

Application of foamed bitumen in road construction in the republic of Karakalpakstan

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ANNOTATION

The article provides a research project that stops the process of destruction and prolonging the service life of old asphalt concrete coverings, on which there are signs of wear in the form of cracks, peeling, chipping, and others.

Key words: highways, asphalt concrete, organic binders, bitumen, foamed bitumen.

INTRODUCTION

Road construction requires a huge amount of building materials. Particular difficulties of construction organizations are associated with the production of highly deficient organic binders and, above all, viscous petroleum bitumen necessary for the construction of roads with asphalt-concrete pavement.

For this reason, in modern conditions in the field of production of road construction materials, it is of great importance to introduce new progressive methods for preparing asphalt-concrete mixtures that provide the required amount of finished products while reducing the energy intensity, labor intensity and material intensity of technological processes.

Less well-known methods based on the use of foamed bitumen. Binders in the foamed state are characterized by high surface energy, low viscosity and, consequently, high activity when interacting with mineral materials (crushed stone, sand).

In the manufacture of asphalt concrete mixes, foamed bitumen during mixing of the stone material with the binder usually contains no more than 20-30% of the gas phase. Therefore, when describing the binder in this state, the authors use the term "foamed bitumen".

In cases where bitumen is considered with a volume content of a gas component of more than 50 percent, the term "Bitumen foam" is used. For the production of foamed bitumen, bitumen in a liquid or heated to a liquid state and water or steam is used. When bitumen and water interact, the bitumen foams. [1, p. 4]

This draft is essentially the first attempt to present the issues of the use of foamed bitumen in road construction practice.

Modern experience in the preparation of asphalt concrete mixes and the strengthening of skeletal materials based on foamed bitumen indicates the significant advantages of this method of work.

When using foamed binders, the consumption of bitumen (up to 10% of the binder weight) and the mixing time of materials (by 20-25%) are reduced, which allows us to consider this method as a material and energy-saving technology and increase the preparation of asphalt concrete and bitumen-mineral mixtures.

With this method, there is a real opportunity to significantly reduce the heating temperature of the binder and mineral materials, which can provide not only a reduction in fuel consumption, but also an increase in the duration of the inter-repair service life of roads with asphalt concrete coverings. When foaming, the volume of bitumen increased 15-20 times. [1, p. 5]

More extensive work on the development of the technology was carried out in the United States and Australia in the 60-70 years.

In a critical review of the experience of using foamed bitumen in road construction.

Later, a method of foaming was developed by introducing cold water into the hot bitumen stream. Water was introduced into a special container, which already contained bitumen. Bitumen in contact with water foamed and exited the container through a series of nozzles. The bitumen flow rate was constant, and the water flow rate was regulated by a shut-off valve. Approximately the greatest effect was achieved when 1-2% of water was introduced into the bitumen. Observations of the experimental sections of road clothing showed good results.

In the 70s, in Australia, foamed bitumen was used in large quantities for processing crushed stone, followed by the construction of road pavement bases from it. This material is called foam asphalt.

MATERIALS AND METHODS

In the 70-80 years, work was carried out on the preparation of mixtures based on sand, gravel and crushed stone. With the use of foamed bitumen, the preparation of cold and hot mixtures in stationary mixers of periodic and continuous action.

It is established that cold mixtures can be prepared with a wet mineral aggregate.

Such mixtures do not stick for a long time when stored in stacks. The preparation of mixtures using foamed bitumen requires less bitumen and energy costs. Meets the economic requirement.

Laboratory and field tests have shown that foamed bitumen can be used for cold regeneration of asphalt concrete surfaces, and the bitumen-mineral mixtures obtained with them have high physical and mechanical properties. From them it is possible to arrange the upper layers of the bases and coverings of highways. [1, p. 19]

In connection with the wide application of this mixture on foamed bitumen in different countries, it became necessary to develop in the Republic of Karakalpakstan "Technical Conditions" standard methods for testing them, taking into account the characteristics of the properties and structure of this material.

Thus, the prospects for the use of foamed binders in road construction, as well as in related areas of production, are very wide and cause increased interest in this field of research.

At present, the applicant has at his disposal:

A network of highways in the Republic of Karakalpakstan;

The main goal of the proposed project is aimed at solving the following tasks:

To develop methods for the preparation of asphalt concrete mixtures on foamed bitumen and samples from them in the laboratory. [2, p. 24]

To determine the main advantages of the technology for preparing asphalt concrete mixtures, namely, a more uniform distribution of the binder in the mineral material (during mixing, higher indicators) of the physical and mechanical properties of asphalt concrete, saving of bitumen and other properties.

Develop in the Republic of Karakalpakstan "Technical conditions" standard methods of their testing, taking into account the characteristics of the properties and structure of this material.

The proposal of an alternative option for the preparation of asphalt concrete mixes and the strengthening of skeletal materials based on foamed bitumen for urban conditions, which is widely used in foreign countries.

To develop the economic efficiency of the technology for the preparation of asphalt concrete mixtures on foamed bitumen.

- Collection and analysis of available materials for the preparation of asphalt mixes and strengthening of skeletal materials;

- Testing of bitumen samples for foamed states under laboratory conditions;

- Preparation of asphalt-concrete mixtures with the use of foamed bitumen;

- Testing of samples of physical and mechanical properties of asphalt-concrete mixtures.

- Preparation of asphalt-concrete mixes in the field directly on the object by the method of mixing on the road. [3, p. 9]

Studies of the performed volumes of work on the physical and mechanical properties of asphalt-concrete mixtures. Determination of the parameters of asphalt concrete mixtures on foamed bitumen;

Study of temperature in the construction of highways;

Development of measures for the reconstruction of highways, development of proposals for asphalt concrete mixes, on foamed bitumen.

a) Search for the possibility of an optimal version of asphalt concrete mixtures on foamed bitumen.

b) Offer an alternative option for the preparation of asphalt concrete mixes and strengthening of skeletal materials.

c) Develop proposals for the choice of construction of asphalt concrete mixes, on foamed bitumen;

Technical and economic efficiency of the use of foamed bitumen.

The cost-effectiveness of the technology for preparing asphalt concrete mixtures on foamed bitumen is achieved by reducing the mixing time of the mixture on the roads, reducing the consumption of bitumen, reducing the energy costs for heating and drying the starting materials.

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