Comparison Pore Aggregate Levels After Extraction With Solvents Pertamax Plus And Gasoline

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Abstract: Loss of asphalt content extraction results become problems in Field Work For implementing parties. The use of solvents with high octane (pertamax plus) for the extraction, dissolving the asphalt more than gasoline. By comparing the levels of aggregate pores after using solvent extraction pertamax plus compared to gasoline could answer that pertamax plus more solvent dissolves the bitumen compared to gasoline. This study aims to obtain comparative levels of porous aggregate mix AC-WC after using solvent extraction pertamax plus compared to gasoline. This study uses the aggregate that has been extracted from the production of asphalt mixtures, when finisher and after compaction field. The method used is the assay of coarse and fine aggregate pores, extraction of bitumen content to separate the aggregate with bitumen. Results of testing the total absorption after extraction using a solvent pertamax plus in the production of asphalt mixtures 0.80%, while gasoline solvent 0.67% deviation occurs 0.13%. In the finisher after the solvent extraction pertamax plus 0.77%, while 0.67% gasoline solvent occurs deviation of 0.1%. At the core after extraction and solvent pertamax plus 0.71%, while gasoline solvent 0.60% 0.11% deviation occurs. The total water absorption after extraction using a solvent pertamax plus greater than gasoline. This proves that the solvent dissolves pertamax plus more asphalt than gasoline.

Keywords: Extraction, Asphalt, AC-WC, Pertamax Plus, Gasoline

1. Introduction

Aggregate is the result of natural stone processing, is the main component of pavement layer, which provides structural properties and contributes 9-95% of the weight or 70-85% of the volume of the pavement structure therefore aggregate properties greatly affect pavement performance. All aggregates are porous, aggregate porosity is the amount of pore content present on the aggregate. As a result, water will sink into the aggregate. Porous aggregates are useful for absorbing bitumen so that the bonds between asphalt and aggregate are good, but too much pore can lead to too much-absorbed asphalt resulting in a thin layer of asphalt.

Asphalt level extraction is often a problem in field testing, where there is a loss of asphalt content, the bitumen content in the field is not suitable or less than the bitumen content of the job mix formula. The use of a pertamax plus solvent which has a high octane content for extraction dissolves more of the asphalt than gasoline. Comparing aggregate pore levels after extraction using solvents pertamax plus and gasoline, is a way to prove it. Pertamax Plus is Pertamina's fuel oil which has an octane value of 95. The purpose of this study was to obtain a comparison of pore aggregate mixture of Asphalt Concrete - Wearing Course (AC-WC) after extract using solvent pertamax plus than gasoline. This study takes aggregates that have been extracted from the asphalt mixture production site, finisher and after compaction of the field.
Several existing studies, Toruan, et.al (2013), analyzing pore levels in several quartz locations. The larger the aggregate porosity the aggregate density becomes smaller so that the maximum density of the mixture becomes smaller and the smaller the aggregate porosity value the specific gravity of the aggregate increases, the greater the maximum density of the mixture becomes larger.° Achmad analyzed (2010), analyzing pore levels at several quartz locations in Gorontalo, mostly mixed asphalt using aggregate from quarry Pilolahela, quarry Tangkobu, and quarry Molintogupo. Negara and Putra (2010), analyzing the limestone pore content. State, et.al, analyzed the limestone pore content of Nusa Penida as a pavement aggregate.° Pertamax plus as a solvent in the extraction of bitumen content dissolves bitumen than gasoline solvent. Where is the deviation in AMP -0.03%, from finisher -0.01%, and core -0.02%. Soehardi did an extraction analysis of asphalt content of AC-WC mixture of coarse gradation with gasoline solvent.°

2. Literature Review

2.1 Aggregate Porosity

Water absorption by aggregates can be used to estimate the amount of bitumen that can be absorbed by aggregates in the mixture. The porous aggregate will absorb the asphalt, so the mixture tends to be dry or cohesive. in the asphalt-aggregate mixture (hot mix) there is a slight addition of asphalt content to satisfy the asphalt absorption by aggregates. Very porous aggregates, when used in the mixture, should be added asphalt quite a lot. Aggregates with very high porosity are not used in asphalt-aggregate mixtures unless the aggregate has excellent properties. Aggregate porosity is generally characterized by the amount of water that can be absorbed by the aggregate when immersed in water.

2.2 Method of Weight Types and Absorption of Crude Aggregate Water

Grain aggregate specific gravity testing was carried out in accordance with the Indonesian National Standard, Weighted Aggregate Water Type and Absorption Water Method using SNI 03-1969-2008. How to calculate it is:

1) Bulk Specific Gravity (SNI 03-1969-2008)

Specific gravity calculates the weight of the dry aggregate and all aggregate volumes, using equations:

\[ Sd = \frac{A}{(B - C)} \]  

with:
- \( Sd \): Bulk density
- \( A \): Weight of dry matter oven test (gram)
- \( B \): Weight of specimen saturated surface dryness (gram)
- \( C \): Weight of specimen in water (gram)

2). Saturated Surface Dry (SNI 03-1969-2008)

Specific gravity calculates the weight of the aggregate in the dry state of the surface and the aggregate volume, using the equation:

\[ Ss = \frac{B}{(B - C)} \]  

with:
- \( Ss \): Specific gravity of dry saturated surface
- \( B \): Weight of dry surface saturated test object (gram)
- \( C \): Weight of specimen in water (gram)

3). Apparent Specific Gravity (SNI 03-1969-2008)

Specific gravity taking into account the weight of the aggregate in the dry state and all aggregate volumes not permeated by water, using equations:

\[ Sa = \frac{A}{(A - C)} \]  

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with:

\[ S_a : \text{Apparent Specific Gravity} \]
\[ A : \text{Weight of dry matter oven test (gram)} \]
\[ C : \text{Weight of specimen in Water (gram)} \]

4) Water Absorption (SNI 03-1969-2008)

Absorption is the percentage of water weight that can be absorbed by pores on the weight of the dry aggregate, using the equation:

\[ S_w = \left( \frac{B - A}{A} \right) \times 100\% \]  \hspace{1cm} (4)

with:

\[ S_w : \text{Water absorption} \]
\[ A : \text{Weight of dry matter oven test (gram)} \]
\[ B : \text{Weight of test surface saturation surface (gram)} \]

2.3 Pertamax Plus

Pertamax Plus is Pertamina's fuel oil, has an octane value of 95. Pertamax Plus, like Pertamax and Premium, is a petroleum product from petroleum processing, generated by adding additives to the process in the oil refinery. An octane number is a number indicating how much pressure it can give before the gasoline burns spontaneously. The name octane comes from octane (C8), because of all the molecules of the gasoline compound, octane which has the best compression properties. Octane can be compressed to a small volume without spontaneous combustion, unlike for heptane, for example, which can be spontaneously burned. The heptane function is as the solvent in the extraction. By having a high octane the fuel will burn completely. \(^{10}\)

3. Methodology

The study was conducted by laboratory testing. Refers to the tests of Specific Weight and Absorption of Crude Aggregate Water using SNI 03-1969-2008 and Tests of Smooth Aggregate Type and Water Absorption using SNI 03-1970-2008. Aggregates used from quarry Solok, West Sumatra. The aggregate after extraction is taken from the aggregate that has been separated from the asphalt using the solvent pertamax plus on each specimen from Asphalt Mixing Plant (AMP), back finisher, and core. Sampling on Marpoyan-Lipat Kain road segment. The results were compared with testing of specific gravity and absorption after being extracted using a gasoline solvent.

4. Results and Discussion

4.1 Comparison of aggregate pore content after extraction of AMP solvent pertamax plus with gasoline

Comparison of aggregate pore content after extraction of AMP using the solvent pertamax plus and gasoline is shown in the Table 1:

| No | Type of Aggregate | Notation | Water Absorption of Aggregates After Extraction (%) | Max Specific Terms (%) |
|----|------------------|----------|-----------------------------------------------------|------------------------|
|    |                  |          | Solvent Pertamax Plus | Solvent Gasoline *     |
| 1  | Coarse agregat   | BIN III  | 0,99          | 0,88                   | 3                      |
| 2  | Medium agregat   | BIN II   | 0,74          | 0,57                   | 3                      |
| 3  | Sand             | BIN I    | 0,84          | 0,76                   | 3                      |

* Fitri analysis (2014)
From the above table, it shows that the aggregate water absorption after extraction from AMP with solvent pertamax plus and gasoline on BIN III (coarse aggregate) deviation 0.11%. In BIN II (medium aggregate) 0.17% deviation, in BIN I (Sand) deviation occurs 0.08%.

4.2 Comparison of pore content of extraction aggregate after extraction of solvent core pertamax plus with gasoline

The results obtained are in the Table 3:

**Table 2. Comparison of Pore Level After Extraction Of Core Solvent Pertamax Plus With Gasoline**

| No | Type of Aggregate | Notation | Water Absorption of Aggregates After Extraction (%) | Max Specific Terms (%) |
|----|------------------|----------|-----------------------------------------------------|------------------------|
|    |                  |          | Solvent Pertamax Plus | Solvent Gasoline * |          |
| 1  | Coarse agregat   | BIN III | 0.94                  | 0.86                | 3         |
| 2  | Medium agregat   | BIN II  | 0.61                  | 0.48                | 3         |
| 3  | Sand             | BIN I   | 0.77                  | 0.69                | 3         |

*Fitri analysis (2014)*

4.3 Comparison of total aggregate water absorption in the mixture after extraction of solvent pertamax plus and gasoline from AMP, finisher, and core

The recapitulation of a moisture content of AMP, finisher, and core is in the Table 4:

**Table 3. Comparison of Total Aggregate Absorption In Mixed After Solvent Extraction of Pertamax Plus and Gasoline From AMP, Finisher, and Core**

| No | Sample | Total water absorption in the mixture (%) | Syarat Spek Maks. (%) |
|----|--------|-----------------------------------------|-----------------------|
|    |        | Solvent Pertamax Plus | Solvent Gasoline * |          |
| 1  | AMP    | 0.80                        | 0.67                  | 3         |
| 2  | Finisher | 0.77                        | 0.67                  | 3         |
| 3  | Core   | 0.71                        | 0.60                  | 3         |

*Fitri analysis (2014)*

From the above table shows that total water absorption in the mixture after extraction from AMP with solvent pertamax and gasoline deviation 0.13%. At the finisher, there is a deviation of 0.1%. And at the core deviation 0.11%. The results obtained are still included in the specification requirement that is a maximum of 3%. The pore content of the extraction aggregate test with the solvent plus solvent is higher than that of the gasoline solvent. This proves that the solvent pertamax plus more dissolves the asphalt compared to the gasoline solvent. Because the solvent pertamax plus has a high octane content of 95 compared to gasoline which is only 88. The higher the octane value makes the fuel burned perfectly.
5 Conclusions

Pertamax plus as a solvent in the extraction of bitumen content produces more bitumen content on the same quarry aggregate because it dissolves the asphalt more than the gasoline solvent. Where the pore rate deviation from extraction aggregate testing with solvent pertamax plus and gasoline are 0.13% in AMP, 0.1% in finisher, and 0.11% in core.

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