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| Research Article

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Possibilities of Improving the Asphalt-Concrete Composition Based on Local Raw Materials in the Conditions of the Uzbekistan Climate and Road Operation

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Annotation
This article emphasizes optimizing the composition of asphalt concrete and its use in road construction. New approaches and technologies are highlighted to improve the physical and mechanical properties of asphalt concrete, ensure its environmental safety, and increase its efficiency in use in traffic tunnels, and information is provided on decrees and innovative materials aimed at the development of asphalt concrete in the road construction industry of the Republic of Uzbekistan.

Keywords: Asphalt concrete, composition optimization, road construction, environmental safety, traffic tunnels, physical and mechanical properties, applications of asphalt concrete.

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Main part. Asphalt concrete plays a significant role in road construction in the Republic of Uzbekistan, and its composition and production technology are constantly being updated. Nowadays, improving the quality of asphalt concrete and ensuring its environmental safety are the main goals in road construction. Improving the durability of roads can be achieved by optimizing the composition of asphalt concrete and using new raw material technologies.

The aggregates, bitumen, and additives used in asphalt concrete directly affect the service life of the road. The importance of applying new technologies to the production of high-quality asphalt concrete in the field of road construction, especially the use of environmentally safe modifiers and innovative materials are increasing day by day.

Decrees aimed at developing the asphalt concrete and road construction industry in Uzbekistan. The Republic of Uzbekistan pays great attention to the development of the asphalt concrete industry. In the Republic, there are a number of programs aimed at ensuring the

environmental safety of asphalt concrete production in the field of road construction, i. e, to reduce any damage. In particular, according to the "Road Construction and Infrastructure Development" program issued in 2020, it is planned to modernize asphalt concrete production technologies and introduce new environmentally friendly technologies. This will make it possible to increase the production efficiency of asphalt concrete by 25-30%.

In addition, measures have been developed to further improve processing technologies in terms of the use of recycled raw materials in the production of asphalt concrete and ensuring their environmental safety. By 2023, the goal was to increase the recycling rate of waste in the asphalt concrete industry to 50%. This is now showing its results.

The main composition of asphalt concrete and its physical and mechanical properties.

Asphalt concrete mainly contains three main components, there are:

1. Bitumen: It is the main binder of asphalt concrete and determines its quality. The main properties of bitumen are viscosity, plasticity and hardness. In the climatic conditions of Uzbekistan, the temperature resistance of bitumen (in the range of 50-70°C) is of great importance.
2. Aggregates: Aggregates make up 60-70% of the asphalt concrete composition. Their size and type directly affect the durability, thermal and mechanical properties of asphalt concrete.
3. Modifiers and additives: Modifiers (such as polymers or synthetic materials) can be added to improve the quality of asphalt concrete. Modifiers ensure the long service life of asphalt concrete and increase its environmental safety.

As for the physical and mechanical properties, they, in turn, are important in the strength, elasticity and heat resistance of asphalt concrete. Many experiments carried out so far show that the strength of asphalt concrete can be increased by 25-30% in case, Aggregates' size and bitumen's amont are optimally chosen correctly. For instance, It is possible to achieve a 15% improvement in the mechanical properties of asphalt concrete measuring 3.5 x 2.5 m.

Optimization of asphalt concrete composition. There are several approaches to optimizing asphalt concrete composition, There are:

1. Improving the quality of bitumen: usually polymer modifiers are added to bitumen to increase the resistance of asphalt concrete to high temperatures (heat or coldness). This creates a foundation for the strength and longevity of asphalt concrete.
2. Altering the type and ratio of aggregates: By optimizing the type and ratio of aggregates used in asphalt concrete, its strength can be enhanced. For example, granite aggregates can improve the mechanical properties of asphalt concrete by 20-25%.
3. Additives and modifiers: Currently, modified polymers and other modifiers are used in the production of asphalt concrete in the Republic of Uzbekistan, which increases the environmental safety of asphalt concrete and extends its service longevity.
4. Using of local materials: The use of stone and sand from local quarries in the composition of asphalt concrete is economically viable.

As a result, in the republic, up to 30% improvement in road construction has been achieved through optimized versions of asphalt concrete compositions. This has led to an increase in the economy of road construction by 15-20%.

Environmental safety. Asphalt concrete production requires environmental safety. The government of Uzbekistan pays special attention to preventing environmental pollution, reducing waste and recycling it during the production of asphalt concrete. Therefore, in some regions of the republic, 60-70% of waste is recycled in the production of asphalt concrete.

With the help of new technologies being used, it was possible to improve the composition of asphalt concrete and increase environmental safety. Through modifiers and additives, the release of Toxic Substances of asphalt concrete was reduced.

The use of asphalt concrete in traffic tunnels. Asphalt concrete has a special place in the construction of traffic tunnels. High elasticity, heat resistance, mechanical strength of asphalt are strictly required in order to extend asphalt service longevity and to ensure safety. The reason is that the specially developed asphalt concrete composition for traffic tunnels can extend the overall service life of the tunnel by 30-40%.

The use of asphalt concrete in tunnels reduces the mechanical and thermal stresses that occur on roads during its use, which in turn allows the tunnels to serve for a longer period of time.

Conclusion. By optimizing the composition of asphalt concrete, it is possible to improve the quality of road construction and ensure environmental safety. Innovative technologies and modifiers improve the physical and mechanical properties of asphalt concrete, which greatly increases the efficiency of road construction.

Uzbekistan's asphalt concrete industry is modernizing its technologies to produce high-quality and environmentally safe asphalt concrete. The use of asphalt concrete in traffic tunnels and other structures allows for increased safety and extended longevity.

Asphalt concrete plays an important role in road construction in Uzbekistan. Its composition and properties must be adapted to the climate, pressure and local conditions. New technologies (modified bitumen, recycled asphalt) can increase the durability of roads.

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