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Increasing the Shipping Strength of Deformation-Resistant Modified Asphalt Concrete Pavels

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ABSTRACT: This article examines the issues of improving the roads of the Republic of Uzbekistan, increasing the shear strength and durability of asphalt concrete roads, the strength and deformation conditions of highly deformable asphalt concrete pavements on an elastic basis.Analysis of the obtained results SFM SP-OEP asphalt concrete made on the basis of the recommended bitumen "Kraton D1186" fully meets the requirements of GOST 9128-2013 and sufficiently helps to increase the shear strength and durability of roads at high temperatures of asphalt pavements.

KEYWORKDS:elastic base, deformation, strength, tensile and deformation condition, asphalt concrete, shear strength, strength coefficient, vertical stress, horizontal stress, temperature.

I. INTRODUCTION

Analysis of the causes of deformation and deterioration of roads in Uzbekistan has shown that shear deformations, cracks and linear irregularities, low viscosity, heat-resistant and highly brittle bitumen occur as a result. In addition, the excessive addition of bitumen to the decrease in the properties of asphalt concrete leads to an increase in its volume, a decrease in strength at high temperatures. Also, the use of mineral materials with different properties that reduce the strength of bitumen leads to a decrease in water and frost resistance of asphalt concrete. The use of a limited amount of crushed sand does not provide the required internal friction of the granular composition between the particles and does not form the optimal structural structure of the road surface.The temperature dependence of the shear strength of asphalt concrete is the main cause of plastic deformation. An increase in temperature reduces the adhesion of the binder and reduces the contact between the asphalt concrete particles. Shear strength tests fully describe the stability of asphalt concrete at high summer temperatures.The cohesive and adhesive strength of bitumen between mineral particles is of particular importance in ensuring shear strength. Therefore, adhesive and heat-resistant bitumen are required to increase the shear strength of asphalt concrete. The MBV proposed to us leads to a significant change in this parameter, i.e. to increase the adhesion and heat resistance by quantitatively changing the structural composition of the bitumen. The use of effective polymers of surfactants SFM additives, which increase the adhesion and heat resistance of bitumen, prolong the flexibility range, form the structure, allows the use of low-viscosity oil adhesives in hot asphalt concrete and provide the required shear strength of the coating.
Our experimental studies of asphalt concrete pavements using MBV have shown that they can significantly increase the shear strength [1].

II. METHODS OF RESEARCH

In order to more accurately demonstrate the performance of asphalt concrete in the fault zone and to assess the resistance to the interaction of shear forces, it is necessary to identify residual deformations in plastic flows that are much smaller than the critical strength.In the first stage, the displacement of the structure from a certain location occurs due to shell deformations. In this case, the main action is taken by the bitumen film and the asphalt binder, resulting in an increase in the coefficient of internal friction and the coefficient of adhesion during cutting. Subsequent voltage stabilization is associated with the perception of force by the grain portion of the mixture.Previous studies have shown

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that an increase in the amount of additives in the bitumen-containing surfactant SP-OEP SFM leads to a significant increase in softening temperature and viscosity [2]. It is therefore not advisable to increase the admixture further, as this leads to a decrease in the flexible-plastic properties of the asphalt concrete, which in turn leads to an increase in hardness and brittleness.Testing of the samples at a temperature of 50 0C (Fig. 2) showed that asphalt concrete SFM "SP-OEP" surfactants were added and their shear strength, i.e. the adhesion coefficient during disintegration, increased according to both the universal compression ratio and the Marshall scheme.

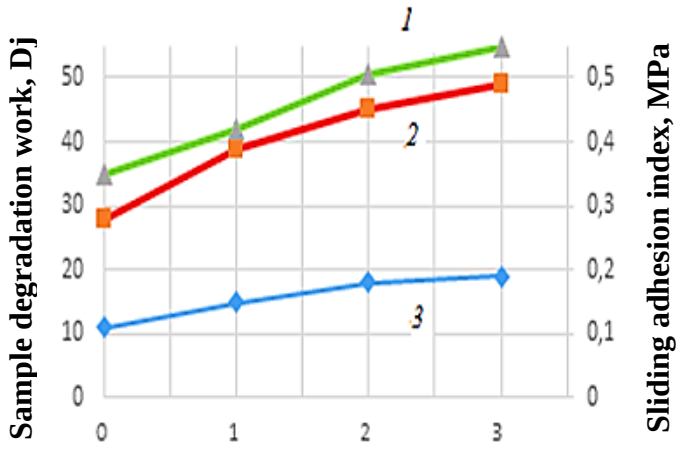

Figure 1. SP-OEP SFM shear strength depending on the composition of the additives: 1-Marshall scheme, 2-index of sliding cranes, 3-axis compression

The effect of SFM "SP-OEP" of the content-forming additive on the shear strength is clearly seen in the testing of samples as the amount of additives increases.The test results (Figure 2) show that the polymer Kraton D1186 has a significant effect on improving the elastic properties of bitumen, which leads to a decrease in the hardness of asphalt concrete and an increase in its elastic-plastic properties. When testing asphalt concrete samples with SP-OEP SFMs, their shear strength at high temperatures was increased, which is due to their structural ability.The increase in the shear strength of asphalt concrete with the addition of SFM "SP-OEP" is mainly due to the increased adhesion of bitumen, which in turn has a high cohesive strength of bitumen films in the zone of contact with mineral particles. In addition, the surfactant SFM "SP-OEP" additive helps to save bitumen and Kraton D1186 polymer due to its cohesive strength MBV structure.

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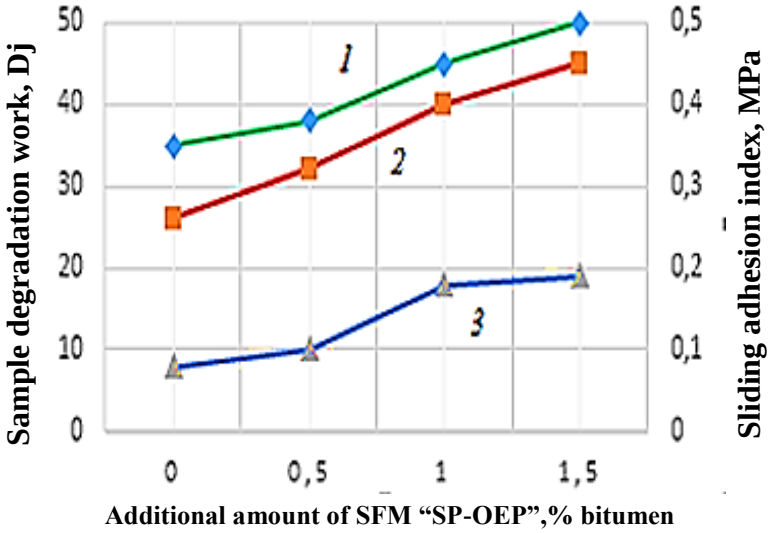

Figure 2. Dependence of asphalt concrete on the basis of BND-200/300 bitumen with the addition of polymer 2.0% SBS "Kraton D1186" on the shear strength at a temperature of 50 0S: 1-Marshall scheme, 2-slide crane index, 3-axis compression

Thus, the shear stability test fully described the shear strength of the recommended asphalt concrete at high summer temperatures. The high efficiency of shear resistance when using SFM "SP-OEP" was found to depend on its structural properties.The effect of SFM SP-OEP on the structure is seen when testing samples of asphalt binder. In this case, the anion-active SFM "SP-OEP" has an effective effect on improving the adsorption properties of bitumen in layers of mineral powder.In order to know exactly the performance of asphalt concrete in the non-destructive zone and to evaluate the interaction of shear stresses, it is necessary to determine the residual deformation, which is much lower than in plastic flows.

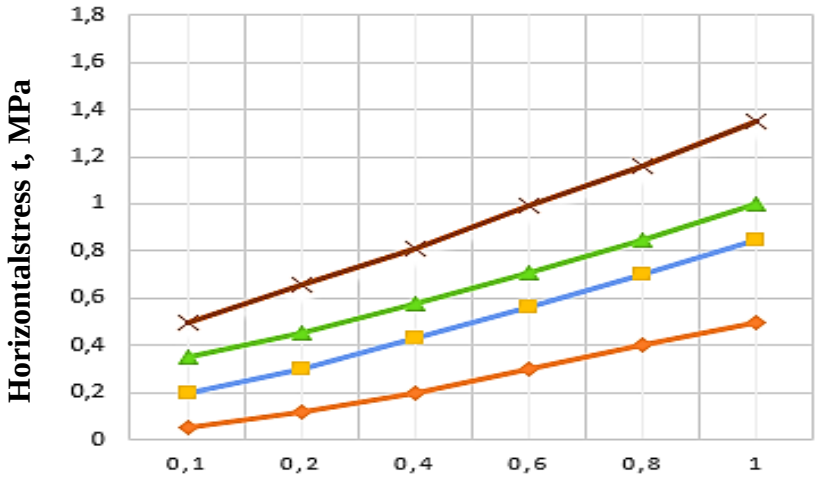

Figure 3. Dependence of strain resistance of samples on the basis of BND 200/300: 1- with the addition of asphalt binder «SP-OEP», 2- without the addition of asphalt binder, 3- with the addition of asphalt concrete «SP-OEP», 4- without the addition of asphalt concrete.

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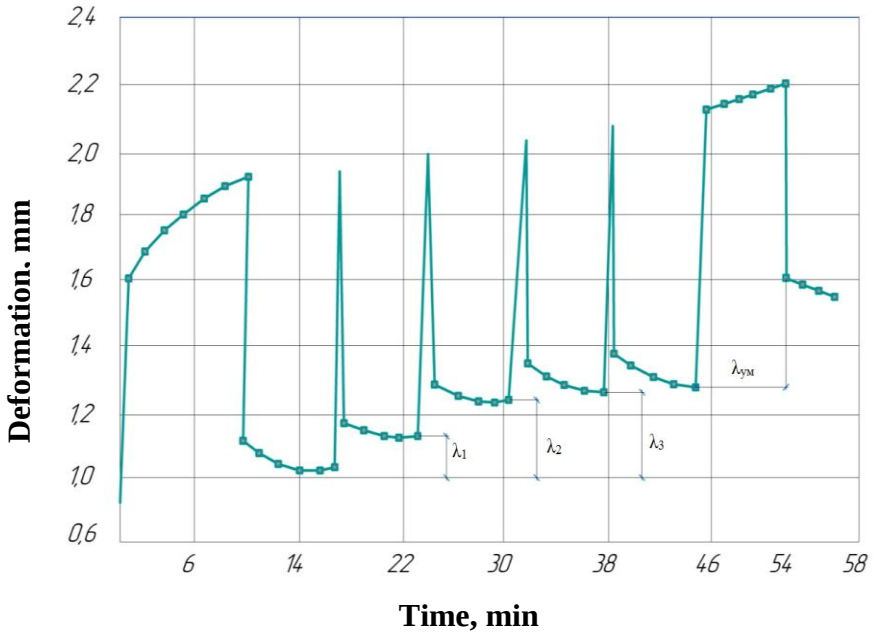

Figure 4. Accumulation of shear deformations in BND 200/300 based asphalt concrete at a temperature of 500C.
Deformation: l1… 4 - residual;
lum - general.

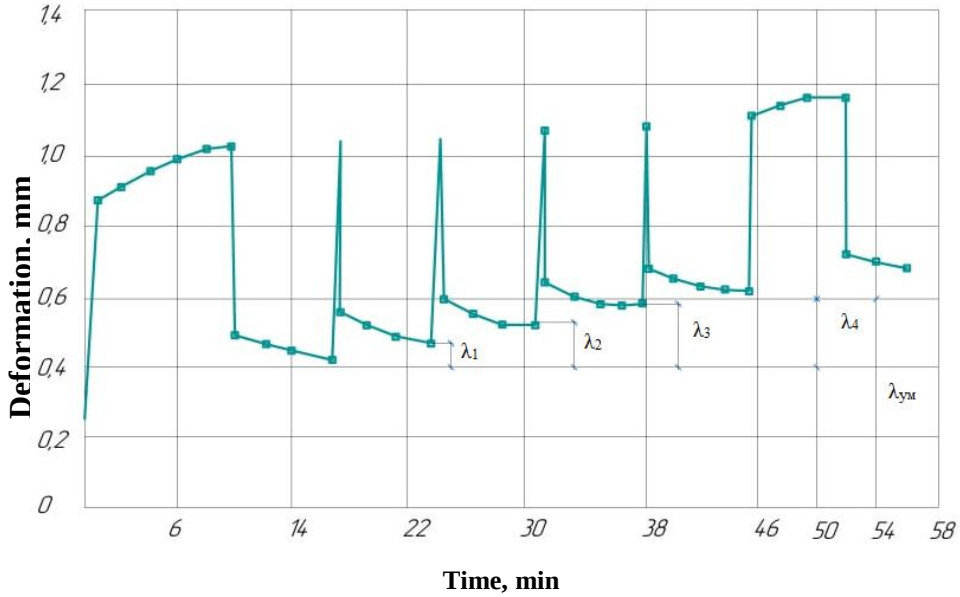

Figure 5. BND 200/300 in the amount of 2% by weight of bitumen
Accumulation of shear deformations at 50 0S in asphalt concrete with SP-OEP added.

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III. CONCLUSION

A.Analysis of the obtained results showed that the adhesion index and internal friction coefficient of asphalt concrete increased to 1.5 times, thermal stability (R50 / R20 compressive strength ratio) increased by an average of 20% if polymer is added to bitumen. "Kraton D1186" reduces the friction rate of asphalt cutting and breaking works by about 10%, the coefficient of internal friction is reduced by 10-15%. These phenomena are associated with an increase in the elastic properties of bitumen when using a polymer.

B. The test results (Figure 2) show that the polymer Kraton D1186 has a significant effect on improving the elastic properties of bitumen, which leads to a decrease in the hardness of asphalt concrete and an increase in its elastic-plastic properties. When testing asphalt concrete samples with SP-OEP SFMs, their shear strength at high temperatures was increased, which is due to their structural ability.

C. Thus, the shear stability test fully described the shear strength of the proposed asphalt concrete at high summer temperatures. The high efficiency of shear resistance when using SFM "SP-OEP" was found to depend on its structural properties.

D. Analysis of the obtained results We can see from Figure 3 that the residual deformation that occurs after each stress characterizes the sliding resistance of asphalt concrete. Residual deformation at each loading and unloading was 0.266 and 0.195 mm higher than those added to “SP-OEP” asphalt concrete and the total residual deformation was 1.34 and 0.63 mm higher, respectively.

E.Analysis of the obtained results can be seen from Figure 4.5, which shows that the modified asphalt concrete "SP-OEP" SFM made on the basis of modified bitumen "Kraton D1186" meets the requirements of GOST 9128-2013. Deformation-resistant modified asphalt pavements help to slide at high temperatures and increase the strength of roads.

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