

Biomass Conversion For Renewable Alternative Energy

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ABSTRACT

Biomass is an organic material produced through a process of photosynthesis and can be used as an energy source. In general, biomass used as alternative fuel is considered because it has economic value which is relatively cheap because it comes from waste around the community. In addition, biomass is one way to reduce the waste problem in the community. Such as agricultural, livestock and other wastes where the waste is not properly managed and can have adverse effects on the environment. Energy conversion is a change of energy from one to another, so conversion of this biomass energy converts a biomass energy into another energy in which the raw material used comes from waste. The conversion of biomass energy is very beneficial for many sectors. Such as coconut husk that can be converted into thermal energy and beneficial to the crafters of anchovy and like animal feces, especially cattle that can be converted into thermal energy or biogas and can be beneficial to the surrounding community. Therefore, the conversion of this biomass energy while providing a positive impact in addition to the community also has a positive impact on the environment for now as well as years to come.

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INTRODUCTION

Indonesia is called as an agrarian country because Indonesia has a source of energy such as abundant biomass. As an example of biomass energy sources is agricultural wastes such as coconut husk, rice husks, stems and corn cobs and others. Biomass energy sources that can be processed into alternative energy. As we know that the amount of waste generated from each sector can have a bad impact on the environment if the waste is not managed properly and managed according to their own characteristics. Indonesia has considerable potential in producing solid waste that is equal to 49,807.43 MW.

However, every waste produced has different characteristics so the processing of it is also different and require considerable cost. Another way to reduce waste is to use it, such as the conversion of biomass energy, which utilizes waste from various sectors to other energy. In addition to reducing waste, this method can be profitable and operational costs are relatively smaller even

there is only a household scale. In addition, the utilization of biomass into alternative energy can replace fossil energy so that the energy produced more environmentally friendly. As we know that the years of consumption from fossil fuels are increasing so that it can cause increased emissions resulting so that it can cause global warming and bring negative impacts to life.

Biomass is an organic material derived from living organisms, plants and animals, such as in agricultural and other wastes. One example of biomass is coconut husk. The biomass of coconut husk can be used for cooking can also be used for drying other foodstuffs. The public has always used fuel in the use of biomass in a traditional way (Syamsiro and Saptoadi, 2007). Biomass is one alternative fuel in addition to coal that can be utilized. The components of biomass are moisture content, volatile substances, bonded carbon, and ash. To eliminate moisture content in biomass is usually done drying. At the pyrolysis stage in the process of devolatilization which will reduce volatile substances. Meanwhile, to reduce the carbon bound by charcoal burning and the rest of this combustion will produce ash (Surono, 2010).

The advantage in the use of biomass into an energy is to increase energy efficiency because of the amount of waste that is present and will be wasted and can have a negative impact if not utilized. In addition, the use of biomass can save costs because as we know that disposing of waste in addition to negative impact also requires a relatively large cost because it requires the provision of the place as well as others. In addition to being utilized, biomass is also used as one of the main products for energy sources such as palm oil, soybeans and distances used for the basic ingredients of biodiesel manufacturing.

The energy generated from biomass can be utilized in various ways other than for cooking as well as for the timber industry as well as for power generation and others. In this more modern era, biomass can be applied in various other sectors. To be able to convert biomass into other energy of course have to go through various process. Factors that can affect the conversion of biomass are: the type and quantity of biomass, the shape of the energy produced, the need, the environmental standards and the economic aspect. In general the conversion of biomass through 2 processes namely thermochemistry and biology. In the thermochemical process occurs 3 processes namely combustion, pyrolysis and gasification. The conversion of biomass is not only in gaseous form but can in other forms such as solid and liquid. Biomass in the form of gases such as biogas, gas producers and others, in solid form such as charcoal, while in liquid form such as ethanol, biodiesel and methanol (Syamsiro, 2016). As we know that Indonesia has considerable potential in producing solid waste that is equal to 49,807.43 MW. Where from the solid waste can be utilized to biomass and biogas energy throughout Indonesia which is about 167,7 MW produced from sugar cane waste and biogas can produce equal to 9,26 MW from gasification process (Lubis, 2007). The matrices of Potential Biomass Year 2013, as shown in Table 1 below.

Table 1. Potential Some Type of Biomass Year 2013

Type of Biomass	Raw Material Availability (tonnes)	Energy Potential (GJ)	General Potential (Mwe)
Palm oil			
fiber	12.830.950	180.778.665	1.231
Shell	6.136.541	108.861.141	759
Empty bunches	23.988.298	118.757.608	827
Cane			
Sugar Cane	9.559.395	73.470.505	582
Coconut			
Coir Coconut	1.119.301	15.464.755	119
Shell	383.760	13.262.898	59
Rice			
Husk	13.016.712	180.592.857	1.432
Straw	90.370.365	1.056.602.982	8.376
Corn			
Cob	4.263.116	62.470.849	495
Stems and leaves	14.920.906	156.177.123	1.238

Sources: Lubis, 2007

Solid fuel is a biomass that occurs through the combustion process, pyrolysis and gasification. While the fuel in the form of liquid is the result of the gasification process. The density and calorific values present in biomass are generally low. To increase the density value one way is by disinfection. As for the calorific value can be increased trough torrefaction. The merger of these two processes will produce solid fuels with high quality biomass content. The drying process by utilizing biomass into thermal energy using heat exchangers and furnaces, in which both devices can increase the

temperature for the drying process so that under any conditions such as in the rain conditions the drying process can still take place. With this method can facilitate the community in supporting the economy in everyday life (Darlis, 2015). Heat Value Some Types of Biomass as shown in Table 2 below.

Table 2. Heat Value Some Types of Biomass

Biomass	Calorific Value (kJ / kg)
Husk	16.054
Straw	17.999
Sugar Cane	17.619
Empty bunches Palm oil	15.900
Wood	17.700

Sources: Darlis, 2015

METHODS

This research uses various methods, such as combustion process, using biodigester, and fermentation process. With a variety of methods used as well as with different sources of different raw materials so that the results are also different. sources of raw materials used are agricultural waste such as coconut husk and corn cobs and livestock waste such as animal waste, especially cow dung.

In coconut energy conversion research where the material used is coconut husk biomass, anchovy, heat exchanger, stove and room for drying process. In this research, biomass is converted to thermal energy by using heat exchanger with combustion process from coconut husk using stove. The resulting hot smoke is poured through the pipes and hot air will be channeled into the drying chamber using a forced convection system which uses two fan bans. This This hot air generated is what will be used for the terrible fish that is in the drying chamber.

In the study of energy conversion based on animal or cattle dung, the materials used are plastic cask, cow dung biomass and gas stove. For the amount of cow dung that is used can be calculated based on the number of average cows multiplied by the amount of one cow dung per day. Dry matter from cow dung can be obtained from the amount of cow dung and cow dung composition in which the composition of cow dung is 80% liquid and 20% solid. For comparison the composition of dry matter with water is 1: 4.

In energy conversion studies using lignocellulosic biomass is to dissolve and separate one or more of the four major components of biomass such as hemicellulose, cellulose, lignin and other extractives. In the process of saccharification which breaks the hydrogen bonds present in the fraction of hemicellulose and cellulose then becomes a sugar component. Sugar cane is produced which will then be fermented to become bioethanol.

RESULT AND DISCUSSION

As we know that the source of biomass energy is agricultural waste such as coconut husk, rice husk, stalk and corn cob and other. An example of a biomass energy source that can be processed into alternative energy is coconut husk. Biomass derived from coconut husk in addition to used for cooking can also be used to assist in the process of drying food raw materials such as anchovies. Biomass derived from coconut husk has a high calorific value of 16,700 kJ / kg or equivalent to the value of the heat of the wood is 8,400 - 17.00 kJ / kg. This process by converting biomass into a thermal energy using a heat exchanger tool and furnace can increase the drying temperature so that the drying process becomes shorter. In addition, by using biomass from coconut husk give positive impact to society or its user that is society or its user can avoid sunshine because the use of this tool or process can be done in place of shade and also can increase work productivity and also decrease worker burden and also can increase the price product.

Biomass derived from animal waste such as cow dung, horses and others can also be used as an alternative material to support the daily needs of the community. Animal waste is one of biomass which uses biodigester. Biodigester is a tool used to accelerate the decay of organic material contained in the waste of animal waste which where there is a sealed tube then the waste of animal waste will be fermented so it will produce energy and materials that can fertilize plants or

compost. Conversion of biomass energy from animal waste, especially cow is one way to solve the problems that exist in the community, especially those who have farms. This energy conversion process is done because this process can change the waste of animal waste into thermal energy which will be used by the community in daily needs such as cooking and others. However, this energy convergence has a weakness that can cause smoke that can interfere with public health.

Biomass can also be used to produce ethanol by using lignocellulose. This production is done to reduce the concerns of people in the competition of the use of crops for food but it can also to reduce greenhouse gas emissions. However, this production is still not exactly perfect because the lignin content contained therein is still recalcitrant to the fermentation process. In addition to bioethanol production, biomass can also be used for biofuel production because the energy content present in it from cellulose can be converted into simple sugars and then can be fermented into bioethanol. In addition to being converted into biofuel, this cellulosic biomass can also be for chemical industries such as organic acids, acetone and glycerol. However, this is still a challenge for many parties because the conversion of biomass into ethanol is still considered inefficient both in terms of process and in terms of results. In addition, the microbes that play a role in the fermentation process has not been maximal so that the results obtained were not maximal.

CONCLUSION

Indonesia is rich in sources to make biomass energy another energy. One source that is often used as a raw material for conversion of biomass energy is waste both in agricultural, livestock and other industries. The more years the waste produced is increasing and causing a bad impact on the environment because the waste generated waste is not managed properly. Biomass energy conversion is one way or the right technology to solve this problem. Biomass energy conversion is proven to be able to reduce the amount of waste that is abundant and can have a positive impact on society and the environment. An example of biomass energy conversion is the conversion of biomass energy from coconut fibers used for the drying of anchovy for the small anchovy craftsmen, in addition to reducing the waste of coconut fiber, as well as reducing the cost of expensive operation, working time efficiency and so on. However, there are some raw materials that are still a challenge for the community due to the processing process and the results are still not perfect. The conversion of biomass energy proves to be one of the best technologies to reduce waste as well as one of the ways to produce cheap and environmentally friendly alternative energy.

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