MODEL PAVEMENT ASPHALT ROADS BY USE WASTE SPON AND WASTE TIRE

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Abstract. Indonesia is the world's biggest producer of asphalt in which raw materials are contained in the soil of the hill and the mountain located on the island of a button. Highway construction is one of the priority sectors of development. The impact of this activity is the growing need for natural asphalt and aggregate, both aggregate coarse and fine aggregates. Asphalt demand of 600,000 tons per year, usually asphalts obtained from the import because Indonesia only sells in the form of raw bitumen and asphalt to get ready so Indonesia bought from other countries, it clearly results in reduced foreign exchange and availability. For the various kinds of innovations made by the manufacturer of asphalt, one with a modified bitumen. The Method used is to mix pure bitumen pen 60/70 with sponge rubber waste and waste the old tires.Based on the research results, the mixed asphalt material sponge waste and waste tires in the composition of 2%, 4%, 6% are not in accordance with the criteria of modified bitumen according to the specification bina marga. Penetrate the sponge Waste and waste tires in the composition of 6% with a value of 56mm and 58mm. Waste ductility Spon composition of 2% with a value of 104, for waste tires in the composition of 2% 4% with a value of 140 and 120. Test Solubility Waste sponge with the composition 6% primarily to the value of 99.904%. Test softening point sponge waste composition 6% with a value of 54.4^{o}C and waste tires in the composition of 6% with a value of 54° C. But after the return value of the elasticity of the sponge waste and waste tires in the composition of 2%, 4%, 6% the test results do not meet the specifications bina marga.

Keywords**:** asphalt modification, waste sponge rubber, waste tires

I. INTRODUCTION

Buton Island Indonesia is one of the world's largest producer of asphalt. Asphalt itself is used since thousands of years ago in Mesopotamia Syria and Egypt. Type of asphalt used was of the type that occurs in nature in the form of straight asphalt rock, or from oil that comes out on the surface and then evaporates the oil and hardened.In addition, the asphalt was also used as raw material for road pavement, especially in Indonesia. The use of asphalt growing rapidly along with the development of the city as well as a new road as access from rural to urban areas as well as access from one village to another.Along rarely wore olive oil or bitumen called bitumen pen 60/70 as an ingredient in the manufacture of hot mix asphalt mixing plant in because Indonesia is not making asphalt imports more oil and bitumen from the outside.These led manufacturers prefer synthetic elastomer type modified asphalt and asphalt bitumen kind of button that has been modified bitumen value characteristics.The sponge material is the raw material for the manufacture of slippers or shoes, which is where the rest of the sponge waste will be disposed and burned or left to accumulate only. Material Rubber tires are also an important component of the motor. Tire life in a limited and will be eroded as the life that can not be used again and must be replaced. In this case, the researchers used a sponge waste and waste tires are used as a mixture of modified asphalt. For researchers using basic ingredients and for the 60/70 pen bitumen modification using waste materials and waste tires in the sponge. Objective calculate test results characteristics of oil bitumen pen 60/70 before there was a mixture of waste and waste tires in sponge, calculate the characteristics of the test results after the added asphalt mixture sponge waste - waste tires and waste sponge mixture calculates usage and waste tires in order to improve highway pavement quality

II. LITERATURE STUDY

2.1 Description Theory

The highway is a portrait of a country. Prosperous countries generally have a lot of roads are smooth. Unfortunately, the portrait was not found in Indonesia. There are still many roads are in poor condition included in Jakarta as the capital city. The number of potholes resulting repair costs and maintain the infrastructure needed around 1.2 million tons of asphalt per year. The amount is not comparable with the national oil bitumen production capacity is only about 720 thousand tons per year. Of that total economic production levels of oil asphalt Indonesia only 300 to 450 thousand tons per year, or about 50 percent of its capacity. Every year Indonesia had to

import about 700 thousand tons of asphalt per year. That is, this country must drain of foreign exchange is not less than 700 million dollars or about 7 trillion per year. The problem is, even if the production of asphalt Indonesia increased to full capacity, the supply of 700 thousand tons of asphalt per year of imported goods will not decrease. Suhardjo Poertadji, researchers from the University of Indonesia bitumen, asphalt production quality or performance of Indonesia does not meet the standard requirements of the manufacture of first-class roads in urban areas, highways, and bridges.

2.2. type Asphalt

In general, the type of asphalt can be classified based on the origin and formation process is as follows:

A. Natural Asphalt

No natural asphalt derived from the mountain like asphalt in Buton island and some are obtained on the island of Trinidad in the form of asphalt lake. The world's largest natural asphalt found in Trinidad, in the form of asphalt lake. Indonesia has natural asphalt that is on Buton island, known by the name of Asbuton (Asphalt Buton Island).

B. Asphalt Oil

Petroleum asphalt is asphalt which is a residue of petroleum distillation. Every petroleum can produce residue types Asphaltic base crude oil containing a lot of asphalt, paraffin base crude oil containing many paraffin, or mixed base crude oil containing a mixture of asphalt and paraffin. Commonly used for road pavement Asphaltic base crude oil.

2.3 Asphalt Modification

Asphalt bitumen modification is made by mixing a hard asphalt with added material. Asphalt modification was introduced outside the country for more than 15 years ago (Caribit, Cariphalt, Mexphalt, Superphalt, etc.) in order to prevent cracking in the winter time, preventing plastic deformation at heavy load in the summer, and is expected to be more durable to oxidation sun.

2.4 Waste Rubber Sponge

Waste is the result of the remainder of a process that can not be reused if this is too much waste in the environment it will have an impact on environmental pollution and the impact on the health of the surrounding community. One of the industries that are closely related to environmental issues is the rubber industry.

2.5 Waste Rubber inner tubes

The old tires it still can be used again for several purposes. Several things can be said to be useful continuously but also there are used only for purposes of brevity only.

The Inner tube can not be explained by land, therefore Waste tires in a very disturbing and it does not work what when on leave granted. Waste including used tires is not just thrown away that can generate environmental problems due to pollution.

III. METHODOLOGY

In this research, an experimental method for conducting laboratory experiments to obtain a composition/data desired. The purpose of this study was to determine the characteristic properties of bitumen pen 60/70 after Waste mixed with sponge rubber and rubber tires, and also how much influence the addition of certain additives to asphalt characteristics as a mixture of asphalt.

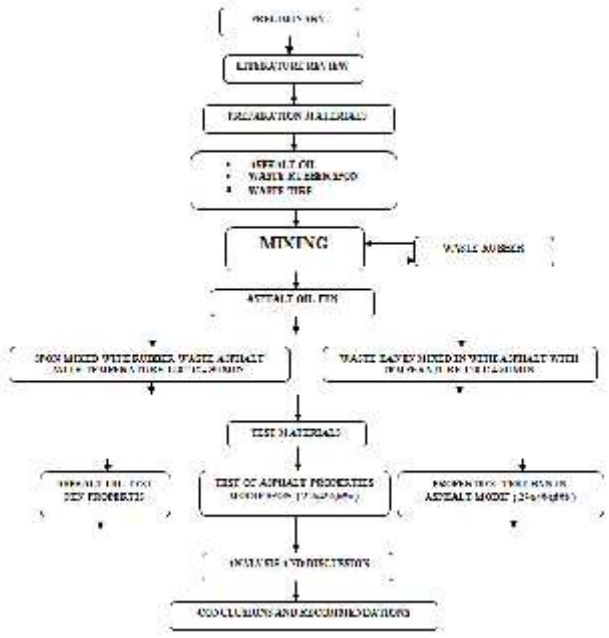

Fig.1 Flow Chart

IV. RESULTS AND DISCUSSION

4.1. Asphalt Testing

Testing of bitumen pen 60/70 Pertamina includes penetration, viscosity, softening point, flash point and burning point, ductility, Toluene solubility, the density of asphalt, the weight lost after Thin Film Oven Test (TFOT), penetration after TFOT, ductility after TFOT. The test results of oil bitumen pen 60/70 yield penetration values 60,4mm, 455 centistokes viscosity, softening point of 48.9 ° C, ductility> 140 cm, solubility Toluene 99 709%, a specific gravity of 1.032 g / cm3, the value of the flash point of 296 ° C , weight loss after Thin Film Oven Test (TFOT) 0.151%, after TFOT 59 180% penetration, ductility after TFOT> 140 cm.

4.2 Planning Asphalt Mixture Pertamina Pen 60/70 With Sponge Rubber Waste

Waste Rubber Sponge Before doing Mixing should be done in refining activity or can take direct refining waste that has been done in house slippers production so that the execution time of mixing the waste rubber sponge can be mixed homogeneously with the base material asphalt.

From these calculations, compositions that meet the requirements are:

1. Composition 1: 1 kg of bitumen Pertamina + 2% mixture of rubber (20 Gram)

2. Composition 2: 1 kg of bitumen Pertamina + 4% mixture of rubber (40 Gram)

3. Composition 3: 1 kg of bitumen Pertamina + 6% mixture of rubber (60 Gram)

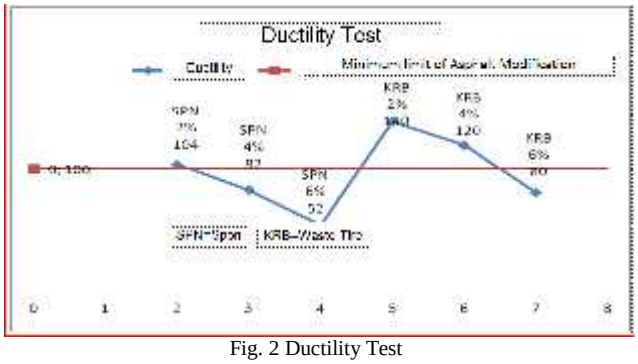

Fig. 2 Ductility Test

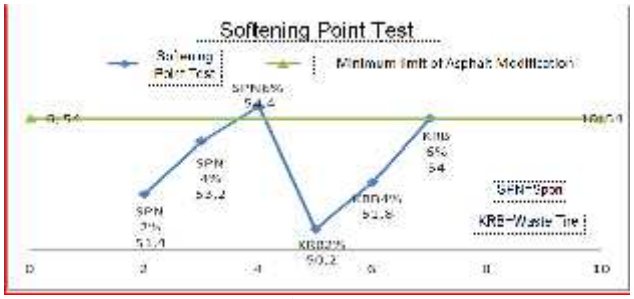

Fig. 3 Softening Point Test

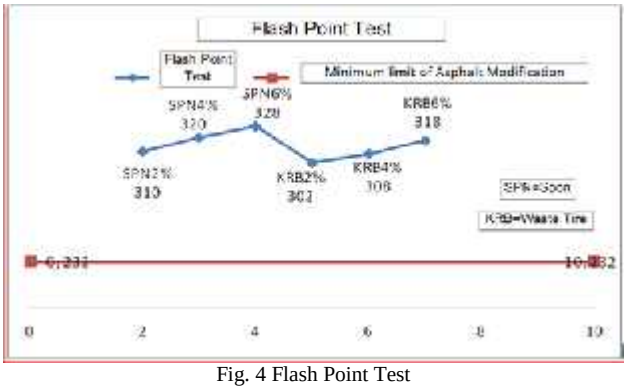

Fig. 4 Flash Point Test

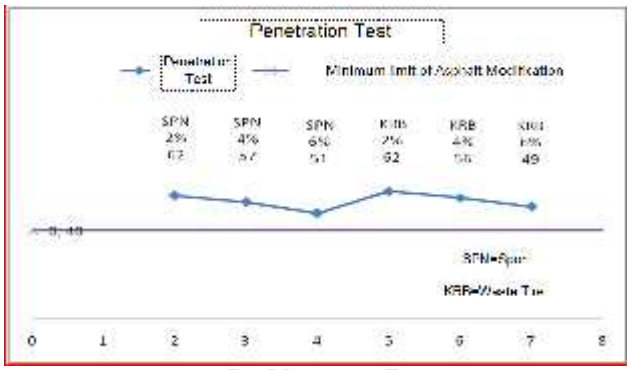

Fig. 5 Penetration Test

4.3 Mixed Asphalt Testing Results Pertamina Pen 60/70 With Sponge Rubber Waste Composition 1, 2 and 3

Experimental study of waste utilization in the sponge for manufacturing modified bitumen was made 3 kinds of compositions, namely compositions 1, 2 and 3. The composition using the types of asphalt is asphalt Pertamina Pen 60/70 with sponge rubber waste. Tests on the asphalt mixture with composition 1, 2 and 3 include penetration, viscosity, softening point, flash point and burning point, ductility, solubility Toluene, the density of asphalt, the weight lost after Thin Film Oven Test (TFOT), penetration after TFOT, ductility after TFOT and elastic after Returns.

The test results of oil bitumen pen 60/70 mixture with a rubber sponge composition Waste 1,2 and 3 produces a value of penetration (56 mm, 53 mm and 48 mm) viscosity (850, 1050 and 1350 centi Stokes), softening point (51, 4, 53,2 and 54,4oC), ductility (104, 82 and 52 cm), solubility in Toluene (98 802, 97.263 and 96.124%), specific gravity (1,038, 1,042 and 1,043 g / cm3), the flash point (310, 320 and 328 ° C), the weight lost after Thin Film Oven Test (TFOT) (0.04, 0.035 and 0.031%), penetration after TFOT (83.9285714, 79.24528 and 75%), ductility after TFOT (74, 54 and 48 cm), the elasticity after the return (12, 21, 33)

4.4 Mixed Asphalt Testing Results Pertamina Pen 60/70 With Rubber Waste tire in Composition 1, 2 and 3

Tests on the composition of the asphalt mixture with 1, 2 and 3 includes penetration, viscosity, softening point, flash point and burning point, ductility, Toluene solubility, density of asphalt, the weight lost after Thin Film Oven Test

The test results 60/70 pen asphalt mix oil with Waste tire rubber in the composition of the 1,2 and 3 resulted in penetration value (58, 52, and 51 mm) viscosity (650, 800 and 1100 centistokes), softening point (50.2, 51.8 and 54 oC), ductility (140, 120 and 80 cm), solubility in toluene (99.904, 99.834 and 99.625%), specific gravity (1,033, 1,034 and 1,037 g / cm3), the flash point (302, 308 and 318 ° C), the weight lost after Thin Film Oven Test (TFOT) (0.022, 0.016 and 0.014%), penetration after TFOT (82.75862, 83.63636 damn 74.5098%), ductility after TFOT (120, 104 and 78 cm), the elasticity after the return (10, 19, 30).

V. CONCLUSION & RECOMMENDATION

Results of laboratory experiments and analysis of experimental results, we can conclude:

1. The test results of oil bitumen pen 60/70 yield penetration values 60,4mm, 455 centistokes viscosity, softening point of 48.9 ° C, ductility> 140 cm, solubility Toluene 99 709%, a specific gravity of 1.032 g / cm3, the value of the flash point 296 ° C, the weight loss after Thin Film Oven Test (TFOT) 0.151%, penetration after TFOT 59 180%, ductility after TFOT> 140 cm in overall compliance with the covenants of bitumen so it can be used as a mixture of hot asphalt because it meets spec in clan ,

2. The test results 60/70 pen asphalt mix oil with sponge rubber waste with a composition of 1, 2 and 3 produces a value of penetration (56 mm, 53 mm and 48 mm) viscosity (850, 1050 and 1350 centistokes), the softening point (51 , 4,

53.2 and 54,4oC), ductility (104, 82 and 52 cm), solubility in Toluene (98 802, 97.263 and 96.124%), specific gravity (1,038, 1,042 and 1,043 g / cm3), the value of the flash point (310, 320 and 328 ° C), the weight lost after Thin Film Oven Test (TFOT) (0.04, 0.035 and 0.031%), penetration after TFOT (83.9285714, 79.24528 and 75%), ductility after TFOT (74, 54 and 48 cm), elastic after the return (12, 21, 33) which as a whole is there are some who do not meet all the requirements that no other asphalt according to the spec building clan. and the results of test results 60/70 pen asphalt mix oil with waste tire rubber in the composition of the 1,2 and 3 resulted in penetration value (58, 52, and 51 mm) viscosity (650, 800 and 1100 centistokes), softening point (50, 2, 51.8 and 54 oC), ductility (140, 120 and 80 cm), solubility in toluene (99.904, 99.834 and 99.625%), specific gravity (1,033, 1,034 and 1,037 g / cm3), the flash point (302 , 308 and 318 ° C), the weight lost after Thin Film Oven Test (TFOT) (0.022, 0.016 and 0.014%), penetration after TFOT (82.75862, 83.63636 damn 74.5098%), ductility after TFOT (120 , 104 and 78 cm), elastic after the return (10, 19, 30) which as a whole is there are some who do not meet all the requirements that no other asphalt according to the spec building clan.

3. Use of bitumen modification that has been modified characteristics value is in need in today's conditions, because of a lot of vehicle speed and vehicle load that has exceeded the limit. By modifying the value of the point of penetration to be rather brittle and elevate the temperature of softening point and by adding rubber waste inside is one way to extend the life of the road construction. But on the other hand, there are many components of asphalt testing is still not meet the spec in a clan, but it is key to asphalt worth using. Lack of facilities for asphalt mix is one of the obstacles, so in a sense, they are less homogeneous. So that researcher still needs more improvement.

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