Hot Water Extraction on Aspal Buton

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Abstract. Asphalt demand for road maintenance in Indonesia is increasingly higher, which is by approximately 1.2 million tons each year. However around 2/3 asphalt functioned now is still imported. Buton asphalt can be straighthly used for road coating. Yet, it goes in line with the increasing cost of the world oil. Due to the oil substance over this kind of asphalt (i.e. buton asphalt), it widens more chances to cultivate this asphalt into oil. Extraction is done by process hot water extraction and solvent extraction. This research tried to determine the optimum yield bitumen from asphalt buton extraction process with hot water solvent and n-heksan solvent with the help of strirring. Asphalt which is used as variabel from asphalt buton. The operation variables were temperature, time, and the amount of asphalt buton mixed with hot water solvent. The result suggested that using hot water solvent didn't generate extract result because the low of temperatur and extraction tension. Therefore by using n-heksan solvent generate % yield bitumen. For rasio of 1 : 5 with a temperature of 60 oC, a time of 30 minutes 2,12 %, a ratio of 1 : 5 at a temperature of 90 oC extraction time 30 minutes 4,84 %, ratio of 1 : 20 at 60 oC, 30 minutes 3,07 %.

1. Introduction.

At this time the use of energy in Indonesia is very high, along with the social development of an increasingly modern society, thus requiring far more energy sources to support these developments. But on the other hand, our energy resources are limited and getting thinner along with these social developments.

Fuel oil is a non-renewable energy source that will run out someday or take a long time to restore it. National oil reserves are currently only 3.7 billion barrels and will last approximately 10 years. Our current oil production is not up to 800,000 barrels per day, so we have to import around 800,000 barrels per day due to consumption of 1.6 million barrels per day.

With this condition, alternative fuels are needed to replace fossil fuels, besides that fossil fuels are known to have a bad impact on the environment. Alternative fuels that are now widely known include biodiesel, biomass, biogas and others derived from plants which can be regenerated in the supply of sources. However, it is again constrained by the limited production capacity along with the limited land for the production of these renewable energy sources.

Asphalt which is usually used for road coatings, especially asphalt from the Buton area contains a lot of oil stored in the parent rock or known as limestone. Buton asphalt has been known since the Dutch era, and is the best asphalt in the world. Also known as "Natural bituman Rock" with very good levels. This asphalt is divided into two categories, namely soft (soft) bitumen content 17-24% and hard (hard) with bituman content 24-30% and is found on Buton Island, Southeast Sulawesi with a total asphalt deposit of 677 million tons. Indonesia requires around 1.2 million tons of asphalt annually, but two-thirds of the asphalt used still comes from imports (66% imported asphalt, 34% local asphalt) [1].

The bitumen recovery process can be carried out in several ways, including the extraction process, namely, thermal extraction, solvent extraction, aqueous extraction, ultrasonic irradiation applied to the extraction process. The process of dissolving bitumen from Buton asphalt with organic solvents has been widely carried out, among others: studied the properties of bitumen extracts by extraction using tetrachloride solvent and using a Sokhlet extractor [2]. Studying the effect of grain size, extraction time and stirrer rotation speed on the mass transfer coefficient in the multistage cross current extraction process of kabungka asphalt with n-hexane as solvent [3]. Research on solvents that could extract asbuton, and the solvents used were n-hexane (C_6H_{14}), pertasol (naptha), and Trichloroethylene (TCE) [4].

Separation of bitumen by hot water extraction process is a separation process that aims to separate bitumen from mineral particles by utilizing differences in surface properties. The slurry conditioning process involves many process elements including mixing, mass transfer, heat transfer and chemical reactions that lead to the separation of the bitumen from the sand and mineral particles.

The removal of bitumen from solids will be easier if both surfaces are made more hydrophilic, due to a decrease in free surface energy which facilitates removal. The slurry conditioning process involves many process elements including mixing, mass transfer, heat transfer and chemical reactions that lead to the separation of the bitumen from the sand and mineral particles.

The removal of bitumen from the solid will be easier if both surfaces are made more hydrophilic, due to a decrease in the free surface energy which facilitates removal. The slurry conditioning process involves many process elements including mixing, mass transfer, heat transfer and chemical reactions that lead to the separation of the bitumen from the sand and mineral particles. The removal of bitumen from the solid will be easier if both surfaces are made more hydrophilic, due to a decrease in the free surface energy which facilitates removal.

Experiments on processing Athabasca of sand with hot water processing using oil flotation in a strimed reactor [5]. Experiments on separating bitumen and Utah tar sands using hot water [6]. A new proposed flowsheet for bitumen extraction with howater on Utah tar sands [7].

The process of separating bitumen from Buton asphalt by hot water extraction has never been done. So this study aims to determine the capability of hot water process technology in separating bitumen from its minerals. This separation process is expected to produce oil content from bitumen bitumen which can then be used as a substitute for fossil fuels.

2. Methodology

This study uses an extraction method using hot water as a solvent. (Solid-Liquid Extraction).The asphalt solids used as samples were taken directly from the Buton asphalt in the form of chunks, after which they were reduced in size by the pulverizing process and then filtered. The particle size used is 30 - 40 mesh.The original rock of Buton is ground and then sieved to obtain a size of 30-40 mesh. First, heat 1000 mL of water in the extractor to a temperature of 60 oC, then add 200 grams of asbuton that has been weighed. This mixture is then stirred using a stirrer motor with a rotation of 300 rpm for 10 minutes. After that, the solution was separated from the raffinate with the extract formed and then weighed the raffinate formed. The resulting extract is put in a separating funnel and allowed to stand for 15 minutes to determine whether there is bitumen extracted or formed. In this research, what will be reviewed is the effect of extraction temperature, extraction time, and the ratio of asbuton with hot water on the % yield of bitumen produced.

3. Result and discussion

Extraction is a process of separating substances from a mixture using a suitable solvent. The basic principle of extraction is based on solubility. Extraction carried out in this study is a solid-liquid extraction in which asphalt buton as a solid and water at a certain temperature as a solvent. Extraction is carried out with variations in temperature, time variations and solvent ratio variations. Extraction is carried out by the process of Hot Water Extraction and Solvent Extraction. After extraction with Hot Water Extraction and separated from raffinate and decanted or allowed to stand, no extract was obtained. Asbuton extraction with water solvent requires a higher (higher) temperature so that the fraction in the asphalt particles can melt to melt so that the diffusion process from asphalt into the

solvent is faster. Extraction carried out on Buton asphalt with water as a solvent at that temperature and time could not produce bitumen because water is a polar solvent, besides the influence of low temperature (only up to 90 oC) and pressure in the extractor according to atmospheric pressure so that the process diffusion in the asphalt particles does not occur. Future research is expected to use high temperature or higher pressure operating conditions and use suitable solvents. besides the influence of low temperature (only up to a temperature of 90 oC) and the pressure in the extractor is in accordance with atmospheric pressure so that the diffusion process on the asphalt particles does not occur. Future research is expected to use high temperature or higher pressure operating conditions and use suitable solvents. besides the influence of low temperature (only up to a temperature of 90 oC) and the pressure in the extractor is in accordance with atmospheric pressure so that the diffusion process on the asphalt particles does not occur. Future research is expected to use high temperature or higher pressure operating conditions and use suitable solvents.

Furthermore, the research was carried out using n-hexane solvent with variations in temperature, time and the same ratio of asphalt and solvent using hot water as solvent. Research with extraction temperature variable obtained bitumen yield % at a ratio of 1: 5 and a reaction time of 10 minutes at a temperature of 60 oC = 1.03%, a temperature of 70 oC = 1.38%, 80 oC = 1.59% and 90 oC = 2 ,12%.

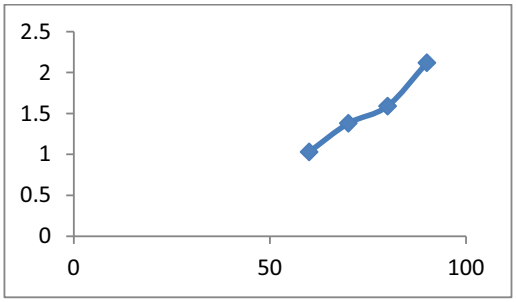

Figure 1. The relationship between extraction temperature and % bitumen yield (sb-x is the extraction temperature and sb-y is % bitumen yield) (Research Results)

Research with extraction time variable obtained bitumen yield % at a ratio of 1: 5 and extraction temperature of 90 oC with extraction time of 10 minutes = 2.12%, time of 15 minutes = 2.20%, time of 20 minutes = 2.875%, time of 25 minutes = 3,75 % and 30 minutes = 4,84 %.

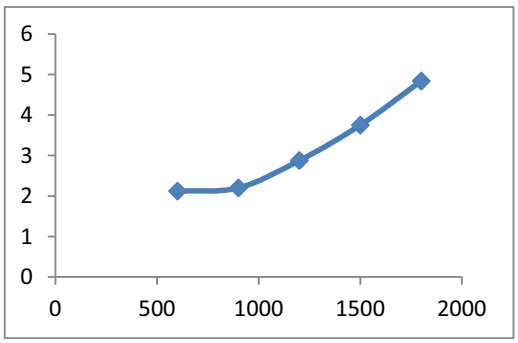

Figure 2. The relationship between extraction time and % yield of bitumen (sb-x is the time in seconds and sb-y is % yield of bitumen) (Research Results)

Research with the variable ratio of asphalt and n-hexane obtained % yield of bitumen at an extraction temperature of 60 oC with an extraction time of 30 minutes with a ratio of 1: 5 is 2.12%, the ratio of 1: 10 is 2.71%, and the ratio of 1: 20 is 3.07.

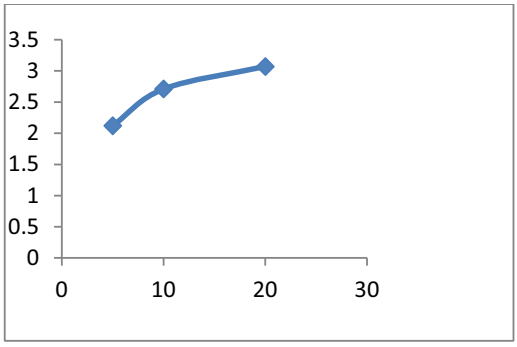

Figure 3. The relationship between the ratio of asbuton with n-hexane solvent and % yield of bitumen (sb-x is the ratio of asbuton to n-hexane and sb-y is % yield of bitumen) (Research Results)

4. Conclusion

From the research that has been done, it can be concluded:

1. The temperature to obtain the optimum bitumen yield cannot be determined.
2. The time to obtain the optimum bitumen yield cannot be determined.
3. The ratio of water and raw materials that produce the optimum bitumen yield cannot be determined.
4. Although the yield of bitumen was not obtained using the hot water extraction process, but with the comparison carried out using the n-hexane solvent, it can be explained that:

The higher the extraction temperature, the greater the extract obtained.
The longer the extraction time, the greater the extract obtained.
The greater the ratio of solvent to asphalt, the greater the extract obtained

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