TECHNICS AND TECHNOLOGY OF PROCESSING BASALT WASTE

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Abstract. During the processes of the production of mineral cotton, a large proportion of non-standard waste products are produced. Besides the costs on their processing, the costs on their processing and disposal (transportation, placement, conservation, etc.) are also required. In addition, waste has a harmful effect on the environment. All this predetermines the need of carrying out the research aimed at studying the physical and mechanical characteristics of materials, the possibilities and methods for their secondary processing, and use in the production of heat and resource-saving products.

One of the important areas of resource and energy saving is the provision of heat insulation of industrial and residential buildings due to a constant increase of costs on their heating. As a result of this, the demand for environmentally pure insulants significantly increases, under the production of which various heat insulating materials are used, including - basalt fibers [1].

In existing methods of producing basalt fiber, waste can be up to 15% during production, which is most often simply disposed of. All this undoubtedly has a detrimental effect on the environment.

The purpose of our research was to find out possible ways of using waste in the production of basalt fiber, to study its physical and mechanical characteristics, and to determine the optimum fractional composition for use in finished products [2]. There was also the task of creating an apparatus and a method for deagglomerating technogenic fibrous materials [3].

Basalt fiber is obtained from the basalt melt in smelters by free flowing through spinnerets made of heat-resistant metals. Since raw materials for the production of rock cotton are rocks, due to this heat-insulating products meet the requirements of fire safety and can be used as fire insulation and fire protection. The limit of the agglomeration temperature of basalt fibers is 1000°C, which causes high values of the maximum operating temperatures [4].

In the process of manufacturing mineral cotton, in addition to cutting areas of the edge of the carpet (6 ... 8%), additional non-standard and unsalable goods (5 ... 8% of the total output) are formed. Thus, from 5 to 15% of products of total production due to their condition are not suitable for implementation and use. In many cases, it is impossible to recycle the forming amounts of trimming edges, and the residue has to be disposed of as waste.

Defective products and trimming edges are exported for disposal to special landfills. It has a detrimental effect on the environment in its turn. In addition, the material particles obtained during the processing of basalt fiber can enter the human lungs and cause undesirable consequences. For this purpose, the binding components are introduced into the composition, which makes it possible to create a relatively safe main product, for using it under preparing heat-shielding materials. Nevertheless, artificial building materials may contain residual components, which adversely affect the human body.

Basalt fiber, in addition to the above said, is an effective micro-reinforcing additive in concretes and other solutions on a cement or gypsum basis. It increases the resistance of concrete to deformation at the initial stage. When concrete begins to shrink (at a later stage), basalt fibers prevent cracking of concrete, thereby reducing the risk of breaking. In production of decorative products from cement or gypsum the basalt fiber reduces the number of defective of products by 90 ... 100%.

The use of basalt fiber in concrete solutions reduces the formation of shrinkage cracks at an early stage by 90% (the reinforcing grid reduces this figure by only 6%). But, in monolithic housing construction,
basalt fiber cannot yet be used as a substitute for steel reinforcement. In this way it is permissible to use reinforcement from basalt plastic.

The use of basalt fiber allows slowing down the process of hydration of concrete, thereby reducing internal stresses at temperature fluctuations. Basalt fiber is resistant to physical damage during mixing, as well as to all chemical substances that make up concrete and alkalis used in production processes. It is also thermo stable and is not subjected to corrosion (which is typical for steel fiber), easily distributed without forming clots, durable, compatible with any additives and admixtures in concrete, plasticizers, antifreeze additives, hardening accelerators and retarders of solidification[5].

Based on the above described analysis of the areas of use of basalt fibers, there is not only the task of providing the necessary technological conditions for the processing of techno genic materials, but also the obtaining micro fibrillated fillers from them with given physical and mechanical characteristics: size, shape, dispersion, etc.

To solve the problem of recycling basalt fiber products waste it is proposed to use it for dispersion reinforcement concrete. We conducted patent studies to find the technical solutions used to disaggregate waste from the production of basalt fiber [6].

The technical proposal is shown in Fig. 1.

![Figure 1. Device for disaggregate](image)

The method of disaggregate of techno genic fibrous materials consists in repeated impact of wire brush working elements fixed on rollers. Rollers having different circumferential speeds provide tensile forces and act on the pressed fibrous materials. The device allows the screening of fine-grained materials, and also due to vibration, eliminates the compaction of materials between rotating wire brush rollers towards each other and facilitates the spatial orientation of the fluffy fibers in the direction of flow. The method also provides for the selection of the disaggregated material according to separate fractions.

Thus, the method and construction of the device we propose will separate effectively the fibrous materials and also make the choice of disaggregated material according to the necessary separate fractions. The resulting basaltic fiber can be used as an effective micro-reinforcing additive in concretes and other solutions. All this will solve the problem of utilization of basalt waste and reduce production costs.

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