, granite, diabase, diorite, trachyte and other volcanic quality rocks; dolomite and marl. Types of raw materials for the production of inorganic thermal insulation materials, metallurgy and blast furnace slag occupy the first place among industrial waste. The properties of raw materials used in the production of refractory and heat-insulating wall materials must meet the standard requirements. The main types of raw materials for the production of aerated concrete products are cement, lime, sand, water, industrial waste, ash, slag and pore-forming components. Aerated concrete is an ecologically harmless product, it does not emit harmful toxins, it is only ecologically second only to wooden products. At the same time, the main advantage is that it does not wear out, does not rot and does not burn. Environmentally friendly raw materials used for the production of aerated concrete guarantee the life safety of aerated concrete products for people [2].

During the production of aerated concrete, it is desirable for the water to be at a temperature of 50-80 $^{0\,C.}$ The optimum water temperature in the production of high-quality aerated concrete depends on the following components:

- different reactions due to the fact that cement may have been produced in different enterprises;

- the temperature of the production room;

- temperature of used components [3, 4] .

During the operation of the enterprise, the water temperature should be 50-60 ^{0}C in the summer, and 60-80 $^{0\,C\ in\ the\ winter.}$ Cement is the best binder for masonry blocks. Cement increases the product's strength and moisture resistance. All types of cement from 400 to 500 brands can be used for product production. Portland cement brand 400 and above (flexural strength 5.5 MPa), (setting time at the beginning of 4.5 min. and the end is not less than 10 hours), the actual density of gray-green Portland cement powder is 3.1 g/cm ^{3}, water demand is 22 -26%, the surface area can be characterized by 2200-3500 g/cm ^{2}.

It is considered inappropriate to use sulfate-resistant cement in the production of aerated concrete blocks. If we want to produce aerated concrete using TsEM I 32.5 grade cement, we need to increase the amount of cement by 12-15%, and reduce the amount of sand by 12-15%. The cement used must be new, if it is old, that is, some time has passed since it was produced, then the strength of the produced aerated concrete will decrease. It is known that preserved cement loses up to 10% strength in 1 month. Ordinary and putsolan portland cements, slag portland cement and nepheline cement are used for the production of aerated concrete.

Economically, it is desirable to use 400 grade cement that hardens in an actoclave. In high-grade cements (600,700), it is necessary to reduce its relative cost, increase the amount of very fine sand filler. In hydration, the use of alite cement with a large amount of tricalcium silicate S_{3S}, which separates the independent hydrate of calcium oxide, is very effective.

$3CaOSiO_2+(n+1)H_2O=2CaOSiO_2 .\ nH_2O+Ca(OH)_2$

dicalcium silicate S_2S. Cement should have hydrogen index rN equal to 12-13 . Less than 11, rN li means less if it is alkaline cement , it is necessary to add lime to the cement . In the production of aerated concrete and foam concrete without an autoclave, the grade of cement is of great importance in determining the strength of concrete: the higher the grade, the stronger the concrete. Sand, gravel, slag, ash, expanded clay, shale, and other materials, any combination of them, are used as fillers in the preparation of refractory and heat-insulating wall products [5] .

Sand is selected and used according to the requirements of GOST 8736-2014. River or quarry sand can be used in this process. In the production of aerated concrete, it is recommended to use small and very small (fraction size: not more than 0.1-0.5 mm) sand groups. The smaller the fraction of sand , the better it is in the production of the product. The amount of soil and dust particles in the composition of the sand should not exceed 2%.

Sand materials. In the production of autoclaved porous concrete, quartz sand is often used as a sanding material. In addition, thermal power plants use ash, "combustible rocks", ash, opoka, marshalite and other sandy materials. Quartz sand should be clean, without soil and organic substances, and contain 70-80% SiO_2. The presence of soil slows down the hardening of aerated concrete and reduces its strength. Organic impurities worsen gas release and expansion of aerated concrete. In the production of gas or foam silicate, instead of quartz sand, ash containing more than 40% SiO_2 can be used [6] .

In the production of aerated concrete and aerated silicate, aluminum powder is usually used as a gas generator all over the world. In the production of aerated concrete and aerated silicate, other types of gas generators are almost never used. 0.35 to 0.6 kg of aluminum powder is used for 1 m^3 of aerated concrete and gas silicate, depending on the volumetric weight of the product. The lower the volumetric weight, the greater the powder consumption.

aerated concrete, there is also a variation method. For example, dolomite flour or ash from thermal power plants can be added to aerated concrete. After the aerated concrete mixture hardens and the reactions are completed, aerated concrete consists only of sand and cement air pores. It does not contain any harmful substances, except hydrogen formed during the reaction [7] .

In the production process in Great Britain, the condition of the aerated concrete raw material base is changing significantly, that is, there is a gradual transition from fly ash to sand, which is used as an aerated concrete filler. In addition, the waste ash left over from burning coal in thermal power plants is gradually becoming a scarce product in Western Europe. Electricity generation by burning coal is being replaced by renewable energy sources, mainly solar and wind energy. Therefore, the price of ash now does not lag behind the price of sand and sometimes even exceeds it. In the preparation of aerated concrete products, cement, quartz sand, special gas-generating additives are added, in some cases, gypsum, lime, industrial waste ash and slag are added to the mixture . In order to increase the strength of aerated concrete, fiber can be added to it, that is, artificial polypropylene fiber or natural basalt fiber. Further work was focused on its properties by adding passive additives to slow down the expansion, by replacing fillers with various high-clay industrial wastes, and by replacing acids with phosphate binders [8] .

the raw material base of the building materials industry by involving in the production of secondary products and industrial waste has great economic efficiency. Aerated concrete products cost in the composition of raw materials share 30-40 percent of the costs organize is enough This raw material as different sides products and industry from waste of use high efficiency determines

Natural and man-made artificial from glass waste , acidic and justified contained grainy from slag alkaline solution with together used as raw material , ts ementni work from release completely out throwing , gas o concrete quality improvement the first in line consistency , carbonation resistance and to the cold by increasing the durability and cost of the body reduces and to the required features have (resistant to acid environment , fireproof) gas and concrete get the job done .

Metakaolinite, microsilica in the author 's scientific works and rice shell added autoclaved and without autoclave work issued aerated concretes Learned . The composition of the mixture is ultradispersed very active of metakaolinite the introduction C a(O N) $_{2}$ has a low basicity , due to the thickening and strengthening of the structure hydrosilicates and kal ts iy hydroal yu minates harvest to increase the strength of aerated concrete , to increase its resistance to water environment, fire resistance , humidity reduce ga , reduce water elasticity enable gave Effective wall building bricks include diatomite, continuous pore and cavity stones with a soil composition of trepel rocks. The advantage of such bricks is that when they are used, the thickness of the wall and the cost of raw materials can be reduced (40%), and the cost of transportation is saved.

References:

1. Bakhodirov A., Abdusamatov K.B., Experimental studies using asbestos cement waste as microfibres in the preparation of aerated concrete, scientific and methodological journal of the Uz Academy, 08.2020, p. 283-287.
2. Abdusamatov K.B., Tilavov E., Kholboev S., Norqulova S., Determination of thermal conductivity of aerated concrete samples obtained on the basis of local materials, SamDAQI. Architecture and construction problems, No. 1, Samarkand-2019, pp. 79-82.
3. Auffart Y., Romanova G.W., Wehrhahn GmbH (Germany) , Modernization of aerated concrete plant company "N+N" in Great Britain: Novoe pokolenie liny dlya proizvodstva autoklavnogo aerated concrete, Sovremennyi autoclaved aerated concrete, Sbornik dokladov V nauchno-prakticheskoy konferentsii g. Pyatigorsk, October 16-18, 2019.
4. Bakhodirov A., Bozorov I. , AbdusamatovK . B. , Industry waste based on prepared of fiberglass concrete mechanic property study , SamDAQI . Architecture and construction problems , Samarkand -2020 , p. 104-106 .

RESEARCH OF METHODS OF OBTAINING ASBESTOS CEMENT AND MICROSILICA WASTE FOR FLAMMABLE AND HEAT INSULATING BUILDING MATERIALS

Abstract: *This article reviews the debate about the safety and potential uses of chrysotile asbestos. The article presents evidence for the safety of chrysotile asbestos as opposed to amphibole asbestos. Also, information is given on the growth of the amount of waste in the world, the possibilities of processing and use of waste from asbestos cement and other asbestos materials in construction, as well as the importance of disposal of industrial waste.*

Key words: *chrysotile asbestos, amphibole asbestos, anti-asbestos company, asbestos cement, industrial waste, construction waste, disposal, recycling, conservation of natural resources.*

The global market for chrysotile asbestos is still dominated by anti-asbestos companies. The company's calls relate to amphibole asbestos, which has been used for many years in the countries of the Eurasian Economic Union and is now banned worldwide. Amphibole asbestos was widely used in western Europe. But in Canada, Brazil, EOII and other countries - chrysotile asbestos has been used for many years due to its safety in controlled use. It is now becoming increasingly clear that anti-asbestos propaganda is at odds with science and objective truth.

Asbestos chemically reflects magnesium hydrosilicate. The chemical composition of serpentine asbestos is represented by the approximate formula (excluding water) $3MgO.2SiO_2$, and that of amphibole asbestos by $MgO.SiO_2$. It can be seen from the formulas that serpentine asbestos contains more magnesium, and amphibole asbestos contains more sand, which to some extent determines the properties and areas of application of individual asbestos types [1].

The solid waste from the production of asbestos cement (asbestos) and asbestos thermal insulation materials must be returned to production or can be used in the production of building materials (blocks with asbestos cement, asbestite perlite, etc.). The most rational direction of disposal of industrial waste, i.e. disposal, is to use it as man-made raw materials to obtain various products for construction purposes.

Processing of construction waste (utilization) is based on two concepts, that is, demolition (demolition) and recycling (recycling). According to the results of scientific research conducted in Europe, construction waste generated in the most developed countries makes up almost a third of all waste. We can draw the following conclusion from the general trend: "the more developed the country's economy is, the larger the share of waste in the total waste is."

The most important reserve that saves resources in construction is the extensive use of secondary material resources, which are production and consumption waste. The volume of industrial waste is growing at a higher rate than public production and is outstripping growth. On average, 8-10% of the cost of basic products is spent only on their disposal and storage. The use of industrial waste provides production with a rich source of cheap and often generated raw materials; leads to savings of capital investments intended for the construction of enterprises that extract and process raw materials and increase their profitability; release useful areas of land and reduce the level of environmental pollution. Increasing the level of utilization of industrial waste is the most important task of state importance [2].

Industrial production is growing year by year all over the world, and the amount of waste is increasing in proportion to its growth, approximately doubling in 8-10 years. The total weight of solid waste generated annually in the United States is 3.5 billion tons, which is about 50 kg of mass per capita .

In Germany and the Netherlands, the share of waste is 55%, in France 70%, and in terms of income per capita - the richest country in Europe - Luxembourg, this figure is 90%. According to the European Association of Demolition, at least 2.5 billion tons of construction waste is generated in all countries. Of this, construction waste in Europe is more than 180 million tons [3].

About 10 billion tons of minerals and the same amount of organic raw materials are used annually. The processing and disposal of most of the world's essential minerals is occurring faster than the discovery of their raw material reserves. Roughly 70% of the costs in the industry of the CIS countries are accounted for by raw materials, materials, fuel and energy. It should be noted that from 10 to 99% of raw materials are emitted into the atmosphere, water bodies and land.

Now, scientific work and experiments are being conducted to improve the physical and mechanical properties of concrete. The results of the researches have shown that it is effective to add various additives, surfactants, and fibers to concrete. Today, enterprises produce concrete products by adding various fibers. These fibers include steel fiber, metal fiber, polypropylene fiber, basalt fiber, glass fiber and other fiber fibers. It is also possible to use industrial waste asbestos cement as a fiber to improve the properties of concrete products.

Many foreign publications with cement concretes in the composition g positive of the presence of dispersed reinforcements role they emphasized . of these publications analysis dispersed reinforcement as a result primary of materials structural characteristics improved indicates the optimal composition of fibers in products and constructions It increases its durability and operational properties . Many researchers have shown the effectiveness of using asbestos, cellulose and other types of fibers to improve the properties of cellular concrete and create a quality structure. It is believed that these fibers significantly thicken the wall between the pores of aerated concrete, stabilize the process of formation of pores in the aerated concrete mixture, and increase the durability of aerated concrete products.

B eton masses contains 6 % asbestos fibers input offer does As a result , asbestos p ortl a ndcement ninghydration results high adsorb ts ion potential of cellular concrete masses structural parts between mutually of influence chemical processes activates cellular of concrete consistency features to increase take will come Asbestos thermal insulation materials can be divided into groups with names reflecting their composition to a certain extent. Asbestos-cement materials consist of asbestos and hardened portland cement. It differs from ordinary asbestos-cement products by its low strength and high porosity [4]. Chrysotile asbestos is the most suitable for the production of thermal insulation materials. It has higher heat resistance than amphibole-asbestos.

The average chemical composition of chrysotile-asbestos of Bazhenov mine in %: SiO_2 42.1; MgO 40.8; Al_2O_3 0.7; Fe_2O_3 1.1; FeO 0.5; constitutional H_2 0; 13.0, adsorption H_2O 1.4; organic matter 0.4. Asbestos fiber has a very high strength. The breaking strength of chrysotile-asbestos undeformed fibers significantly exceeds the strength of most natural and artificial fibers, organic and inorganic.

Temperature resistance is one of the most successful technical properties of asbestos. This property depends on its chemical composition and the behavior of water present in asbestos when heated. Compared with amphibole asbestos, chrysotile-asbestos has a higher temperature resistance due to the large amount of MgO in its content. The sorption (absorption) property of asbestos fiber is used in the production of thermal insulation materials. Asbestos heat-insulating materials can be considered as a mixture of asbestos fiber and highly porous materials: diatomite, light magnesia, freshly tempered gypsum, etc. It is usually the second component that makes up about 70-80% of the total weight of the material. 20-30% remains due to asbestos fibers. The properties of asbestos materials (porosity, strength, temperature resistance) are mainly determined by the properties of this component of the mixture, known as filler.

The addition of asbestos fiber to the main component of the thermal insulation material improves the properties of the main component: increases strength and reduces volumetric weight. The effectiveness of adding asbestos fiber is not the same for all materials. Asbestos fiber acts as a reinforcing component in them, they resist the formation of cracks and air shrinkage during drying of products or structures, increase strength. Heat insulation boards and molds can be made by mixing asbestos and cement and mixing with water, then molding and drying. Dense and durable asbestos-cement heat-insulating products are distinguished by high porosity and strength. Asbestos-cement heat-insulating plates are much smaller in size than ordinary asbestos slates due to their low strength. Plates are 1000 mm long, 500 mm wide, and 30 mm thick. Shells are 500 mm long, 30 to 60 mm thick. Asbestos-cement tiles are divided into three brands 300, 400, 500 according to their characteristics. Shells are issued in two brands - 400 and 500 [5].

By using the best quality asbestos and careful preparation, the volume weight of the product can be reduced to 150 kg/m ^{3}. The strength limit for this winter is 2-3 kg/cm ^{2}, the heat transfer coefficient is 0.075-0.09 kcal/m·h·grad (at 25 ^{0}C). Asbestos cement products are bioresistant to water. They do not swell when submerged in water. The limit temperature of their use is equal to 450 ^{0}C. Type VI asbestos and 400-grade Portland cement are used for the production of asbestos-cement products. In order to save asbestos, as a fibrous component, it can be partially replaced with good mineral cotton. The mixture of raw materials in this case is as follows in percent by weight of dry mass: asbestos-43, cement-43, mineral fiber cotton-14. This direction in the use of asbestos materials is explained by the need to more effectively use the valuable properties of asbestos, in particular, its resistance to high temperatures. The following thermal insulation constructions are made of asbestos materials: a) mastic; b) solid product (plate, shell, segments); c) soft product packaging materials (cord, paper, etc.) and g) mixed materials.

Asbestos materials have a general field of application, the main of which are: energy equipment of power stations, plants and factories; surface and underground laying of heat networks; technological equipment and pipelines in chemical, oil refining, gas and other industries. However, each material has its preferred areas of application where its heat protection and other properties can be used more effectively. I heat insulation material and from him performing insulation constructions choose one a series of technical and economic to factors depend

Many companies producing asbestos-cement products have adapted to the production of products by the wet process, using low-concentration asbestos-cement suspensions. When preparing a suspension with this technology, asbestos is soaked in a large amount of water (85-90%) and mixed with cement. The asbestos-cement suspension is then filtered by a mesh rotating cylinder. As a result, a thin, water-saturated layer of asbestos cement is formed on the surface of the cylinder. This layer is dehydrated in the measuring drum, and then transferred to the vacuuming and forming equipment. As a disadvantage of this technology, we can see a large amount of man-made waste due to the use of large amounts of suspensions.

The first type of wet waste can be used directly in the production of products by adding it to the molding mixture. Due to the fact that such wastes are usually dehydrated, the need for additional water addition creates inconveniences in processing.

The second type of wet waste includes solid insoluble parts of asbestos and cement in a water-dispersed suspension, as a dispersed phase. Such waste is sent through a pipe to a specially constructed wastewater treatment plant, where solids settle and the purified water is reused. As a result, waste such as porridge accumulates in the screening equipment, which is considered unsuitable for product production [6].

As a result of the analysis of the chemical composition of wet waste, it was shown that there are components related to the used raw materials in their composition. The main oxides are CaO and SiO_2, their content is on average 60%. Asbestos content does not exceed 6-7% on average. The length of asbestos fiber is 1.35-4.8 mm in half, and 0.25-1.35 mm in the other half.

According to the statistics of EOII, in the first half of 2020, Kazakhstan exported 89.9 thousand tons of chrysotile-asbestos, during this period Uzbekistan received 45.8% of the product. If 90,000 tons of chrysotile asbestos are imported into Uzbekistan per year, and 2.5-4% man-made waste is generated by enterprises, it is estimated that 9,000-14,400 tons are produced. It should be noted that 9,000-14,400 tons of asbestos-cement waste (1.5-2% of which is wet waste from cleaning equipment) is being accumulated in the republic per year.

According to the information of asbestos-cement industry enterprises, the amount of sediment in the process of processing water is 1.5-2% compared to the mass of raw materials. Wet asbestos-cement waste is collected in the processing equipment, and as a result, these wastes occupy large areas. From an ecological, wasteful and economic point of view, it is effective to introduce recycling of waste in the production process.

Asbestos -cement products manufacturing industry produces a lot of dry waste along with wet asbestos-cement waste. These wastes are constantly generated in the production of pipe and slate products. In the production technological process of enterprises, the cement+water+asbestos fiber mixture cannot be fully used (in recuperators), if the period of hydration of cement with water exceeds 2 hours, the quality of this mixture decreases, and the remaining mixture is sent to the cleaning equipment.

Microsilica waste can be used to improve the properties of various building materials. Microsilica is an ultradisperse powder formed as a waste product as a result of the condensation of high-silica dust during the production of silicon alloys. As a result of the development of the industry, with the increase in the production of silicon alloys on a global scale in recent years, the issue of studying the properties of microsilica formed in the form of ultradispersed powder material and the possibility of their use in modern construction has become urgent.

Microsilica is an ultradispersed material consisting of spherical particles obtained during gas cleaning of technological furnaces in the production of silicon and ferrosilicon. Microsilica particles have a spherical shape and a smooth surface. Meanwhile, the average particle size is 0.1-0.2 microns, which is up to a hundred times smaller than fly ash or cement particles, and its average surface area is 20 square meters/gram.

The use of microsilica in the construction industry allows to save up to 40% of cement consumption without adversely affecting concrete properties, and to reduce thermal energy during heat and moisture treatment of products. In practical conditions, 1 kg of microsilica can provide the strength properties of 4-5 kg of porcelain cement. Improves concrete properties such as compressive strength, denting, chemical stability, frost resistance, fire resistance and resistance to melting.

In the silicate industry, microsilica is used to increase the durability and service life of silicon carbide refractories, as well as to reduce the cooking temperature of the product during their production. The use of 2% by mass of microsilica ensures high retention of silicon carbide in the refractory and lowers the firing temperature from 1350 °C to 1300 °C . Microsilica is a multifunctional additive used to improve the physical, mechanical and operational properties of cement, cement concrete, aerated concrete, refractories, etc. [7].

Asbestos-cement waste is a valuable raw material for the production of building materials, in particular, for the production of fire-resistant and heat-insulating wall materials. The use of asbestos-cement waste as a raw material for the production of refractory and heat-insulating wall materials allows to significantly reduce the cost of the product, improve the physical and mechanical properties of the product, reduce a large amount of industrial waste and expand the useful land areas occupied by such waste, and significantly improve the environmental condition of this area. .

12-20% of asbestos fiber in asbestos cement waste in fire-resistant and heat-insulating wall materials prepared by adding asbestos cement waste increases strength by dispersing reinforcement in the material.

In addition to this, 2 more indicators have been newly created in the fire safety index for the classification of materials, i.e., the flammability group and the group of surface flammability . The main principle of fire regulation is to ensure the safety of people in fire conditions based on goal-oriented processes. In addition, the development of fire regulation is carried out for the following purposes:

- the maximum required level of fire safety in construction;

- providing the design process by creating a choice for the designer with a wide range of alternative solutions;

-to make it possible to carry out quantitative analysis of fire safety of objects. The main process of fire regulation is to ensure the safety of people in the event of a fire and to achieve minimum losses. But in practice, such materials are used that threaten people's life and health, increase the development of fire and increase the loss of materials. At the same time, fire-safe materials are used in the construction - concrete, reinforced concrete, natural and artificial stone materials, as well as wall materials with high fire safety.

Limiting the use of combustible materials reduces the likelihood of fire safety impacts on humans. It is known from the practice of a large number of experiments that difficult combustible and even non-combustible materials decompose under fire conditions, releasing smoke and toxic products. As the fire progresses, the burning of these materials increases, spreading the flame across the surface and releasing additional heat.

Indicators include: low heat of combustion, oxygen index, smoke generation index and toxicity of combustible products. It is possible to connect and use the above bases through an electronic network. Standardization of their use according to the flammability of materials and the speed of flame spread is carried out in different countries by the type of room, taking into account the type of material, the functional direction of the room, the presence of fire engineering systems, the method of attaching materials to the structure, the direction of the structure.

The strength properties of wall materials, ceramic materials and mineral alloys under fire conditions are practically unchanged. Their strength does not change at temperatures of 900-1300 ^{0C}, which is the calculated baking temperature of ceramic materials . For mineral alloys, the temperature range is close to their melting point. Such a temperature cannot be reached under fire conditions. The condition of materials of this group under fire conditions depends on the fact that all processes occur as a result of the first heating, that is, at their cooking temperature, and as a result of secondary heating, physical processes (temperature deformation and the release of capillary moisture) occur. Dense ceramic materials (tombop tiles) have the property of disintegrating as a result of rapid heating.

In the production of refractory and heat-insulating wall materials, cellular concrete is used among several materials. It was analyzed that in the production of aerated concrete, which belongs to the class of cellular concrete , sand and thermal power plant ash are used as fillers, but the use of asbestos cement waste is one of the effective methods for obtaining fire-resistant and heat-insulating materials.

Refractory wall materials are distinguished by the fact that the cost of preparation by baking or pressing from raw materials such as refractory clay and fireclay is slightly more expensive than the cost of products obtained on the basis of waste. Due to the absence of a cooking part in the technological process of production of refractory and heat-insulating wall materials made on the basis of asbestos-cement waste, heat energy spent for cooking is saved. It was analyzed that this, in turn, leads to a decrease in the cost of construction materials.

References:

1. Express information, production and trade position of TNVED TS 2524 "Asbestos" on the EAES market for the first half of 2020.
2. European Commission. (2020). Construction and Demolition Waste Management Protocol. Retrieved from https://ec.europa.eu.
3. Hu, M., Kleijn, R., Bozhilova-Kisheva, K. P., & Di Maio, F. (2019). "Circular economy and waste management in the building sector." Journal of Industrial Ecology, 23(5), 1171-1184. https://doi.org/10.1111/jiec.12840
4. Rashidov, J., Narov, R., Yusupov, K., & Kadyrov, I. (2024). Unraveling the Effects of Compound Additives on the Strength of Cast Concrete. Revista de Gestão Social e Ambiental, 18(5), e05599-e05599.
5. Alonso, M. M., García, J. A., & Lloret, E. (2020). Microwave thermal inertisation of asbestos-containing waste and its recycling in traditional ceramics. Journal of Hazardous Materials, 381, 120890. https://doi.org/10.1016/j.jhazmat.2019.120890
6. Rashidov, J., Ibragimov, B., Chulliyev, F., & Salimova, I. (2023). Structure of refractory materials based on local mineral raw. In E3S Web of Conferences (Vol. 401, p. 02057). EDP Sciences.
7. Capitani, D., Spreafico, M., & Moretti, L. (2024). Recycling thermally deactivated asbestos cement in mortar. Journal of Environmental Management, 342, 117645. https://doi.org/10.1016/j.jenvman.2023.117645