PREPARATION OF ASPHALT CONCRETE WITH BEKE OIL SANDS

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Abstract

In the paper asphalt mix samples were prepared by addition of oil sands deposits Beke and studied their properties. Test results showed that a mixture containing 52.9 wt.% of oil sand on all physical and chemical characteristics correspond to fine porous asphalt mix mark 2.

Typically, asphalt concrete (AC) is a mixture of inorganic filler (crushed stone, sand, gravel, limestone) and petroleum-derived binder (bitumen). Bitumen serves primarily as a binder in asphalt concrete, the viscous nature of bitumen allows the asphalt to sustain significant flexible, creating a very durable surface material. Bitumen is containing approximately 4-7 % by weight in holly mixture. It consists of mineral aggregate bound together with binder, laid in layers, and compacted. This composite material commonly used to surface roads, street, runway, revetment, port facilities, recreational (bikeways, tennis courts, tracks), hydraulic structures, parking lots, and airports. The process was refined and enhanced by Belgian inventor and U.S. immigrant Edward de Smedt. Asphalt concrete has several synonymous in the world. AC commonly called asphalt, blacktop, asphalt (or asphaltic) concrete, bituminous asphalt concrete or bituminous mixture. As well as using terms on asphalt concrete - pavement (in North America), tarmac (in Great Britain and Ireland) and asphaltbeton (in Kazakhstan) [1-5].

The durability of asphalt concrete is greatly influenced by the environmental changes during the year between hot and cold temperatures as well as between day and night. Usually high temperatures can soften the bitumen and reduce the stiffness of AC making the mix more susceptible to rutting. Otherwise, low temperature can increase the stiffness of bitumen and reduce the flexibility of the asphaltic concrete, hence, inducing fatigue failure. Thus, high temperature stiffness and low temperature flexibility are important properties in asphalt concrete respectively to avert rutting and cracking. Asphalt is routinely milled and re-laid along with fresh materials, saving money and preserving non-renewable natural resources [1-3].

In the paper asphalt mix samples were prepared by addition of oil sands deposits Beke and studied their properties. According to all of the results, the natural bitumen from oil sands clothest to paving bitumen by physical and mechanical characteristics. Regarding to this reason, all of the samples prepared without adding petroleum bitumen. Because of natural bitumen from oil sands were estimated for petroleum paving bitumen [5]. Mineral aggregates in oil sands estimated for screenings. Because of they have same size and its main component is quartz [6]. At experiment 3 samples were prepared by 5, 6.2 and 7 wt.% natural bitumen in holly mix. The physicochemical characteristics of samples tabulated in table 1.

In the 1st sample 3372 g of oil sands are used, in the composition of them 371 g of natural bitumen and 3000 g of mineral parts. Because, content of organic part in oil sands were 11 wt.%. The content of oil sands in the initial mixture was 45.7 wt.%. For the preparation of the 2nd sample 3932.6 g of oil sands were added. In this material consists of 432.6 g of natural bitumen and 3500 g of mineral parts. The content of the oil sands in the initial mixture was 52.9 wt.%. 3rd sample

prepared by 4454 g of oil sands were used. As parts of the organic species are 490 g, the amounts of the mineral part are 3964 g. The content of the oil sands were – 59.5 wt.%.

Thus, the test asphalt mix prepared by proven performance to meet the requirements ST RK 1225-2013 showed that a mixture containing 6.2 wt. % of bitumen on all physical and chemical characteristics correspond to fine porous asphalt mix mark 2. Asphalt mix prepared with 5 wt. % bitumen does not correspond to the fine porous asphalt mix two brands in terms of strength 500C at - 0.4 MPa, instead of at least 0.5; water resistance during prolonged water saturation -0.31, instead of at least 0.5. As well as with 7 wt. % bitumen sample does not correspond to the fine porous asphalt mix two brands in terms of water resistance during prolonged water saturation -0.40, instead of at least 0.5.

Table 1 – The physical and mechanical characteristics of samples

Name of indicators	Estimated bitumen in asphalt mix			Basic requirements for the ST RK 1225-2013
	5 %	6.2 %	7 %	
1	2	3	4	5
Medium density, g/cm^3	2.31	2.33	2.28	not rated
Water saturation, %	6.1	5.4	5.3	for the dense type of B, V, G from 1.5 to 4.0 for the porous type from 5 to 10
Compression strength, MPa, at 20 °C	1.3	0.8	1.0	not less than 2.5 for M1 not less than 2.2 for M2 not less than 2.0 for M3
Compression strength, MPa, at 20 °C water-saturated	1.2	1.0	0.9	not rated
Compression strength, MPa, at 50 °C	0.4	0.7	0.5	not less than 1.3 for B M1 not less than 1.2 for B M2 not less than 1.1 for B M3 not less than 0.7 for the porous M1 not less than 0.5 for the porous M2
Compression strength, MPa, at 0 °C	2.2	2.1	2.3	no more than 13.0 for the porous not rated
Water resistance	0.92	1.25	0.90	not less than 0.85 for the dense M1 not less than 0.80 for the dense M2 not less than 0.7 for the porous M1 not less than 0.6 for the porous M2
Water resistance with prolonged water saturation	0.31	0.50	0.40	not less than 0.75 for the dense M1 not less than 0.7 for the dense M2 not less than 0.6 for the porous M1 not less than 0.5 for the porous M2

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