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# ADVANTAGES OF USING MODIFIED BITUMEN IN INCREASING THE TEMPERATURE RESISTANCE OF ASPHALT CONCRETE PAVEMENT

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**Abstract**
The service life and quality indicators of asphalt concrete pavements largely depend on their resistance to temperature effects. Intense summer heat and severe winter frosts often lead to plastic deformations, cracks, and other defects in the road surface. The use of modified types of bitumen is recognized as an effective solution to this problem. Bitumen modified with polymers, rubber, or other additives increases the thermal resistance of asphalt concrete mixtures, ensuring their mechanical stability and durability. This study examines the technological properties of modern modified bitumen used in the production of heat-resistant asphalt concrete, as well as their mechanism of action and practical effectiveness.

**Keywords**: Asphalt concrete, modified bitumen, deformation, service life, polymer, rubber, heat resistance.

## Introduction

In the work of the President of our country Sh.M.Mirziyoyev "Critical analysis, strict discipline and personal responsibility - should be the daily rule of the activities of every leader," in order to eliminate serious shortcomings in ensuring the comprehensive development of territories and radical transformation of infrastructure activities, the Cabinet of Ministers was instructed to create

The second of these areas is the development and control over the implementation of forecast parameters of programs for the development and modernization of road transport, engineering, communication, and social infrastructure, as well as their achievement [1].

The development of the country's economy largely depends on the state of the transport network, including highways[2]. The high-quality, long-term stable operation of highways depends on the physical and mechanical properties of the road surface.

Today, in the field of road construction, increasing the heat resistance of asphalt concrete pavements remains one of the urgent tasks. Climatic factors, in particular, sharp temperature fluctuations, lead to plastic deformations of the road surface [3].

Therefore, the use of modified bitumen types instead of traditional bitumen is becoming increasingly widespread. Bitumen modified with polymers ensures the elasticity of the road surface, strength at high and low temperatures, protecting it from cracking and settling. In this work, the advantages of modified bitumen, their degree of heat resistance, and practical applications are analyzed. The research results show that this technology is highly effective in terms of road quality and service life.

Temperature fluctuations in our country, especially very high temperatures in summer, cause the deformation of asphalt concrete pavement. To prevent this deformation, we should use a modified bitumen type rather than a regular bitumen type [4].

## MATERIALS AND METHODS

Modified bitumen is a bitumen improved using a polymer product. When using this type of bitumen, we obtain the following advantages: firstly, it is highly heat-resistant and gives elasticity at low temperatures, after which its mechanical strength increases and its resistance to various deformations improves [5]. As an example, it can be said that ordinary bitumen softens at summer temperatures, i.e., above (50 $^0$C), which leads to the formation of traces. This negatively affects the quality and safety of the road. Polymer bitumens serve to prevent this problem. For example, bitumen with the addition of the SBS (stryin-butadiene-stryin) modifier retains its shape at high temperatures and acquires specific elasticity[6].

Currently, in foreign countries, that is, in European and Asian countries, including Turkey, China, and Russia, a modified type of bitumen is widely used.

## RESULTS AND THEIR DISCUSSION

Coatings using bitumen as a binder - products, concrete and other materials are exposed to external environment, moisture, harmful gases and mechanical forces during use. Therefore, to ensure that such materials and products are suitable for long-term use, several requirements are imposed on bituminous binders:

Ensuring bonding with mineral rocks to form a structure and strength resistant to the negative effects of the external environment, temperature, carbon gases, and water;

Strong adhesion with stone and other materials, formation of a water- and frost-resistant layer;

It is necessary to ensure that bitumen does not corrode for a long time and its properties do not change during use.

One of the main properties of bitumen is the strength of bitumen layers. Its strength is determined by the thickness of the bitumen, the type and strength of the filler materials, and the degree of resistance to external temperatures. We recommended the use of modified bitumen to increase its heat resistance, and we will show its difference from ordinary bitumen based on this (Table 1).

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**Table 1 THE ADVANTAGES OF POLYMER-MODIFIED BITUMEN**

| N | Component | Common bitumen | Modified bitumen |
|---|---|---|---|
| 1 | Main component | Petroleum bitumen | Petroleum bitumen |
| 2 | Polymer additive | No | Yes; SBS, APP, EVA |
| 3 | Asphalt and Maltanes | Asphaltenes are high maltanes are low | Balanced asphalt-maltane ratio |
| 4 | Stabilizers | Usually not added | Stability add-ons are available. |
| 5 | Adhesive regulators | Low or none | Controlled by custom modifiers |

**Modification methods**

Add polymer 1 (SBS, APP, EVA)

2-rubber, rubber powder mixing

3-nano-modification (addition of organic and inorganic nanoparticles)

These were the methods of modification.

Technical and economic advantages

Technically - service life increases by 2-3 times; high heat resistance up to +300 C and strong deformation resistance.

From an economic point of view - although the costs of the modification process are high, the costs of repair and maintenance during operation are reduced by 40-50%, and from an ecological point of view - profit; due to the possibility of waste recycling, the impact on the environment is reduced.

**DISCUSSION**

Based on the above information, we can conclude that bitumen in asphalt concrete performs a binding function, serving to bond materials together. Thus, to increase the durability of asphalt concrete in the climate conditions of our republic, if we use high-quality materials and a type of bitumen modified with polymers, it will ensure a long service life for our asphalt concrete pavement and prevent problems that arise on roads.

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