The Solid Phase Curing Time Effect of Asbuton with Texapon Emulsifier at the Optimum Bitumen Content

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Abstract. Buton asphalt (asbuton) could not be utilized optimally in Indonesia. Asbuton utilization rate was still low because the processed product of asbuton still have impracticable form in the term of use and also requiring high processing costs. This research aimed to obtain asphalt products from asbuton practical for be used through the extraction process and not requiring expensive processing cost. This research was done with experimental method in laboratory. The composition of emulsify asbuton were 5/20 grain, premium, texapon, HCl, and aquades. Solid phase was the mixture asbuton 5/20 grain and premium with 3 minutes mixing time. Liquid phase consisted texapon, HCl and aquades. The aging process was done after solid phase mixing process in order to reaction and tie of solid phase mixed become more optimal for high solubility level of asphalt production. Aging variable time were 30, 60, 90, 120, and 150 minutes. Solid and liquid phase was mixed for emulsify asbuton production, then extracted for 25 minutes. Solubility level of asphalt, water level, and asphalt characteristic was tested at extraction result of emulsify asbuton with most optimum ashphal level. The result of analysis tested data asphalt solubility level at extract asbuton resulted 94.77% on 120 minutes aging variable time. Water level test resulted water content reduction on emulsify asbuton more long time on occurring of aging solid phase. Examination of asphalt characteristic at extraction result of emulsify asbuton with optimum asphalt solubility level, obtain specimen that have rigid and strong texture in order that examination result have not sufficient ductility and penetration value.

1. Introduction
Asbuton Emulsion is a method developed to extract the bitumen content in Asbuton, extraction results obtained is a material which has some similarities like the nature of the bitumen in the bitumen crude oil processing residue results. The study ever conducted on asbuton extraction merely reviewing the content / composition of the constituent material optimum asbuton bitumen emulsion to produce the highest levels [1, 2]. Therefore, this study seeks to get the best asphalt content by optimizing the reaction or bonding that occurs between asbuton and premium with aging or keep a mixture of such materials in a container that has been prepared. Fluxing oil is liquid element whose function to soften the asphalt on asbuton. Texapon emulsifier is an emulsifier solution which serves to make an emulsion of oil, water and Asbuton so that such substances can be mixed in the form of slurry. Grinder 60- MB type rotation

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speed of 3000 rpm, is used as a means of mixing the solid phase mixing between asbuton grain 5/20 with premium fluxing.

2. Experimental
This study was carried out experiments to obtain the extraction asbuton emulsion to be further advanced research on materials extraction results. Making the material extracted utilizing the process of emulsion (Asbuton emulsion) using emulsion method. Emulsion method for the separation of asphalt on asbuton of mineral require emulsifier that is similar to the processing of bitumen emulsion. The process of making the test object, there are two phases, namely solid and liquid. Solid phase is a mixture of grains asbuton 5/20 with premium fluxing mixed using a grinder-type MB 60 with mixing time 3 minutes. The solid phase mixture is then processed at the aging stage solid phase with a variation of curing time 30 minutes, 60 minutes, 90 minutes, 120 minutes and 150 minutes. Varian time on curing the solid phase is expected to affect the values obtained from the bitumen content of asphalt solubility assay. While the liquid phase consists of texapon as an emulsifier, HCl and distilled water. Texapon acts as an emulsifier for a process of oil in water emulsions. Solid phase and liquid phase mixed using a drill mixer modification spin speed 2000 rpm. Then the extraction process on a machine centrifuge extractor for 25 minutes 20x100 rpm speed. Results will separate bitumen extraction of minerals in Asbuton. Minerals will be left behind in the bowl while the extraction of bitumen emulsion machine will be out of the bowl and galvalum accommodated in containers that have been prepared. Asphalt emulsions are accommodated in galvalum container extraction h then conducted the test include: the levels of solubility of hydro-carbon, water content and characteristics of the asphalt.

The procedures of sample producing are as follow:
1. Grinding the grain 5/20 asbuton the clot due to long storage time using a grinder-type players MB 60 with blunt knives.
2. Preparation of solid phase extraction asbuton which is a mixture of grains asbuton 5/20 and fluxing (premium) by weight according to plan. Weight premium used was 133.33 grams, equivalent to a ratio of 1: 3 by weight asbuton. Mixing grains asbuton 5/20 of 400 grams and premium gasoline using a drill that has been modified with a stirrer while mixing solid phase for 3 minutes. Drill rotation speed is 2000 rpm.
3. When the solid phase is completed, then perform the curing of the solid phase results in the porcelain dish that has been prepared with a variety of curing time 30,60,90,120 and 150 minutes.
4. Preparation of a liquid phase which comprises the material texapon (emulsifier), HCl and distilled water. Weight texapon that by 3.13 grams, 4.80 grams HCl and distilled is 200 grams. Then the liquid phase is allowed to stand for ± 24 hours for the foam formed during mixing of the liquid phase disappears and liquid return.
5. Some modifications to the extraction machine centrifuge extractor is done by adding galvalum container as the container extraction asbuton fine emulsion, sieve # 60 which is placed between the bowl and cover the bowl, as well as a double perforated clamp plate galvalum sieve # 60.
6. The extraction process asbuton emulsion for 25 minutes, at 20x100 rpm rotation speed. Bitumen extraction process separates the content (in the form of emulsions) and minerals contained in asbuton emulsion.

The test object is made triple means three test object will have the weight of the composition and method of making the building blocks of the same on each of these variants curing time. The goal is that the average yield of the three objects of the same test to ensure the accuracy of test data. Obstacles encountered is when mixing the solid phase, Grinder type MB 60 is not able to maintain the current composition of the mixture statutes mixing process runs. As a result, a mixture of solid phase bounced out and attach to almost the entire wall where mixing the Grinder. As a solution Grinder MB type 60 still function but with different uses of the initial planning. Table 1 presents the planning of each materials composition.
Table 1: The Materials composition

| Code of sample | Granular Asbuton (gram) | Premium (gram) | Time of aging (menit) | Time of Mixing (menit) | HCl (gram) | Texapon (gram) | Aquades (gram) | Time of Ekstracion (menit) |
|----------------|-------------------------|----------------|-----------------------|-----------------------|------------|----------------|---------------|-----------------------------|
| 1A             |                         |                | 30                    |                       |            |                |               |                             |
| 1B             |                         |                | 60                    |                       |            |                |               |                             |
| 1C             | 400                      | 133.33         | 90                    | 3                     | 4.80       | 3.13           | 200           | 25                          |
| 1D             |                         |                |                       |                       |            |                |               |                             |
| 1E             |                         |                |                       |                       |            |                |               |                             |
| 2A             |                         |                | 30                    |                       |            |                |               |                             |
| 2B             |                         |                | 60                    |                       |            |                |               |                             |
| 2C             | 400                      | 133.33         | 90                    | 3                     | 4.80       | 3.13           | 200           | 25                          |
| 2D             |                         |                |                       |                       |            |                |               |                             |
| 2E             |                         |                |                       |                       |            |                |               |                             |
| 3A             |                         |                | 30                    |                       |            |                |               |                             |
| 3B             |                         |                | 60                    |                       |            |                |               |                             |
| 3C             | 400                      | 133.33         | 90                    | 3                     | 4.80       | 3.13           | 200           | 25                          |
| 3D             |                         |                |                       |                       |            |                |               |                             |
| 3E             |                         |                |                       |                       |            |                |               |                             |

Table 2: The solubility of Asphalt

| Code of sample | 30 (%) | 60 (%) | 90 (%) | 120 (%) | 150 (%) |
|----------------|--------|--------|--------|---------|---------|
| P1             | 91.50  | 95.48  | 94.23  | 96.76   | 95.63   |
| P2             | 90.10  | 93.75  | 93.60  | 94.69   | 94.03   |
| P3             | 91.04  | 91.18  | 92.49  | 92.86   | 90.65   |
| Average        | 90.88  | 93.47  | 93.44  | 94.77   | 93.44   |

3. Results and Discussion

3.1. Testing of asphalt solubility

Assay solubility of asbuton emulsion bitumen extraction results in this study was calculated using a filter paper and the solvent is TCE (trichlorethylene). The method refers to the ISO 2438: 2015 on the solubility test method for asphalt [3,4].

From Table 2 can be graphed that solid phase curing time relationship with the levels of solubility in asbuton bitumen emulsion. The graph of the relationship can be seen in Figure 1. Based on these data, obtained coefficient determination $r^2 = 0.8863$ while the value of the correlation coefficient $r = 0.9414$, or can be said to be a very strong correlation. The longer the curing time, the solid phase will be increasing the dissolved asphalt component of Asbuton grains in the emulsion Asbuton up at a certain time has decreased. This is because at a certain time span, fluxing premium gasoline have maximum working attractive asphalt asbuton attached to rocks. In this study, certain span of time is 120 minutes. Testing of bitumen content of asphalt solubility test produces a value above 90%, which means that the content of the asphalt on the test object is high. But 90% is not entirely is pure asphalt but still leaves the other emulsion constituent ingredients such as premium, HCl, texapon and distilled water.
Figure 1. Aging time relationship graph with levels in Buton Bitumen Emulsion

Bitumen content extraction results obtained researchers increased dramatically compared to the secondary data from the factory in the range of 20% and research on the extraction of emulsions asbuton previous range 26-32% [5]. This happens because the development of methods for processing and modification of the research methods of extraction asbuton previous emulsion. Researchers used a method which enables bitumen emulsion inherent in mineral asbuton can be detached, then the process of extraction can separate the bitumen from the mineral asbuton although not in its entirety. Some modification conducted in this research is to add a sieve # 60 and galvalum perforated plate so that the mineral held by sieve # 60 does not come out of the bowl when the extraction process takes place. This is a significant impact on support levels to drop filler content in the extraction asbuton emulsion. This is evidenced by the results of solubility test of asphalt that produce high levels of above 90%.

3.2. Water Content
Test the water content of the emulsion asbuton extraction results are basically the same with the test of water content [5].

| Time of aging (minute) | Water content P1 (%) | Water content P2 (%) | Water content P3 (%) | Water content average (%) |
|------------------------|----------------------|----------------------|----------------------|--------------------------|
| 30                     | 5.00                 | 6.53                 | 6.78                 | 6.10                     |
| 60                     | 4.27                 | 4.11                 | 5.02                 | 4.47                     |
| 90                     | 4.01                 | 5.68                 | 4.49                 | 4.72                     |
| 120                    | 4.23                 | 4.50                 | 4.83                 | 4.52                     |
| 150                    | 4.20                 | 4.36                 | 5.54                 | 4.70                     |

Results graph curing time of the solid phase of water content in asbuton emulsion (AE) is presented in Figure 2
Figure 2. Relationships graph between Curing Time and Water Content of the Emulsion Extraction Asbuton

Figure 2 gives an overview obtained coefficient determination $r^2 = 0.4105$ while the value of the correlation coefficient of 0.6407, showing a correlation between curing time with the content of water in emulsion Asbuton extract strong enough. From the regression analysis can be expressed the longer the curing time of solid phase it will obtain the water content in the extraction asbuton emulsion get smaller, it is because the longer the curing time of solid phase (asbuton grain and premium) will make the asphalt bound by fluxing more. The function of the liquid phase (texapon, HCl and distilled water) to separate a mixture of asphalt and fluxing premium of mineral increasingly needed in large numbers. Then the water content is still contained in the emulsion decreases in line with the longer curing time the solid phase.

3.3 Test Results of Asphalt Emulsion Extraction Characteristics

Testing of bitumen characteristics is intended to determine the value of the test ductility, penetration, softening point, flash point and fuel, density and viscosity.

| Type of Test          | Test Standard       | Results | Unit  |
|-----------------------|---------------------|---------|-------|
| Ductility             | SNI 06-2432-1991    | - *     | cm    |
| Penetration           | RSNI 06-2456-1991   | - *     | $10^{-1}$mm |
| Softening Point       | RSNI 06-2434-1991   | >100    | °C    |
| Flash and burn point  | SNI 06-2433-1991    | 270 and 290 | °C   |
| Specific Gravity      | SNI 06-2441-1991    | 1.66    | g/cc  |
| Affinity              | PA-0312-76          | 100     | %     |

Table 4 is a picture of the nature of the asphalt properties (after the emulsion process is completed) on the extraction asbuton asphalt emulsion that has the most optimum levels. Based on these test results, obtained the value of ductility and penetration test has not been measured, as well as the test value is very high softening point. The main factor that makes the absence of penetration and ductility values are used, namely fluxing premium [6]. This occurs because the premiums as a fluxing participate in asbuton evaporated when the emulsion is completed as the evaporation of moisture present in the emulsion. Selection of premium gasoline as a fluxing caused by the extraction asbuton previous research results that fluxing used is kerosene, takes quite a long time (months) to experience settlement / precipitation emulsion mixture. The purpose of the use of premium gasoline as a fluxing in order to speed up the settling time of bitumen. But unanticipated nature of the gasoline that is easy to evaporate
so that the components oil / oil on asphalt go missing in line with the completion of the process Asbuton emulsion back into Asbuton and obtained a very hard asphalt texture. The process of evaporation of water is common in the asphalt emulsion, (heating step to remove the element of water in the emulsion be taken to accelerate the process in order to test the characteristics to do). Texture hard and stiff obtained after missing water content indicates that not only the element of the water is evaporated oil, but the elements also disappear given the premium nature volatile. The results of this product or test specimen is not suitable when used as a binder in the mix of the surface layer (surface course) of pavement due to a very high stiffness. But the results of this product can be used for a mix function as a foundation layer (base course), and developed into the added material or modifications to conventional asphalt (bitumen 60/70 pen) for increasing performance and to reduce the amount of consumption of crude oil and bitumen to optimize asphalt Asbuton are not so utilized [7,8].

4. Conclusion
Asphalt optimum levels generated from bitumen solubility is equal to 94.77% in the variation of the solid phase curing time of 120 minutes. The levels of distilled water in the extraction asbuton emulsion showed a decrease in the water content of the emulsion asbuton the longer curing time solid phase takes place. The test results from the extraction of bitumen characteristics asbuton emulsions, suggesting that the fluxing premium (petrol) participated evaporate / lost with the completion of the process Asbuton emulsion becomes Asbuton extract

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