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Investigation of the Effect of 60% of the Addition of Latex on Asphalt Pen 60-70

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Abstract. This study discussed the increase of latex 60% addition to obtain the standard of asphalt 60-70. The comparison used were without the increase of latex addition (L0), 1000 g penetration of asphalt 60-70 with 100 g latex with 60 % degree or 10 phr (L1), 1000 g penetration of asphalt 60-70 with 200 g latex 60 % degree or 20 phr (L2), 1000 g penetration of asphalt 60-70 with 300 g latex 60 % degree or 30 phr (L3), 1000 g penetration of asphalt 60-70 with 400 g latex 60 % degree or 40 phr (L4). All of the samples homogenized by heating at 150ºC temperature and 250 rpm within 30 minutes then soaked in the tub for 30 minutes at 25ºC.

Keyword: asphalt, latex, penetration.

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1 Introduction

Indonesia has not been able to become the number one producer of natural rubber, because the productivity of rubber plantations in Indonesia is low, which is 1.19 tons/ha compared to Thailand of 1.7 tons/ha. The disposal of used tire waste into the environment can cause environmental pollution because the tire is not biodegradable in the soil and can cause disease. Because it is mixed in a hot state, it is often referred to as a hot mix that is done in a mixing plant called as Asphalt Mixing Plant (AMP). Lately asphalt research combined with materials such as rubber has been widely published and this pattern is very possible to make asphalt especially for highways in Indonesia. Long loading is a function of the thickness of pavement and speed of the vehicle [1]. Modified asphalt that has been sold in Indonesia since 1996 we know several brands, such as High Bonding Asphalt, Mexphalte, Cariphalt, Bituplus, Superfleks, Superphalt, Starbit, Aspal Prima 50, Retona, and so on [2].

Natural rubber particles contain rubber hydrocarbons and small amounts of non-rubber materials, such as fats, glycolipids, phospholipids, proteins, carbohydrates, inorganic materials, and others [3]. Considering that for the manufacture of car tires needed the best and most

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expensive materials, this encourages entrepreneurs to use rubber. Latex Hevea consists of rubber, resin, protein, ash, sugar, and water [4]. The most commonly used method is the centrifugation method (sedation), since it produces a large production capacity, the latex viscosity is lower (not viscous), and the latex yield is purer (not mixed with sediment and dirt) [5]. The comparison between the amount of Nitrogen base and Acid Afit I with the amount of Acid Afit II and Paraffin is called the parameter of malten composition that determines the resistance of asphalt to abrasion [6]. Polymer styrene butadiene styrene (SBS) is a polymer that provides the most optimum combination of usable power, durability, ease of use and economy when compared to other synthetic elassers [7]. High ductility indicates that the asphalt is getting pliable, so the better it is used as a pavement binding material [8].

2 Methods

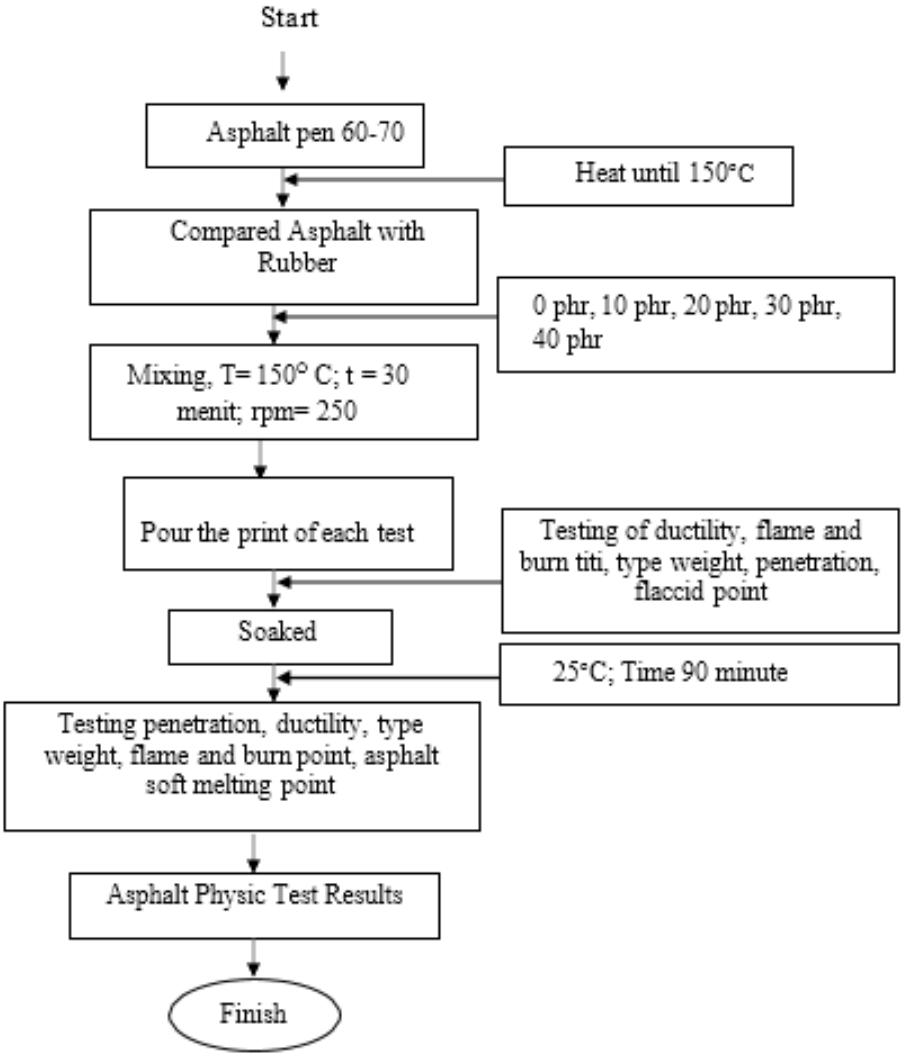

Figure 1. Research Flowchart

3 Result and Discussion

3.1. Latex Characteristics Yield 60 %

Measurable ammonia content is 0.835 %. This concentrated latex is classified into high ammonia concentrated latex (high ammonia content) because it contains more than 0 ammonia. 6%. The concentrated latex used in this study was concentrated latex with a dry rubber content of 58.4%, meaning there were 58.4 grams of rubber particles in 100 mL of concentrated latex. The amount of concentrated latex solids used is 59.19%, meaning there are 59.19 grams of total solids in 100 mL of concentrated latex. The difference between the value of the amount of solids and the content of dry rubber in concentrated latex is less than 2%, which is 0.79%, it indicates that concentrated latex contains non-rubber solids and dirtyers. The result of nitrogen level analysis is 0.24% [9]. From the analysis of nitrogen levels, it can be known the amount of protein contained in this concentrated latex. The type of hard asphalt is characterized by the penetration rate of asphalt, this figure states the hardness of the asphalt or the level of asphalt consistency [10]

3.2. Latex Mixing Content of 60% With Asphalt Pen 60-70

Mixing latex into asphalt begins with asphalt heating at a temperature of 150-160oC at that temperature the asphalt melts perfectly [11]. The asphalt is heated or thawed on a container with an asphalt volume of 2/3 the volume of the container. This aims to make room for the mixture to expand when latex is inserted into the hot asphalt [12].

Figure 2 Rubber homogenization process with asphalt

3.3. Latex Effect of 60% On Asphalt Penetration

Table 1. Asphalt Pen Penetration test results 60-70 with Latex

Sample	Latex Composition (%)	Penetration (mm)
L0	0	60
L1	10	56
L2	20	65
L3	30	76
L4	40	86

Table 1 shows that latex addition has a phr limit in order to obtain harder asphalt, while the addition of latex phr large enough to asphalt makes the penetration value increase, meaning the value of asphalt rigidity becomes decreased.

3.4. Latex Effect Of 60% On Asphalt Soft Spots

Table 2. Test results Soft spot asphalt pen 60-70 with Latex

Sample	Latex Composition (%)	Soft Spot (^{o}C)
L0	0	50
L1	10	53
L2	20	53
L3	30	54
L4	40	57.5

Table 2 shows the effect of latex addition with asphalt on soft spots, the higher the rubber content in the asphalt, the higher the mushy point value. This is because the higher the rubber content in the asphalt, the more rubber particles that fill the spaces between asphalt particles. Based on SNI 06-2434-1991 states that the minimum value of asphalt soft spots is 50^{o}C.

3.5. Latex Effect of 60% On Asphalt Ductility

Table 3. Test results of asphalt ductility pen 60-70 with Latex

Sample	Latex Composition (%)	Ductility (cm)
L0	0	100
L1	10	104
L2	20	150
L3	30	150
L4	40	125

Table 3 shows the effect of latex addition with asphalt on the ductility of the increase in the value of asphalt ductility increased at 10 phr, 20 phr and 30 phr while in 40 phr there was a decrease in the value of ductility on asphalt. This is because the higher the rubber content in the asphalt, the more rubber particles that fill the spaces between asphalt particles.

3.6. Latex Effect of 60% On Asphalt Flame and Burn Point

Table 4. Test results Point on and burn asphalt pen 60-70 with Latex

Sample	Latex Composition (%)	Flash Point (^{o}C)	Burn Point (^{o}C)
L0	0	200	235
L1	10	221	275
L2	20	255	283
L3	30	270	290
L4	40	280	305

Table 4 shows the effect of rubber addition on flash points and burn points. The higher the rubber content in the asphalt, the higher the value of the flash point and the burn point. This

happens because latex contains 40% water and other constituent components, so at the time of asphalt heating to find the point of flame and burn the asphalt occurs evaporation of water and other constituent components. When the phr is raised then the amount of water and other components in latex is also getting bigger .

3.7. Latex Effect of 60% On Asphalt Specific gravity

Table 5. Test Results Specific gravity asphalt pen 60-70 with Latex

Sample	Latex Composition (%)	Specific gravity ($g.ml^{-1}$)
L0	0	1.0246
L1	10	0.9317
L2	20	0.9129
L3	30	1.0613
L4	40	1.0472

Table 5 shows the results of specific gravity test. in addition to 10 phr shows a result of 0. 9317 $g.ml^{-1}$, for the addition of 20 phr showed a result of 0.9129 $g.ml^{-1}$, for the addition of 30 phr showed a result of 1.0613 $g.ml^{-1}$, for the addition of 40 phr get a result of 1.0472 $g.ml^{-1}$, and for conventional asphalt get a result of 1 $g.ml^{-1}$ [13]. In addition10 phr and 20 phr get results smaller than 1 $g.ml^{-1}$ according to SNI 06-2488-1991 does not qualify because it is below the standard value, while for 30 phr and 40 phr meets the standard based on the results of calculation of asphalt type weight because it has a value greater than 1 $g.ml^{-1}$ [14].

4 Conclusion

Based on the phr used in asphalt mixture, latex utilization can be increased to 20 phr while for 30 phr or the rest only meet a few conditions in asphalt standards. The results of observation of asphalt pen characteristics 60-70 with the addition of latex content of 60% get the following conclusions, penetration results L0: 60 mm, L1: 56 mm, L2: 65 mm, L3: 76 mm, L4: 86 mm. Soft spot results L0: 50^{o}C, L1: 53^{o}C, L2: 53^{o}C, L3: 54^{o}C, L4: 57.5^{o}C. The ductility of each sample was L0: 100 cm, L1: 104 cm, L2: 150 cm, L3: 150 cm, L4: 125 cm. The result of the flash point was L0: 200^{o}C, L1: 221^{o}C, L2: 255^{o}C, L3: 270^{o}C, L4: 280^{o}C and the burn result was L0: 235^{o}C, L1: 275^{o}C, L2: 285^{o}C, L3: 290^{o}C, L4: 305^{o}C. Result of ductility was L0: 1.0246 $g.ml^{-1}$, L1: 0. 9317 $g.ml^{-1}$, L2: 0.9129 $g.ml^{-1}$, L3: 1.0613 $g.ml^{-1}$, L4: 1.0472 $g.ml^{-1}$.

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