

Application of Basalt Fiber in Reinforced Concrete Sleepers

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Abstract – In this article the analysis of the Railways, which railway sleepers were made of different materials. Wooden sleepers tarred to protect against the negative effects of weather conditions. Today, reinforced concrete structures are rightly considered the material of the future for the manufacture of support under sleepers. Thus, the analysis shows the high efficiency of basalt fiber structures in reinforced concrete sleepers.

Keywords – Rails, Railways, Sleepers, Basalt Fiber, Wooden Sleepers, Reinforced Concrete Structures.

During the existence of Railways, supports for sleepers were made of various materials. Were stone, but the stone is difficult to process, quickly cracks and becomes unusable. Durable wooden sleepers tarred to protect against the negative effects of weather conditions. However, after a while, they also required either replacement or repair of railway tracks. Today, reinforced concrete structures are rightly considered the material of the future for the manufacture of support for sleepers and foundations for buildings and structures. Apply the Foundation of reinforced concrete sleepers for buildings of all kinds of complexity and number of floors on all types of soil. However, it should be borne in mind that this product weighs a lot. During this time, new types of reinforced concrete products are accepted at the experimental sites. Such reinforced concrete sleepers use basalt fibers. The properties of basalt fibers, such as resistance to high temperatures, acids, and especially alkalis, open up huge prospects for the use of basalt fibers in construction as:

- Reinforcing material for concrete and asphalt concrete pavements of motor roads, takeoff and landing strips and taxiway of airfields;

- Corrosion and chemical resistant rebar, the strength of which is several times higher than the strength of alloy steels;
- Non-flammable and fire-resistant composite materials for nuclear and thermal power plants, oil refineries and chemical plants, firewalls (fire blocking structures) of high-rise buildings and other critical industrial facilities where the occurrence and spread of fires is unacceptable;
- Chemically resistant and wear-resistant coatings, composite materials;
- Filters for filtering industrial and household effluents, filters for smoke and dust emissions of industrial enterprises.

Applications of basalt fiber in concrete is determined by technical and economic efficiency, which is due to the most full use of the positive properties of basalt fiber reinforced concrete compared to conventional concrete and concrete-reinforced steel rebar. When choosing design solutions, the methods of manufacturing, installation and operating conditions of structures are taken into account.



Rice.1. Basalt fiber.

The shape and dimensions of the elements should be taken based on the most complete use of the features of the properties of basalt fiber in reinforced concrete, the possibility of mechanized and automated factory production, the convenience of transportation and installation of structures [1]. It is also advisable to take into account the specific properties of dispersed reinforced concrete. For example, the GRC and the radio waves are not susceptible to overgrowing of algae in reservoirs. The accumulated domestic and foreign experience allowed us to determine the initial nomenclature of cost-effective basalt fiber structures in reinforced concrete. The most effective thin-walled structures are without a roll panel of coatings, ribbed panels of coatings and ceilings, elements of fixed formwork, elements of underground communications, wall panels and partitions, floor slabs, monolithic shells, elements of loggia fences, balconies and architectural facades, elements of hydraulic structures. Important at present are the issues of saving energy required for the production of various building materials. The amount of energy required for the production of concrete is minimal compared to the amount of energy (reduced to a single equivalent) required for the manufacture of steel, aluminum, glass, bricks, and plastics. In addition, the production of concrete materials requires less water consumption than the production of steel and has less impact on environmental pollution. Concrete reinforcement leads to a corresponding increase in the energy intensity of the material. Since the use of steel-reinforced concrete is carried out on a large scale, it becomes a significant problem to

minimize the consumption of metal and its most rational use in concrete. For example, often-concrete reinforcement with steel reinforcement is performed only based on the forces acting on the structure during transportation or installation [3]. In this case, the thickness of structural elements is usually set at least 60-80 mm (since it is necessary to provide a sufficient thickness of the protective layer of concrete to protect the reinforcement from corrosion). However, at the same time, the specified thickness of the elements in terms of strength may be unjustified. This leads to structural overspending of concrete and rebar, which practically does not fulfill its direct purpose during the operation of structures. In addition, a significant amount of steel in reinforced concrete structures is spent on mounting, cross-section and distribution fittings. Thus, there are potential opportunities to reduce the consumption of valves in structures.

If the weak component in the concrete is the mortar part, then in this case, the dispersed reinforcement will prevent the appearance of cracks in the mortar part and the main load will be borne by the filler-expanded clay when stresses appear. When getting basalt fiber into reinforced concrete, not only the correct choice and rational combination of raw materials, but also the technology of their production are important [2-4]. The principles of technology and methods of dispersed reinforcement depend largely on the type of concrete matrix used. The type of concrete determines the type of dispersed reinforcement that is rational for it and the optimal values of the geometric parameters of the dispersed reinforcement.



Rice.2. Basalt fiber in reinforced concrete sleepers.

Thus, the analysis shows the high efficiency of basalt fiber structures in reinforced concrete. At the same time, further research is needed to determine the areas of the most rational use of concrete using fibers from various materials.

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