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## IMPACT AND WATER FLOW STUDIES OF COMPONENTS FORMULATION FOR MIXING PROCESS CONTAIN OF POLIPROPHYLENE AND HOT MIX ASPHALT PENETRATION 60/70.

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**IMPACT AND WATER FLOW STUDIES OF COMPONENTS  
FORMULATION FOR MIXING PROCESS CONTAIN OF  
POLIPROPHYLENE AND HOT MIX ASPHALT PENETRATION 60/70.**

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**ABSTRACT**

The thermoplastic Poliprophylene (PP) powder were mixed with Hotmix Asphalt 60/70 system to produce feedstock for sample of Asphalt pavement by using mixer and mold flow adviser simulation. The combination of 6%,7% poliprophylene and hotmix asphalt penetration 60/70 were choosen with various formulation adopted to attain optimum feedstock properties. Two different kinds of components system are poliprophylene with composition 6%,7% and hotmix asphalt penetration were deeply in investigated. It is found that the water flow of pure asphalt is 0,91 MPa, combination asphalt and poliprophylene 6% is 1,09 MPa, Asphalt and prophylyene 7% is 1,33 MPa. The absorbtion of water for poliprophylene 6% and 7% is higher than pure asphalt,but the impact of asphalt combined with poliprophylene higher than the impact of pure asphalt. The results of simulation of mold flow advisor,water flow is faster 13,57 second than manual method 22,55 second.

Keywords :Polypropylene, Hot Mix Asphalt Penetrasi 60/70, Composition.

**I. Introduction**

After selecting the hotmix asphalt penetration and poliprophylene,next concern is to mix these components with varies composition of poliprophylene, mixing is the first step in preparation of feedstock for asphalt pavement (1,2). The quality of mixing is crucial,since defeciencies can not be corrected by subsubsequent encountered with asphalt pavement mixtures and consider how mixing can be assessed (3,4). Another concern is homogeneties in component mixture,uniform quantities of the particles are needed in all portions of the mixture. Consider the particle size,it is not easy to get the goal. Intensive mixing is needed to ensure that each interstice between the particles contains hotmix asphalt penetration 60/70 and poliprophylene as repretative combination of the component (6). Therefore in mixing are needed in all portions of



the mixture, because melting point of each are different. Composition system selection for fine powder is important to achieve low viscosity of the asphalt pavement (9). It is desired to complete mixing during mixing stages. The component system in mixing consist of major hotmix asphalt penetration 60/70 and varies processing aids such as polypropylene 6% and 7%. The selection of component system for hotmix asphalt was observed in this work.

## 2. Experimental Procedure

A. Preparation of sample, standard SNI 06-2489-1991 and SNI 03-6753-2002, as follow :

No	Agregat	Weight (gram)
1	Sand	56,4
2	Stone Ash	428,7
3	Medium Gravel	451,3
4	Rough gravel	169,2
5	Cement / Filler	22,6

B. Specification of Experimental

No	Speciment	Number of speciment
1	Pure asphalt soaking 30 minutes	3
2	Pure asphalt soaking 24 jam	3
3	Combination asphalt and polipropylene 6% soaking 30 minutes	3
4	Combination asphalt and polipropylene 6% soaking 24 hours	3
5	Combination asphalt and polipropylene 7% soaking 30 minutes	3
6	Combination asphalt and polipropylene 7% soaking 24 hours	3

C. Procedure to make the sample of standard SNI 06-2489-1991 and SNI 03-6753-2002.

1. Agregat and filler heated on bowl up to temperature 150°C.
2. Asphalt and Poliprophylene was heated until melt and poured in to bowl contain agregat and filler which has heated up to 150°C, then mixed until asphalt and agregat homogenous and next poured to the mold.
3. Perform the compaction by compactor, 75 times and count by manual.
4. Recompress the surface of specimen reversed object with 75 times the collision.
5. Release the key of the mold and ejected the compact mold, then leave on room temperature for 24 hours.

### 3. Results and Discussion

Based on sequencing mold process with agregat, asphalt and poliprophylene, the physical shape of the specimen is cylindrical, diameter 100 mm correspond to SNI 06-2489-1991 and SNI 03-6753-2002.

A. The results of impact test SNI 06-2489-1991

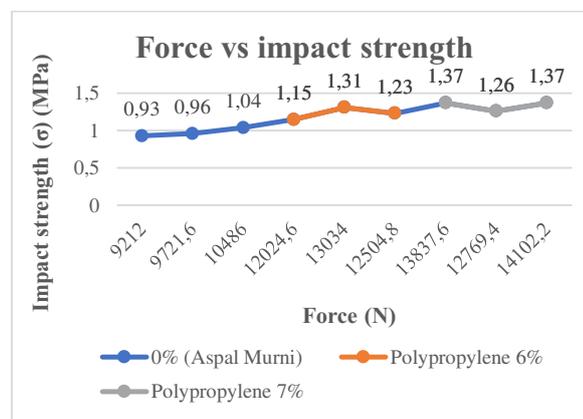


Figure 1. Comparison of pure asphalt with mix asphalt at impact test.

## B. The results of water absorption test SNI 03-6753-2002

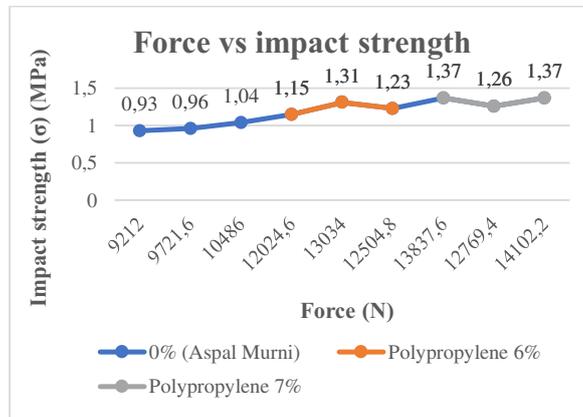


Figure 2. Comparison of pure asphalt with mix asphalt at water absorption test.

In figure 2 . shown that impact strength of hot mix asphalt penetration combined with polypropylene 6%:7% increased the impact strength than pure asphalt. It happened because the influence of polypropylene which has water flow properties better.

## C. Percentages of water absorption test .

Tabel.1 Water absorption test results for 30 minutes SNI 03-1970-1990

% tages <i>Polypropylene</i>	Sample test	$B_k$ (gram)	$B_j$ (gram)
<b>0% (Pure Asphalt )</b>	1	1179,7	1184,1
	2	1185,3	1189,9
	3	1188,7	1194,1
<i>Polypropylene 6%</i>	1	1190	1195,8
	2	1160	1167,6
	3	1179,3	1186
<i>Polypropylene 7%</i>	1	1183,9	1187,6
	2	1185,7	1189,9
	3	1180,3	1185,1

Tabel 2. The result of water absorbtion test for 24 hours. SNI 03-1970-1990

<b>% tages Polypropylene</b>	<b>Sample test</b>	<b><math>B_k</math> (gram)</b>	<b><math>B_j</math> (gram)</b>
<b>0% (Aspal Murni)</b>	1	1176,4	1179,5
	2	1191	1194,1
	3	1182,7	1186
<b>Polypropylene 6%</b>	1	1184,3	1187,8
	2	1185,7	1189,3
	3	1189,3	1194,1
<b>Polypropylene 7%</b>	1	1190	1194
	2	1186,7	1190,4



Figure 3. kind of mixing vs % tages water absorbtion.

In figure 3. Shown that absorbtion for 30 minutes is higher water absorption than absorbtion for 24 hours. Irsyadul Anam , 2011 . higher *polypropylene* consequence lower absorption of water . It happened because during compacturing process , the compacture unit did not work perfectly, consequently the sample has much fluids in the combination of asphalt and had prophyllene .The highest percentage water absorption as a result of percentage asphalt is not optimum . Before absorption *their* material , the percentage of asphalt must be calculated at optimum level, next amount of as aggregated can be formulated axerage when added other material.

D.The result of fill time analysis unit moldflow adviser. 2014

Table 3. Time for pouring liquid plastic for absorption 30 minutes.

<b>% tages Polypropylene</b>	<b>Sample test</b>	<b>Time (s)</b>
0% (Pures asphalt )	1	22,1
	2	23,1

	3	22
<i>Polypropylene 6%</i>	1	23
	2	22,6
	3	22,5
<i>Polypropylene 7%</i>	1	23,2
	2	22,8
	3	22,1

Tabel 4. Time for pouring liquid plastic of sample for absorption 24 hours.

% tages <i>Polypropylene</i>	Sample test	Time (s)
0% (Pure Asphalt )	1	22,5
	2	22,3
	3	23,6
<i>Polypropylene 6%</i>	1	21,8
	2	22,6
	3	22
<i>Polypropylene 7%</i>	1	23,3
	2	22,4
	3	22,3

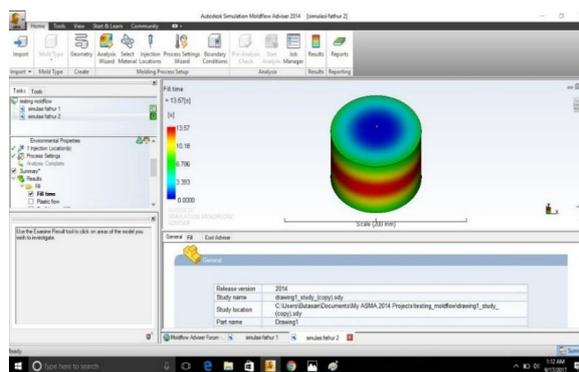


Figure 4. Simulation of *Modflow Adviser Fill Time Analysis*

In figure 4. Above shows varies of colour. Each colour represents varies of time. Red colour shows the longest time of plastic flow to the bottom of mold 13,57 seconds. Blue colour shows the fastest time of plastic flow to

the filled mold. Manual process filled the plastic flow to the mold needs 22,55 second. Time needed to fill the mold by using mold flow adviser 2014 is faster than manual filling.

#### 4. Conclusion

1. The polymer asphalt has greater strength than pure asphalt 0,97 Mpa, Asphalt with 6% polypropylene 1,23 Mpa, the percentage of strength increasing is 26% than asphalt with 7% polypropylene 1,3 Mpa.
2. The impact strength of pure asphalt with 24 hours of immersion has strength 0,91 Mpa, Asphalt with 6% polypropylene the strength 1,09 Mpa with the increasing of impact percentage has 1,18 Mpa of strength, the percentage of impact strength is 29,6%.
3. Time of filling by manual method is 22,5 second while by using simulation is 13,57 second.
4. Absorbability of asphalt with 6%, 7% polypropylene is greater than pure asphalt, but the strength of impact is lower than the strength of impact of pure asphalt.

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