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VARIETY OF BIOFUELS AS FUTURE FUELS (ENVIRONMENTALLY FRIENDLY FUELS)

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ABSTRACT

At this time human life cannot be separated from the use of fossil oil energy, where almost every line of life cannot be separated from use of fossil oil. Both for transportation facilities, whether it's land, sea, or air transportation, we have realized that the availability of fuel from fossil materials is running low, so there is a need for alternative materials to replace fossil fuels because the consumption of fuel oil continues to increase from time to time. availability of oil supply from fossil availability the rest is limited, and Indonesia's oil shortage is a real possibility. As a result, Indonesia has to import crude oil and petroleum for raw materials for refineries. Products that meet energy demand in the community. On the other hand, Indonesia has great potential. The possibility of biomass or renewable resources being used as biofuel for biodiesel and bioethanol (ethanol) where the raw materials for these fuel products are available and can be renewable. Therefore, energy diversification To reduce oil, biofuels need to be introduced as an alternative to oil consumption, especially in the transportation sector. As a result, the land is needed to grow palm oil for the supply of biodiesel feedstock and its surroundings. We grow cassava and provide the raw material for bioethanol. The goal is to challenge the use of biofuels as a pioneer for alternative energy materials. So that in the future it is possible that the use of biofuels is the main fuel because in addition level of COpollution^2 to the minimal, oil palm plantations with a 30-year plant renewal cycle are the lungs of the world that can absorb CO ^{2}, so it can be ascertained that the use of This alternative biofuel fuel is the right fuel.

KEYWORDS

Biodiesel, Bioethanol, BioAvtur, Green Diesel, Green Gasoline, Green Avtur

Introduction

No It is conceivable if in this world we no longer use fossil fuels, the question may arise how we can turn on the vehicles that we have been used to using for our daily transportation, energy for electricity and for industrial or household needs. will work fine as it should. Of course the answer to all of that is one solution is renewable alternative energy materials, namely energy materials from plants and animals, both from plantations and agriculture or from the wild or free.

Renewable alternative energy materials from vegetable materials (plants and animals) of course require continuous processing and research, thus requiring competent human resources in the energy sector, but geographically, the Unitary State of the Republic of Indonesia is an area whose natural resources support the development of bioenergy. Indonesia's climate is a tropical climate so that flora and fauna in Indonesia are very abundant, where we are the world's largest producer of palm oil.

Contents.

B root ingredients from plants and animals (Bio Fuel) . Any source of fuel / energy in the form of solid, liquid or gas produced from organic materials. Root materials from plants and animals (plants or animals) can be produced directly from plants or indirectly from industrial, commercial, domestic or agricultural wastes. Alternative biofuel materials can be divided into two types, namely from materials that can be consumed as well as materials that cannot be/used to be consumed. Foodstuffs for humans and materials intended for consumption include human food products such as sugar, food extract (starch) , or vegetable oil extracts that are used as biofuels through the conventional method, namely transesterification , besides that biofuels can be made from non-food plants, from waste Agricultural waste and edible residues, which are adapted to be produced using a hydrocracking system, such as palm oil can also be produced into biofuels using conventional methods and depending on the circumstances.

The use of biofuels is often used as an alternative material to conventional fuels used as vehicle fuels that we usually use on a daily basis, but for the actual use of biofuels to be used to meet various energy needs. The uses of biofuels include:

1. transportation. The use of transportation equipment that can use alternative energy materials, namely:
   a. Land Transportation. The use of land transportation includes the use of alternative materials such as Biodiesel, Bioethanol, Greendiesel.
   b. Sea Transportation. The use of marine transportation includes the use of alternative materials for biodiesel on ships
   c. Air Transportation. The use of air transportation includes the use of alternative materials such as bioavtur, biogasolin, green avtur

2. Power plants. The use of biofuels in power plants, especially diesel power plants, is replaced by biodiesel fuel.
3. Heating. The use of biofuels in heaters is the use of stoves and other heating devices.

Table 1. Estimated Energy Demand in the Transportation Sector in Indonesia 2005-2025. (Based on Crude Oil Price $40/Barrel)

Type B. Burn	2015	2017	2019	2021	2023	2025
Solar	725.2	806.1	886.6	965.6	1046.8	1128.9
Premium	825.2	928.0	1030.0	1158.2	1301.9	1441.2
Avtur	123.5	143.8	165.0	190.0	219.6	250.6
Fuel oil	20.9	22.9	24.7	26.9	29.4	31.8
Natural gas	45.8	49.8	53.7	53.4	54.9	56.3
Electricity	0.2	0.2	0.2	0.2	0.2	0.3
Total	1740.9	1950.7	2160	2394.2	2652.8	2909.2

Source*: *BPPT Energy Planning Team, October 2005.

Along with the development of technology, many alternative fuels have been found, including many biofuels which have been widely used in various human activities related to transportation, power generation, as well as biofuel heaters that have been found, including:

1. **Biodiesel** . in the form of a combination of mono-alkyl esters of fatty acids, which is used as an alternative fuel as a substitute for diesel engine fuel, where the diesel fuel is made from renewable materials such as palm oil and animal fats. In the manufacture of laboratory-scale biodiesel can be done with the following materials:
    a. New or used Cooking Oil 1 liter.
    b. Methanol as much as 200 ml or 0.2 liters .
    c. Nitric acid (NaOH) 3.5 grams for use in clean cooking oil, and 4.5 grams forused on used cooking oil or maybe more . This substance is used to neutralize free fat or FFA which will be more abundant than used cooking oil. Can also be replaced with KOH but considering the price is more expensive and the quantity is also 1.4 times more.

The process of making caustic soda is dissolved first in methanol and then put into oil and then heated to over 55 ^{0} C then stirred quickly using an electric or magnetic stirrer for 15 to 20 minutes, then allowed to cool overnight, then after it will get biodiesel on the surface with a clear yellowish color and below it there is soap and FFA fat, and there is also a residue of unreacted methanol and 79 ml of glycerine, then to get it by pouring the top, namely biodiesel by leaving the bottom on a large scale the remaining sediment is taken back for processing and will get glycerin which is expensive as well as soap and unreacted methanol.

Table 2. Raw Material Land Area and Biodiesel Production Potential by Region in Indonesia.

Region	**Soya bean**		**Palm oil**	
	Area (Ha)	**Biodiesel (KL)**	**Area (Ha)**	**Biodiesel (KL)**
Sumatra	67201	302404	3028000	18470800
Java	588234	2647052	19000	115900
Bali & Nusa Tenggara	123594	556171	0	0
Borneo	10988	49445	509000	3104900
Sulawesi	41761	187924	100000	610000
Maluku and Papua	247832	1115245	38000	231800
Total Indonesia	**1079609**	**4858242**	**3694000**	**22533400**

***Source**: Oil Palm Plantation Statistics 2004. Directorate General of Plantation Production Development. Indonesian Statistics Book 2004. BPS.*

Note : Each hectare of soybean plantation can produce an average of 4.5 kl of biodiesel. Each hectare of oil palm plantations can produce an average of 6.1 kl of Biodiesel.

2. **Bioethanol** . Bioethanol which is commonly called bio alcohol or commonly found in alcoholic beverages and here will be used as fuel. Ethanol is often used as an additional fuel for gasoline so that it becomes a *biofuel. The* composition of ethanol in gasoline in the world has increased from 3.7 percent to 5.4 percent. In 2010, the world's total ethanol production reached 22.95 billion gallons , while the US alone (86.9 billion liters), with the USA alone produced 13.2 billion US gallons, or 57.5% of the world's total quota .

The steps for making bioethanol are as follows:

a. Fermentation. The first step in making bioethanol is by fermentation with microbes on sugar.
b. distillation. To remove the water content in bioethanol, namely by distillation, not all water can be separated, there is still 3 to 4 percent water in it, and until this process is called anhydrous ethanol.

Dehydration. This process is to remove the water content of anhydrous ethanol which still contains 3-4 percent water, so that the bioethanol is ready to be mixed with gasoline up to 5.4%.

Table 3. Raw Material Land Area and Ethanol Production Potential by Region in Indonesia

Region	Cassava		Sweet potato		Corn	
	Area (Ha)	Ethanol (kl)	Area (Ha)	Ethanol (kl)	Area (Ha)	Ethanol (kl)
Sumatra	350385	612581	36012	40279	710201	383367
Java	663585	1348506	61984	83780	1859891	1028148
Bali & Nusa Tenggara	103309	159922	23405	28259	322306	136787
Borneo	37392	68531	8957	8923	59196	18493
Sulawesi	59260	98782	17454	17844	382393	194256
Etc	23645	40302	39614	43155	12514	6249
Total Indonesia	**1237575**	**2335209**	**187426**	**227770**	**3346501**	**1774984**

Source *: Processed based on BPS data, 2004 and BBTP-BPPT, 2005.*

Note : The raw material requirements for corn are 5 kg/liter ethanol, sweet potato 8 kg/liter ethanol, and cassava 6.5 kg/liter ethanol

3. Bioavtur . In the context of efforts to use non-fossil fuels in aviation, as well as to reduce world carbon emissions. In the development of bioavtur, namely the development of catalysts carried out by PT Pertamina and in collaboration with ITB. A long and tortuous journey has been traversed to arrive at the successful stage of dynamic or flight testing. Starting from a research synergy between Pertaminaand Research and Technology Innovation (Pertamina RTI) and the Bandung Institute of Technology's Center for Catalysis Engineering (PRK-ITB) in the development of a "Red-White" catalyst to convert palm kernel oil into bioavtur raw material in 2012.

For testing of bioavtur in a structured and academic manner, it has been started at the Faculty of Machinery and Aerospace ITB since 2012 on a laboratory scale. Iman K Reksowardojo, as the ITB Bioavtur Flight Test Research Team, said that from this research activity, several Doctors, Masters and Bachelors, both from within and outside the country, as well as international scientific journals of high reputation, collaborated with Hokkaido University, Japan, Asean University Networking/Southeast Engineering Education Development (AUN/SEED-Net), JICA and Pertamina.

Furthermore, the collaboration was expanded to lead to production, with PT KPI (PertaminaInternasional Refinery) to conduct production tests before industrial scale processes at the Refinery Unit (RU) IV Cilacap to process a mixture of Refined, Bleached, and Deodorized Palm Kernel Oil (RBDPKO) and kerosene using a red and white catalyst, as one of the nation's best innovations. In this test, 2.4%-v bioavtur has been produced, which is called J2.4.

The criteria for vegetable materials for making bioavtur are the results of expert opinions to provide an assessment of the aspects and criteria being tested. For this reason, we process this data to be presented as follows:

1. Palm oil is a potential raw material for bioavtur production with a weight value of 0.361.
2. Furthermore, the second order is occupied by biomass, namely with a weight value of 0.327
3. Next, the third and fourth ranks are coconut oil and palm kernel oil

4. Green Diesel .*Green diesel* or in other words Biohydrocarbon Diesel which has different advantages compared to diesel which is made from fossil fuels or biodiesel based on palm oil, while the two advantages are relatively higher cetane value, lower sulfur content and oxidation. more stable which is better and colors are also clearer . Pre-processing is important because it is one of the ways to produce green fuel through the process of processing vegetable oil raw materials along with fossil oil processed simultaneously, at this time Pertamina has succeeded in injecting Refined Bleached Deodorized Palm Oil (RBDPO) into the Destillate Hydrotreating Refinery. Units (DHDT) in several existing refineries using a domestically produced Red-White catalyst.

5. Green Gasoline. The government's efforts to reduce the use of fossil fuels, especially the type of gasoline, because most vehicles, both motorcycles and four-wheeled vehicles, on average use gasoline in the government's effort to suppress imports of gasoline. it is based on palm oil or CPO. Green gasoline production is estimated to reach around 2.1 million kilo liters in 2030 from none at present.

When detailed, the processing method of green gasoline consists of mixing processing of palm oil (CPO) in an existing oil refinery (*co-processing*) which is 0.1 million kl. Then, through the construction of a new unit (*stand alone*) the palm oil processing refinery is processed into *green gasoline* of 2 million kl. Thus , the total *green gasoline* in 2030 is approximately 2.1 million kl.

In the future, we can jointly encourage the dynamics of biofuel development, both from *co-processing* at the current Pertamina refinery, which will be changed to processing palm oil from processing petroleum, or in the implementation of separate refineries or separate refineries. or *stand alone* ," he explained in the National Webinar 'Strategy for Strengthening Oil Palm Management Policy .

6. **Green Avtur**. Jet fuel (Green Avtur is designed for gas turbine jet fuel, the color is clear yellowish, the most common fuels are Jet A and Jet A-1 fuels both of which have been equipped with international standard and eligibility certificates . As well as the only fuel specifically for dealing with cold weather, namely the type of Jet B talent material

The fuel for jet aircraft is a mixture of a number of different hydrocarbons , possibly thousands more. The range of measures (molecular weight or carbon number) used by jet fuel is designed to withstand the temperature extremes that jet fuel must withstand at freezing temperatures of minus . Because to avoid things that are not desirable, especially the freezing of fuel, so added a guan catalyst to prevent freezing called FSII (*fuel system icing inhibitor*).

Current and Future Issues

Scientists suggest that one of the main reasons for this drastic change in weather/ climate is the result of excessive consumption of fossil fuels and the release of greenhouse gases into the thinning atmosphere, resulting in the melting of the ice sheets on Earth. the poles as well as uncertain climate change and rising air temperatures and the occurrence of many natural disasters. This is due to the large amount of CO_2 [that] is released into the air so that the use of conventional energy needs to be reduced. The United States Department of State also stated that biofuels such as ethanol and other biofuels produce fewer hydrocarbons than fossil-based fuels, even ethanol produces 48% fewer hydrocarbons than fossil fuels then biodiesel only releases only a quarter of the hydrocarbons emitted by fossil fuels. conventional diesel fuel, this of course will be the right choice because it is clear that the use of biofuels is more environmentally friendly .

In addition, unlike fossil fuels, where this energy source is not renewable because it requires a process of thousands of years , biofuels can be produced continuously because we will always be able to plant more plants again when the results can no longer be harvested to be used as fuel. Researches have been carried out by scientists related to the development of biofuels, especially the problem of deforestation which is closely related to biofuels . Therefore, Crude Palm Oil (CPO) which has the highest yield among other vegetable crops is believed to be the most economical raw material for biodiesel. The life span of oil palm trees is between 25 and 30 so that it absorbs a lot of carbon pollution so that apart from being an alternative fuel for oil palm plantations, it is also the lungs of the world .

So that in the future it is possible that the use of biofuels is the main fuel because in addition to the minimal level of CO_2 [pollution] , oil palm plantations with a 30 year plant renewal cycle are the lungs of the world that can absorb CO_2 , so it can be ascertained that the use of This alternative biofuel fuel is the right fuel.

Conclusion

Fuel which is the raw material from nature is an appropriate alternative material as a substitute for fossil energy materials, where the raw materials for the manufacture of these energy materials are very abundant. Especially if we focus on the development of biofuel materials by developing the planting of trees that can produce energy such as oil palm, sweet potato, corn and so on. Apart from being a source of energy to support national energy self-sufficiency, these plantations will also absorb a lot of manpower, besides that, large plantations will become the lungs of the world, with these energy plants at the same time functioning as CO_2 [absorbers] .

With the use of biofuels in addition to being self-sufficient in energy, we will reduce imports of fuel from abroad so that it will reduce the cost of the fuel subsidy applied. This will reduce the government's burden, especially on fuel subsidies. As with the use of oil palm as a biofuel base material with blocky land, it will be

even more efficient in handling transportation so that it will facilitate production, besides that, bioethanol fuel from sweet potato material even with a small area can produce large quantities.

However, from environmental factors we also have to pay attention to, usually in plantation land clearing activities we have to re-open land or by cutting down trees or opening debt into plantations, this factor also needs to be considered because indiscriminate land clearing will violate ethics and cause forest damage.

The use of biofuel is an energy for the future with its environmentally friendly features. This type of energy is also a new renewable energy where every time this energy plant plant, especially palm oil will grow with a span of 25 to 30 years.

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