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Increasing the Strength of Asphalt Concrete Road Surfaces under the Influence of Modifiers

Akhadjon Akhmedov Urmonjonovich [1]

Abstract: This article shows the use of increasing the durability of modified asphalt concrete formed with the addition of polymers "Kraton D1186" and surface-forming additives SFM "SP-OEP" with long-term water saturation, which is influenced by the main parameters of asphalt concrete, concrete is also considered in terms of frost resistance, corrosion resistance and crack resistance.

Keywords: mineral materials, temperature, corrosion, humidity, crack resistance, frost resistance, water resistance, strength, bitumen, chemical analysis.

Introduction: Due to the insufficient adhesion of bitumen to the surface of mineral particles, water enters the pores of asphalt concrete through the defects in the mineral grains and peels off the bitumen film from the surface, which leads to the weakening of the structural bonds and facilitates its destruction. Adhesion of bitumen to the surface of mineral materials, which reduces water resistance during long-term water saturation of asphalt concrete, increased by adding SFM "SP-OEP" structural additive. It increases the adhesion and cohesion of bitumen to mineral materials, and thereby increases the water resistance of asphalt concrete.

Water resistance during long-term water saturation is one of the main properties associated with asphalt concrete's resistance to cold, corrosion, cracking. The resulting water, as well as its freezing and the increase in the size of asphalt concrete holes, lead to the removal of bitumen films from the surface of mineral materials, and the emergence of internal stresses. As a result, the strength decreases and the destruction of asphalt-concrete coatings is accelerated. It is most suitable to increase water resistance by increasing the strength of adhesion of bitumen layers to the surface of mineral particles of asphalt concrete [1,2].

Since the service life of asphalt concrete pavements is a violation of the permissible level of traffic and operational condition of the road, the calculation of road pavements should be carried out not only by the criterion of road maintenance. The strength of the pavement in the elastic phase is also related to the criteria for preventing the loss of stability of the pavement due to the formation of irreversible deformations that break the flatness of the pavement and, accordingly, reduce the speed of vehicles [3,4].

Main part: Heat resistance and a significant increase in water and cold resistance of asphalt concrete require the use of high-quality modified bitumen. For this reason, detailed studies on increasing heat, water and frost resistance of asphalt concrete using "Kraton D1186" polymers and addition of SFM "SP-OEP" surface-forming additives are of great interes[11-33].t.

Figure 1 shows the water resistance of asphalt concrete based on Kraton D1186 polymers during long-term water saturation depending on the amount of SFM "SP-OEP" additive. As can be seen from the figure, with the combined use of polymers and structural additives, water resistance from 10 to 18% and with long-term saturated water from 15 to 23%, as well as a significant improvement was observed when using Kraton D1186 polymers.

[1] Senior Teacher, Ferghana Polytechnic Institute, Republic of Uzbekistan, Ferghan

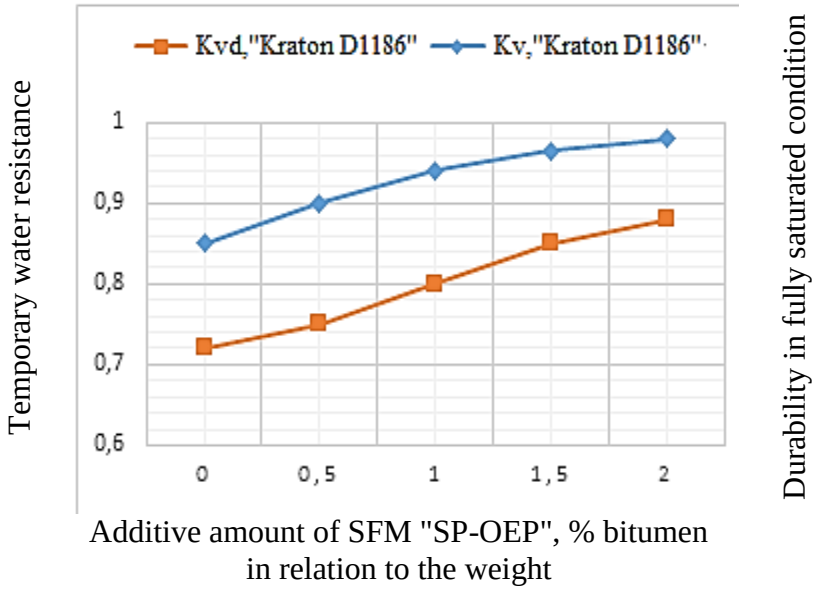

Figure 1. Dependence of water resistance (Kv) with long-term water saturation (Kvd) of modified asphalt concrete and the amount of "SP-OEP" SFM additive.

The study of the effect of the recommended additions of polymers and SFMs on the water resistance of asphalt concrete during long-term water saturation showed that the results primarily increase its effect on the properties of bitumen, improve its adhesion to basic and acidic rocks , increases cohesion and flexibility, reduces temperature, helps to increase frost resistance, corrosion resistance and crack resistance of asphalt concrete pavements.

The ability of asphalt concrete to resist the appearance of cracks under the influence of climatic factors and traffic load is one of the important indicators. Sample asphalt concrete preparation and testing was carried out in accordance with GOST 12801. Cracking resistance of asphalt concrete using polymers and their effectiveness have been proven in the research of many scientists [5.6, 11-33].

The results of the study of the effect of the recommended polymer additives on the cracking resistance of asphalt concrete when testing samples depending on the amount of "SP-OEP" SFMsi showed that the effect of polymers on bitumen properties and adhesion to mineral substances improved. An increase in viscosity and, accordingly, a decrease in bonding strength, a decrease in the fracture temperature of bitumen is associated with the effect of the recommended SFM additives.

Cracking resistance of asphalt concrete based on "Kraton D1186" polymers depends on the amount of added "SP-OEP" SFMsi. With the combined use of polymers, the structural additive "SP-OEP" SFMsi also helps to increase the crack resistance by 20 to 25%. This means that the plastic properties of bitumen are preserved and its brittleness decreases. A small change in the softening temperature during thermostating of bitumen modified with structural additives is explained by the significant preservation of the composition of the oily part, which was shown in the group chemical analysis of the compositions [7,8-33].

The specified shortcomings of GOST 9128-97 do not allow determining the compositions that fully meet the design solution adopted in the project and the climatic conditions of the area of the road location in the design of asphalt concrete mixtures. is one of the reasons for the rapid development of damage to road surfaces during further operation.

The main requirements for road bituminous binders are as follows: 1) strength of bituminous binders, which must meet the requirements of climatic and operational conditions of use 2) uniformity 3) heat resistance 4) resistance to service life 5) Mineral adhesion to materials[9,10].

The test results (Fig. 2) show that Kraton D1186 polymer has a great 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 the addition of "SP-OEP" SFMs, their shear strength increased at high temperatures, which is related to their structural ability.

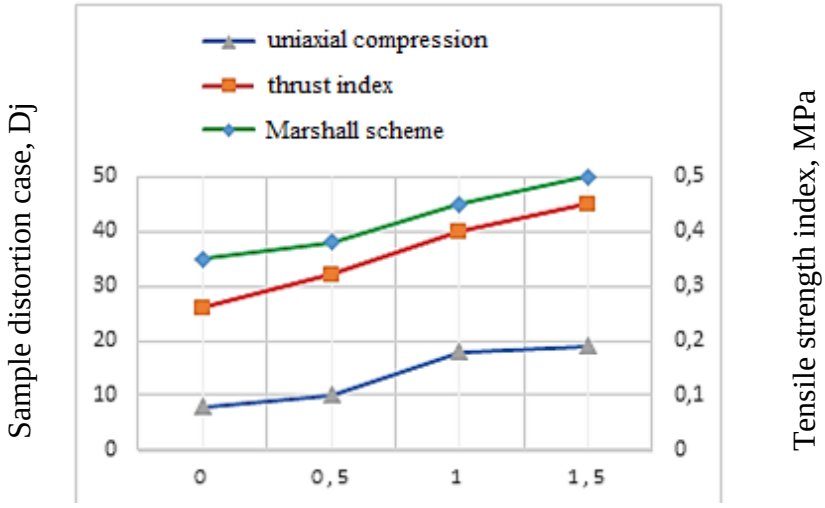

Figure 2. Dependence on shear strength of asphalt concrete produced on the basis of BND-200/300 bitumen with the addition of 2.0% SBS "Kraton D1186" polymer at a temperature of -50 ^{0}C.

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Summary: The effectiveness of the SFM "SP-OEP" additive in the structure organization can be seen when the asphalt binder samples are tested. In this case, the anionic active SFM "SP-OEP" has an effective effect on improving the adsorption properties of bitumen in layers of mineral powder.

The study of the effect of the recommended additions of polymers and SFMs on the water resistance of asphalt concrete during long-term water saturation showed that the results primarily increase its effect on the properties of bitumen, improve its adhesion to basic and acidic rocks , increases cohesion and flexibility, reduces temperature, helps to increase frost resistance, corrosion resistance and crack resistance of asphalt concrete pavements.

The above researches that the addition of "SP-OEP" SFM from the "Kraton D1186" polymer to the bitumen composition leads to the addition of individual effects from each additive, and it corresponds to our theoretical concepts. We can see that the structure and properties of modified bitumen correlate with the performance of high positive temperature asphalt concrete pavements, providing low temperature cracking resistance and corrosion and water resistance.

REFERENCES

1. Irkinivich K. I., Umaraliyevich K. I., Urmonjonovich A. A. Improvement of asphalt concrete shear resistance with the use of a structure-forming additive and polymer // International Journal of Scientific and Technology Research. - 2019. - T. 8. - №. 11. - C. 1361-1363.
2. Irkinovich, K. I., Hamzaevich, H. I., Dusmatovich, D. A., & Urmonjonovich, A. A. (2020). Strength and deformation conditions of large deformation-resistant asphalt slabs lying on an elastic base. Int J Agric Extension Social Dev, 3(2), 13-19.
3. Kasimov, I. I., & Akhmedov, A. U. (2021). Increasing the Shipping Strength of Deformation-Resistant Modified Asphalt Concrete Pavels. International Journal Of Advanced Research In Science, Engineering And Technology, 18076-18080.

4. Erkinovich, Q. I., Dusmatovich, D. A., & Urmonjonovich, A. A. (2020). The study of the effect of vehicles on the deformation of modified asphalt: Concrete coatings. Int J Agric Extension Social Dev, 3(2), 06-08
5. Маткаримов Шухрат Адхамович, & Ахмедов Ахаджон Урмонжонович (2020). Расчет асфальтобетонных дорожных покрытий на упругом основании. Universum: технические науки, (12-1 (81)), 96-101.
6. Kasimov, I. I., Dusmatov, A. D., Akhmedov, A. U., & Abdullaev, Z. J. (2019). The research of two-layers axially symmetrical cylindrical clad layers on their physic mechanical properties. Журнал Технических исследований, (2).
7. Касимов, И. И., Дусматов, А. Д., Ахмедов, А. У., & Абдуллаев, З. Д. (2020). Расчет асфальтобетонных дорожных покрытий. Журнал Технических исследований, 3(1).
8. Дусматов, А. Д., Гаппаров, Қ. Ғ., Ахмедов, А. Ў., & Абдуллаев, З. Ж. (2021). Влияния на физико-механические свойство двухслойных цилиндрических оболочек в напряженно-деформированном состоянии. Scientific progress, 2(8), 528-533.
9. Дусматов, А. Д., Ахмедов, А. У., Маткаримов, Ш. А., & Мамажонов, Б. А. У. (2022). Междуслоевые сдвиги двухслойных комбинированных бетоностеклопластиковых плит. Universum: технические науки, (1-1 (94)), 78-82.
10. Хамзаев, И. Х., Умаров, Э. С., Касимов, Э. У., & Ахмедов, А. У. (2019). Расчет многослойной плиты на упругом основании-ФерПИ. I Международной научно-практической кон-и, 24-25.
11. Goncharova, N., Abobakirova, Z., Davlyatov, S., Umarov, S., & Mirzababayeva, S. (2023, September). Capillary permeability of concrete in aggressive dry hot climate. In E3S Web of Conferences (Vol. 452, p. 06021).
12. Abobakirova, Z., Umarov, S., & Raximov, R. (2023, September). Enclosing structures of a porous structure with polymeric reagents. In E3S Web of Conferences (Vol. 452, p. 06027).
13. Management of Innovative Working Behavior, Lesnikova, E.P., Jakhongirov, I.J., Sadykova, K.V., Zakharova, T.I., Santalova, M.S.Lecture Notes in Networks and SystemsЭта ссылка отключена., 2021, 198, страницы 1008–1016.
14. Y Karimov, I Musaev, S Mirzababayeva, Z Abobakirova, S Umarov, Land use and land cover change dynamics of Uzbekistan: a review, E3S Web of Conferences 421, 03007
15. Akramov, X., Davlyatov, S., Umarov, S., & Abobakirova, Z. (2023). Method of experimental research of concrete beams with fiberglass reinforcement for bending. In E3S Web of Conferences (Vol. 365, p. 02021). EDP Sciences.
16. Goncharova, N., Abobakirova, Z., Davlyatov, S., Umarov, S., & Mukhamedzanov, A. (2023). Polymer reagent in construction practice. In E3S Web of Conferences (Vol. 365, p. 02024). EDP Sciences.
17. Mirzababayeva, S., Abobakirova, Z., Umarov, S. Crack resistance of bent concrete structures with fiberglass reinforcement, E3S Web of Conferences, 2023, 452, 06023.
18. Abobakirova, Z., Umarov, S., Raximov, R. Enclosing structures of a porous structure with polymeric reagents E3S Web of Conferences, 2023, 452, 06027
19. Strength and uniformity of composite reinforced columns, Akramov, K., Davlyatov, S., Kimsanov, B.*E3S Web of Conferences*, 2023, 452, 06012.
20. Smart-City Ecosystem Using Block-Chain Technology Davlyatov, S. *2023 3rd International Conference on Advance Computing and Innovative Technologies in Engineering, ICACITE 2023*, 2023, страницы 1077–1080

21. Artificial Intelligence Techniques: Smart Way to Smart Grid, *Davlyatov, S.2023 International Conference on Artificial Intelligence and Smart Communication, AISC 2023, 2023, страницы 838–842*

22. Salimov, O. M. (2020). Abduraxmanov UA Rare Devonbegi Madrasah in Samarkand (restoration and repair) Architecture. Construction. Design Nauchno-prakticheskiy journal. Tashkentskiy arxitekturno stroitelnye Institute, 1.).

23. Comparison of current and expired norms for the development of methods for checking and monitoring the seismic resistance of buildings.Shodiljon Umarov, Khusnitdin Akramov, Zebuniso Abobakirova and Saxiba Mirzababayeva, E3S Web Conf., 474 (2024) 01020, DOI: https://doi.org/10.1051/e3sconf/202447401020.

24. Abobakirova Z. A., Bobofozilov O. Ispolzovanie shlakovых vyajuщix v konstruktsionnых solestoykix betonax //international conferences on learning and teaching. – 2022. – T. 1. – №. 6..

25. Abobakirova Z. A., Bobofozilov O. Remont betonnogo pola–vidы povrejdeniy i merы po ix ustraneniyu //international conferences on learning and teaching. – 2022. – t. 1. – №. 10. – s. 32-38..

26. Abobakirova, Z. A. (2021). Regulation Of The Resistance Of Cement Concrete With Polymer Additive And Activated Liquid Medium. The American Journal of Applied sciences, 3(04), 172-177.

27. Asrorovna A. Z. Effects Of A Dry Hot Climate And Salt Aggression On The Permeability Of Concrete //The American Journal of Engineering and Technology. – 2021. – T. 3. – №. 06. – S. 6-10.

28. Abobakirova Z. A. Regulation Of The Resistance Of Cement Concrete With Polymer Additive And Activated Liquid Medium //The American Journal of Applied sciences. – 2021. – T. 3. – №. 04. – S. 172-177.

29. Akhrarovich A. X., Mamajonovich M. Y., Abdugofurovich U. S. Development Of Deformations In The Reinforcement Of Beams With Composite Reinforcement //The American Journal of Applied sciences. – 2021. – T. 3. – №. 5. – S. 196-202.

30. Goncharova N. I., Abobakirova Z. A., Kimsanov Z. Technological Features of Magnetic Activation of Cement Paste" Advanced Research in Science //Engineering and Technology. – 2019. – T. 6. – №. 5.

31. Kimsanov Z. O., Goncharova N. I., Abobakirova Z. A. Izuchenie texnologicheskix faktorov magnitnoy aktivatsii sementnogo testa //Molodoy uchenыy. – 2019. – №. 23. – S. 105-106.

32. Goncharova N. I., Abobakirova Z. A. RECEPTION MIXED KNITTING WITH MICROADDITIVE AND GELPOLIMER THE ADDITIVE //Scientific-technical journal. – 2021. – T. 4. – №. 2. – S. 87-91

33. Goncharova N. I., Abobakirova Z. A., Mukhamedzanov A. R. Capillary permeability of concrete in salt media in dry hot climate //AIP Conference Proceedings. – AIP Publishing LLC, 2020. – T. 2281. – №. 1. – S. 020028.