A new technology has been developed for the modification of road-oil bitumen of the brand "Baku 85/25".

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Abstract: The general industrial-producedbitumen have a softening temperature of 38-40°C. Therefore, during the flight period, where the temperature reaches 50-56°C, asphalt concrete is destroyed, spreading toxic gases into the atmosphere, evaporating, and creating environmental problems. With this in mind, this work focuses on a method for increasing the softening temperature of asphalt concrete systems by modifying petroleum-road bitumen with a polymer with functional groups. As a result of the modification, it was possible to change the characteristics of bitumen (heat resistance, frost resistance, plasticity, adhesiveness, resistance to aggressive environments, high dielectric properties, etc.) at a relatively cheap price, falling into a wide range creates the possibility of wide application. A road surface based on roller bitumen is advantageous compared to concrete not only in terms of strength but also in terms of safety and is 2.0-2.5 times **cheaper. It is proved that the modified bitumen "Baki 85/25" based on the asphalt concrete** mixture has high deformation characteristics. Such high elastic characteristics are imparted by asphalt concrete styrene-butadiene rubbers and isoprene rubbers. By adding polymeric modifiers to 3-5 mass parts of bitumen, it was possible to increase its viscosity by 2 times, and its strength by 4 times

Keywords: modification, styrene-butadiene-styrene copolymer, softening point, modified bitumen, polyisoprene rubber (PRS -3), polymer asphalt concrete

Introduction

Our literature studies have shown that to use petroleum bitumen as a binder, it is necessary to modify it with polymers. [1-4]

Currently, the demand for oil and road bitumen is growing, which makes it necessary to improve the properties of asphalt concrete materials. The main component in road construction is a bitumen. The properties of bitumen can be improved by modifying them with polymers [5-8]. Thermoplastics are the most widely used polymers used to modify bitumen.[9-12]

Modification of bitumen with synthetic polymers for asphalt coatings is a popular practice on a global scale. This modification helps to improve certain engineering properties of bituminous binders, such as rheological properties [13-16]. An important and critical research topic for polymer-modified bitumen (PMB) is its relationship to the rheological properties of the PMB microstructure to ensure its high performance. This is related to another fundamental research question, namely, how the morphology of PMB arises under different conditions. These topics have been intensively studied by researchers over the years [17-18], [19-22]bituminous modifiers are a

complex process that usually involves the dispersion and swelling of the modifier and the phase evolution of the mixture [23-29].

Methods

In the laboratory, the solid state for the preparation of modified bitumen

bitumen is heated in an electric furnace to a liquid state for 20 minutes. The maximum heating temperature of bitumen should not exceed 160 ° C. This is due to the rapid aging of bitumen at high temperatures, which worsens the properties of the polymer item composition obtained from it. Preheated plasticizer resin is added to the heated bitumen. An electric mixer with a rotational speed of 1200 rpm is connected to the system. . . After the polymer is added, the mixture is heated to 160 ° C with continuous stirring for 1.5-2.5 hours and then the heating is stopped, and the mixture is cooled to 140 ° C.

As a result of the above operations, we obtain a polymer-tumen binder (PBSBS-modified field composition samples prepared in the laboratory with a high-cutting mixer.

2. Resultand disscusion

2.1 Recipe and technology of bitumen preparation

As a result of the research, three recipes for the preparation of PMB were developed. Quantitative ratios of components in the mixture were prepared based on the normalized amount of polymers and plasticizers, as well as the adhesive additive. Important economic criteria were taken into account when compiling the recipe:

1. Temperature regime and duration of bitumen modification; 2. Availability and low cost of components.

The main properties of the bitumen "Baku 85/25" I used were determined and the results are given in Table 1.

Table 1

Basic properties of "Baku 85/25" bitumens and Discussions

basic properties	Baku 85/25" bitumens
25°C -also the depth of penetration of the needle into the sample, mm / 10	84
Bitumen softening temperature by "KvaSh" method °C	39
Extension, sm	68
Fraas görə kövrəklik istiliyi , °C	-9

The following recipe was used based on SBS rubber, which we used to modify petroleum bitumen (Table 2)

Table 2

The composition of the polymer-bitumen composition

Components of the composition	Quantity of components according to samples, mass fraction								
	1	2	3	4	5	6	7	8	9
SBS rubber	-	2,5	3,5	4,5	5	7	8	9	10
PİR (PİR -3) Bitiumin	- 100	1 97,5	1 96,5	1 95,5	1 95	1 93	1 92	1 91	1 90
talk	20	20	20	20	20	20	20	20	20
Taken from the Guzdek quarry, the particle size is close to the size of a mint		-150	109-	79	74	69	71	65	57
High molecular weight oil	-	-	-	-	9	11	10	16	19
The mixing temperature of components in the mixer, °C	160	160	160	160	160	160	160	160	160
Mixing time, min	20	20	20	20	20	20	20	20	20

The composition was prepared based on Table .2 and the main properties of the composition were determined and the results are reflected in Table .3.Table 3

Basic properties of polymer-bitumen composition

The name of the indicators	Indicators on samples								
	1	2	3	4	Prototype	6	7	8	9
Conditional strength in fracture, MPa	6,5	9,2	6,0	6,9	It breaks withouta load	6,0	9,0	6,0	8,5
Conditional strength in fracture,%	770	956	909	790	-	910	930	790	860
Shore A hardness,	59	54	45	48	20	45	47	39	42
alloy flow index(AFİ)T=190 °C, P=49 H, gr/10 min	27	29	38	39	100	34	37	33	29

The properties of primary bitumen and after modification were studied (Table .4)

Table.4

Basic properties of primary bitumen and modified bitumen

The name of the indicators	My first bitumen	modified bitumen		
		For example.	For example.	For example.

		6	7	8
Depth of needle penetration into the sample at 25 ° C, mm / 10	66	40	36	27
according to the ring and ball method ° C	55	102	98	91
Stretching, see	67	56	49	36
The softening temperature on Faars, ° C	-0	-19	-15	11

Fraas refers to the temperature of brittleness - the temperature at which the first crack in the sheet is formed by a thin layer of bitumen on a flat steel sheet as the temperature drops.

For application in production conditions, we used a well-known technology to prepare crushed stone-mastic asphalt concrete based on Table 3 and studied their physical and mechanical properties. The data obtained are shown in Table5

table5

Physical and mechanical properties of asphalt polymer concrete mix table 5.

№	basic properties	GOST 31015-2002 according to the norm	0 %	0,1 %	0,2 %	0,3 %	0,5 %
			SBS				
1	Density (volumetric mass), g / sm3	-	2,39	2,40	2,40	2,41	2,41
2	Residual porosity,%	2,0–4,0	3,761	3,358	3,358	2,956	2,956
3	Water saturation, % by volume	1,5–4,0	2,82	2,33	2,23	2,16	2,01
4.	Compressive strength, MPa at temperature: 20 °C 50°C	- 2,5-0,70	3,29 0,75	3,52 0,87	3,67 1,00	3,99 1,11	4,12 1,12
5.	Water resistance coefficient	-	0,86	0,92	0,94	0,95	0,97
6.	Water resistance coefficient for long-term water saturation (15 days)	0,75	0,79	0,86	0,88	0,91	0,92
7.	Crack resistance - ultimate tensile strength at a split at a temperature of 0 ° C, MPa	3,0 – 6,5	3,48	3,82	3,99	4,21	4,16
8.	Coefficient of internal friction tg	0,94	0,89	0,90	0,92	0,92	0,91
9.	hear adhesion at 50°C, MPa	0,20	0,18	0,33	0,57	0,60	0,65
10.	Binder runoff index,%	0,20	0,24	0,19	0,18	0,15	0,13

To improve the mechanical properties of the asphalt concrete mixture, the effect of the solidity of the mixture was determined by adding mineral dust nanoparticles formed in quarries to

the mixture. Studies have shown that the miner owner plays the role of a structural bitumen additive in the monolithic compaction of crushed asphalt concrete and sand grains.

The use of activated mineral powder in the production of asphalt concrete mixture allows to reduce the heating temperature of the mixture by 10-20 ° C without reducing the quality, and the service life of asphalt concrete pavements using activated mineral powders is on average 4-5 years longer than that of inactivated mineral powders. Results are given in Table6

Table 6

Physical and mechanical properties of asphalt concrete composition for the road surface.

The name of the indicators	results obtained					
	standard 31015-2002 according to the norm	1	2	3	4	5
Density (and weight), g/cm3	not normalized	2,38	2,39	2,395	2,406	2,410
Ultimate compressive hardness, MPa At 20^0C At 50^0C	 Not less than 2.5 Not less than 0.7	 3,51 0,72	 4,08 0,78	 4,26 0,85	 4,59 0,89	 4,72 0,92
Cracking strength Tensile shear strength, MPa At 0^0C	Should not be less than 0.20	0,20	0,32	0,55	0,59	0,63
Watersystem,%	1,5-4,0	3,07	2,68	2,52	2,33	2,05
Waterresistance	not normalized	0,85	0,89	0,90	0,92	0,94
Water resistance must be maintained with prolonged exposure to water (15 weeks).	, It should not be more than 0, 70	0,83	0,84	0,87	0,89	0,91
Internalabrasioncoefficient	It should not be more than 0,94-					
Polymer Flow Index 10/ minutes	It should not be more than 0,20	0,20	0,19	0,15	0,13	0,12
Residualporosity%	2,0-4,0	3,64	3,57	3,13	2,46	1,83

Results

The results show that the penetration of the prepared sample is 1.4 times higher than the standard, and the elasticity is 4 times higher.

Based on the results obtained, it was proposed to use polymer-modified "Baku 85/25" bitumen in the preparation of the asphalt-concrete mix.

As a result of our research work, a new processing technology for ecological neutralization of obsolete polymer products was developed, polymer grindings of 0.16-0.18 mm were obtained, and "Baku 85/25" brand bitumen was modified with this polymer grinding.

Thus, the most important environmental problem has been solved and very valuable raw materials have been obtained. Due to the very low physical and mechanical properties of petroleum road bitumens, asphalts laid on them deteriorate quickly and cannot withstand the conditions of operation. In this work, we have tried to apply the recently synthesized, relatively inexpensive SBS rubber to the industry by modifying the bitumen produced at the Baku refinery.

As a result of our research, a recipe for a polymer-bitumen-based polymer asphalt concrete mix was developed and proposed for industrial use.

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