

Utilising Of Canary Shell As The Material Of Bio-Briquette

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ABSTRACT

The current technological advances lead to ever increasing energy needs. One of the sources of energy that have a potential replacement for renewable sources of energy and economically is a bio-mass, such a briquettes. This study purpose to know the processes and stages of manufacture about briquettes from raw canary shell and coal, worth the calories, compressive strength as the rate of combustion. Canary shell crushed and coal, sifted, canary shell and coal then separated by size inside a bag of samples. Canary shell and coal mixed with tapioca flour and water, heated on the stove then mixed to flat, molded and pressed to make it more solid and then dried under the Sun. Making dough briquettes using a composition of 250 gr: 50 gr: 100 ml in comparison with 100%, 50%: 50%, 75%: 25%. Grain size was used in this study consist of 28 mesh, 65, mesh and 80 mesh. Test results from the compressive strength, strong value that it brings the most nice tap in 80 mesh 50: 50 comparison because the most powerful against the heavy pressure. As for the calorie value has the highest calorie content that is 100% canary briquettes 6,354 cal/gr with mesh size of 65.

Keywords: Canary shell; Coal; Bio mass; Briquettes

1. INTRODUCTION

Coal is one of the primary energy sources that has a very long history of utilization. Coal is the terminology of society that is used to refer to all remaining plants that have become fossilized, solid, dark, and can be burned [1].

The supply of refined fuel oil began to be crisis because the reserves were limited while the source of fuel wood is also crisis because the area of the forest is less than the ideal requirements. So one alternative energy source is coal. Lately the price of fuel oil has increased rapidly which has an impact on the increasing selling prices of fuel including kerosene in Indonesia.

To anticipate the increase of fuel prices in this case kerosene, alternative fuels that are cheap and easy to obtain are needed. Coal briquette is an alternative solid fuel made from coal. In this study, briquettes that will be made from a mixture of canary shells are alternative fuels instead of kerosene which has technical feasibility to be used as household fuels, small or medium industries.

Canary shell are agricultural solid wastes which are mostly grown in the eastern part of Indonesia, but are currently not maximize utilized by the community [2]. Canary is one of native plant of Indonesia, which are widely grown in eastern Indonesia,

such as Sulawesi, Maluku and Seram Island [3].

Coal briquettes are solid fuels of certain shapes and sizes, which are composed of fine coal grains which have undergone a compression process with certain compressive power, so that the fuel is easier to handle and produces added value in utilization. Good briquette requirements are easily ignited, do not emit smoke, are water proof, show a good combustion rate (time, combustion rate and combustion temperature) [4].

Briquettes also have economic advantages because they can be produced in a simple manner, have a high heating value, and the availability of coal is quite a lot in Indonesia so that it can compete with other fuels. Some types of briquettes that are commonly known include pillows, honeycomb, cylinder, egg and others [5].

Charcoal briquettes for wood and coconut shell has a standard is SNI (National Indonesia Standard). SNI number 01-6235-2000 with requirement of quality as following Inherent Moisture 8%, Ash 8%, Volatile Matter 15%, Fixed Carbon 77%, Calorific Value 5,000 cal/gr, and Pressure 0.46 kg/cm² [6].

This study aims to determine the process and stages of making bio-briquettes from raw materials of canary shells and coal, and also to determine the quality of briquettes, namely caloric value, compressive strength and combustion rate. The coal sample originated from the island of Borneo while a

sample of canary shells originated from the Selayar Island Regency.

2. METHODOLOGY

Sample processing was carried out at the Laboratory of Mineral Processing and Geomechanics Laboratory.

The stages of processing samples are divided into two processing canary shells and processing coal. Processing of canary shell and coal is almost the same, only different in the initial process of processing the sample.

The processing stages of canary shell samples are canary shells are dried and then weighed. The canary shell burned using a drum and then left for one night. Canary shell are weighed and crucified using a double roll crusher to destroy the compact shell of the canary. After the size of the canary shell has shrunk then grinding using a ball mill to be mashed for 30 minutes. Canary shell powder is weighed and then screened using a sieve shaker to separate small and large samples and then put in a sample bag. Samples of canary shells and tapioca flour were weighed and water was measured as needed. Tapioca flour and water heated on the stove until the color turns clear. Its function is for adhesives in making briquettes. Canary and adhesive powder is put in a container and mixed until smooth. After the canary powder and the adhesive have been mixed evenly then printed and compacted using a press. Canary briquette samples are dried in the sun for 2 days. The dried briquettes are then put in a sample bag and labeled and then taken to the laboratory

for testing. The first test is the calorie content of briquettes at PT. Superintending Company Of Indonesia (Persero) Makassar Branch (SUCOFINDO). The second test is compressive strength in the Land Mechanics laboratory of the Civil Engineering Department of the Universitas Muslim Indonesia. The third test is the combustion rate to determine the length of combustion in the briquette sample.

The stages of coal processing are almost the same as the stages of processing canary shells, the only difference being that coal is not burned but only crushed using a hammer and crushed using a jaw crusher. The next stage is the same as the processing of canary shells

3. RESULT AND DISCUSSION

The following are the results of study on briquettes made from a mixture of canary shells and coal, other additives, tapioca flour and water with a composition of 250 gr (main ingredient): 25 gr (tapioca flour): 100 ml (water).

A. Size 28 Mesh Briquettes

In this study several observation were carried out namely caloric content, unconfined compression and combustion rate. The results for 28 mesh briquettes are show in Table 1, Figs. 1 and 2.

The results of the 28 mesh briquettes can be seen in Table 1 and Fig. 1. From the picture above, we can see the comparison between unconfined compression (blue) and calorie content (red). For 100% canary shell briquettes obtained the weight produced before drying is 57.2 gr and after drying for \pm 2 days is 49.9 gr, the briquette height is 5.62 cm with a diameter of 3.97 cm. After testing the caloric content of 5,420 kcal/kg, the compressive strength of a load is 9.196 kg/cm². The final test in this study was the burning rate of briquettes which started to burn 3 minutes and the total burning time of the entire briquette was 1 hour 44 minutes. At the time of combustion produce smoke that is little and almost invisible. The smoke produced is white. Fig. 2 illustrated combustion rate briquette for 28 mesh.

Table 1. Size 28 Mesh Briquettes Data

No.	Size (Mesh)	Composition (%)	Unconfined Compression (kg/cm ²)	Calorie Content (Kcal/gr)	Burn Rate (Time)	Smoke
1.	28	Canary 100%	9.196	5,420	1 h 44 min	Smoked
2.	28	Mix. 50% : 50%	9.181	5,731	1 h 55 min	Smoked
3	28	Mix. 75% : 25%	8.568	5,561	1 h 50 min	Smoked
4	28	Coal 100%	8.334	5,846	2 h 8 min	Smoked

For 50% : 50% mixed canary shell and coal briquettes obtained the weight of the briquettes produced before drying is 52.2 gr

and after drying for \pm 2 days is 42.8 gr, the briquette height is 4.95 cm with a diameter of 3.84 cm. After testing the caloric content of

5,731 kcal/kg, the compressive strength of a load is 9.181 kg/cm². The final test in this study was the combustion rate, the briquettes started burning 4 minutes and the total burning time of the entire briquette was 1 hour 55 minutes. At the time of combustion produce smoke that is little and almost invisible. The smoke produced is white.

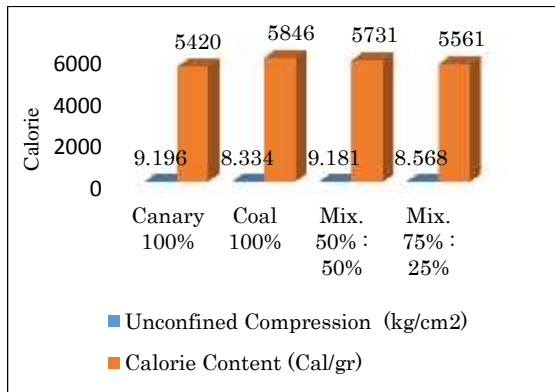


Fig. 1. Size 28 Mesh Briquette Chart

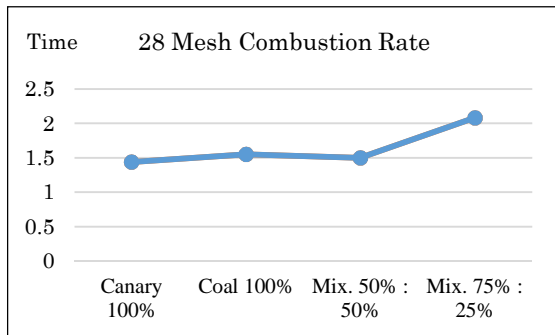


Fig. 2. 28 Mesh Combustion Rate

For 75%: 25% canary shell and coal mixture briquettes obtained 53.0 gr of the briquettes produced before drying and after drying for ± 2 days 42.6 gr, the briquette height was 4.99 cm with a diameter of 3.86 cm. After testing the caloric content of 5,561 kcal/kg, the compressive strength of a load is 8.568 kg/cm² (fig. 3). The final test in this study was the combustion rate, the briquettes

began to burn 4 minutes and the total burning time of the entire briquette was 1 hour 50 minutes (fig. 4). At the time of combustion produce smoke that is little and almost invisible. The smoke produced is white.

For 100% coal briquettes, the weight of the briquettes produced before drying is 60.2 gr and after drying for ± 2 days is 44.0 gr, the briquette height is 4.86 cm with a diameter of 3.94 cm. After testing the calorie content of 5,846 kcal/kg, the compressive strength of a load is 8.334 kg/cm². The final test in this study was the combustion rate, the briquettes began to burn 5 minutes and the total burning time of the entire briquette was 2 hour 8 minutes. When burning produces a lot of smoke. The smoke produced from all of these briquettes is white.

B. Size 65 Mesh Briquettes

In this study several observation were carried out namely caloric content, unconfined compression and combustion rate. The results for 65 mesh briquettes are show in Table 2, Figure 3 and 4.

The results of 65 mesh briquettes can be seen in Table 2 and Figure 3. From the picture above you can see the comparison between unconfined compression (blue) and calorie content (red). For 100% canary shell briquettes obtained the weight of briquettes produced before drying is 59.1 gr and after drying for ± 2 days is 36.6 gr, the briquette height is 5.23 cm with a diameter of 3.90 cm. After testing the caloric content of 6,354 kcal/kg, the compressive strength of a load is

5.455 kg/cm². The final test in this study was the combustion rate, the briquettes began to burn 4 minutes and the total burning time of the entire briquette was 2 hours 18 minutes. At

the time of combustion produce smoke that is little and almost invisible. Figure 4 illustrated combustion rate briquette for 65 mesh.

Table 2. 65 Mesh Size Briquette Data

No.	Size (Mesh)	Composition (%)	Unconfined Compression (kg/cm ²)	Caloric Content (Kcal/kg)	Burn Rate (Time)	Smoke
1.	65	Canary 100%	5.455	6,354	2 h 18 min	Smoked
2.	65	Mix. 50% : 50%	2.517	6,020	1 h 56 min	Smoked
3.	65	Mix. 75% : 25%	9.717	6,096	1 h 52 min	Smoked
4.	65	Coal 100%	8.996	6,539	2 h 6 min	Smoked

For 50% : 50% mixed canary shell and coal briquettes, the weight of the briquettes produced before drying is 53.4 gr and after drying for ± 2 days is 48.4 gr, the briquette height is 5.42 cm with a diameter of 3.94 cm. After testing the caloric content of 6,020 kcal/kg, the compressive strength of a load is 2.517 kg/cm². The final test in this study was the combustion rate, the briquettes started burning 3 minutes and the total burning time of the entire briquette was 1 hour 56 minutes. At the time of combustion produce smoke that is little and almost invisible.

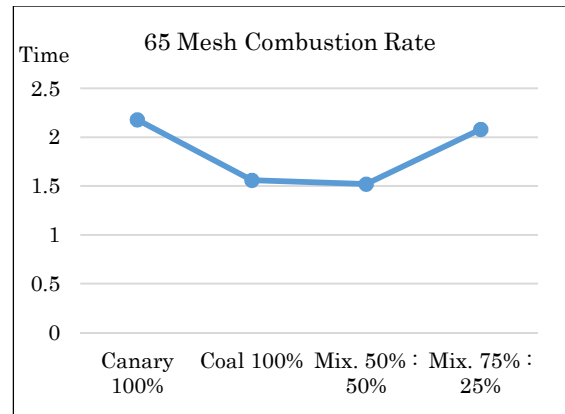


Fig 4. 65 Mesh Combustion Rate

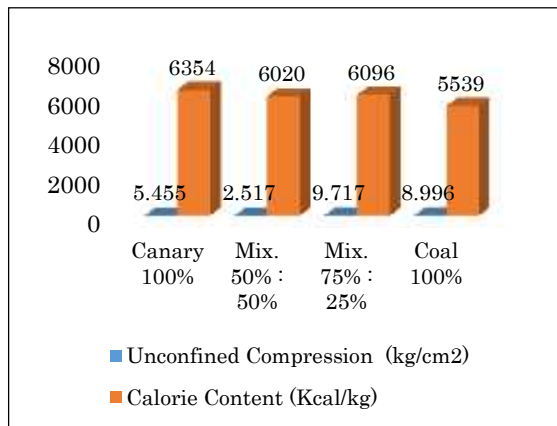


Fig 3. Size 65 Mesh Briquette Chart

75% : 25% of canary shell and coal mixture briquettes obtained the weight of the briquettes produced before drying was 47.0 gr and after drying for ± 2 days it was 42.3 gr, the briquette height was 5.51 cm with a diameter of 3.90 cm. After testing the caloric content of 6,096 kcal/kg, the compressive strength of a load is 9.717 kg/cm². The final test in this study was the combustion rate, the briquettes began to burn 4 minutes and the total burning time of the entire briquette was 1 hour 52 minutes. At the time of combustion produce smoke that is little and almost invisible.

For 100% coal briquettes, the weight of the briquettes produced before drying is 48.6 gr and after drying for ± 2 days is 32.4 gr, the briquette height is 5.39 cm with a diameter of 3.97 cm. After testing the calorie content of 5,539 kcal/kg. While the compressive strength of a load is 8.996 kg/cm². The final test in this study was the combustion rate, ie the briquettes began to burn 5 minutes and the total burning time of the entire briquette was 2 hours 8 minutes. When burning produces a lot of smoke. The smoke produced from all of these briquettes is white.

C. Size 80 Mesh Briquettes

In this study several observation were carried out namely caloric content, unconfined compression and combustion rate. The results for 80 mesh briquettes are show in Table 3, Figure 5 and 6.

The results of 80 mesh briquettes can be seen in Table 3 and Figure 5. From the picture above we can see the comparison between unconfined compression (blue) and calorie content (red). For 100% canary shell briquettes obtained the weight of briquettes produced before drying is 49.2 gr and after drying for ± 2 days is 40.8 gr, the briquette height is 5.31 cm with a diameter of 3.91 cm. After testing the caloric content of 6,308 kcal/kg, the compressive strength of a load is 8.088 kg/cm². The final test in this study was the combustion rate, the briquettes began to burn 4 minutes and the total burning time of the entire briquette was 2 hours 23 minutes. At the time of combustion produce smoke that is little and almost invisible. The smoke produced is white. Figure 6 illustrated combustion rate briquette for 80 mesh.

Table 3. 80 Mesh Size Briquette Data

No.	Size (Mesh)	Composition (%)	Unconfined Compression (kg/cm ²)	Calorie Content (Kcal/kg)	Burn Rate (Time)	Smoke
1.	80	Canary 100%	8.088	6,308	2 h 23 min	Smoked
2.	80	Mix. 50% : 50%	10.110	5,984	1 h 56 min	Smoked
3	80	Mix. 75% : 25%	2.033	5,716	1 h 30 min	Smoked
4	80	Coal 100%	2.980	5,814	2 h 14 min	Smoked

For 50% : 50% mixed canary shell and coal briquettes obtained the weight of the briquettes produced before drying is 47.9 gr and after drying for ± 2 days is 43.0 gr, the briquette height is 5.53 cm with a diameter of 3.93 cm. After testing the caloric content of 5,984 kcal/kg, the compressive strength of a load is 10.110 kg/cm². The final test in this

study was the burning rate of briquettes which started to burn 5 minutes and the total burning time of the entire briquette was 1 hour 56 minutes. At the time of combustion produce smoke that is little and almost invisible. The smoke produced is white.

75% : 25% for canary shell and coal mixture briquettes obtained 60.5 gr of the

briquettes produced before drying and after drying for ± 2 days 44.1 gr, the briquette height was 4.61 cm with a diameter of 3.94 cm. After testing the caloric content of 5,716 kcal/kg, the compressive strength of a load is 2.033 kg/cm². The final test in this study was the combustion rate, the briquettes began to burn 4 minutes and the total burning time of the entire briquette was 1 hour 30 minutes. At the time of combustion produce smoke that is little and almost invisible. The smoke produced is white.

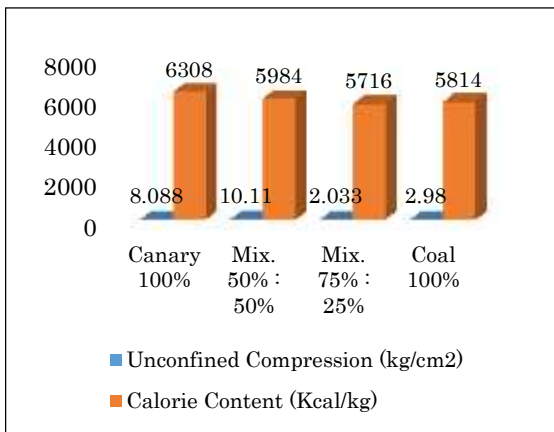


Fig 5. 80 Mesh Size Briquette Chart

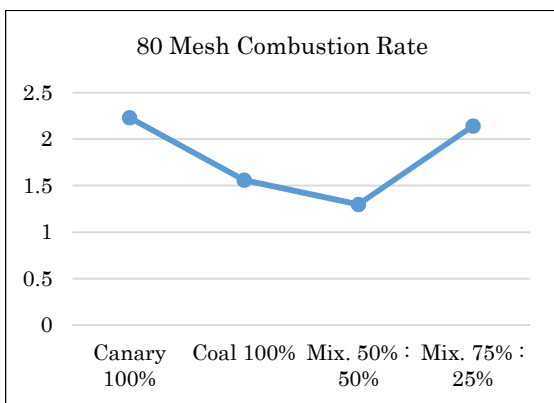


Fig 6. 80 Mesh Combustion Rate

For 100% coal briquettes, the weight of the briquettes produced before drying is 62.1 gr and after drying for ± 2 days is 57.0 gr, the briquette height is 5.40 cm with a diameter

of 3.94 cm. After testing the caloric content of 5,814 kcal/kg. While the compressive strength of a load is 2.980 kg/cm². The final test in this study was the burning rate of briquettes which started to burn 5 minutes and the total burning time of the entire briquette was 2 hours 14 minutes. When burning produces a lot of smoke. The smoke produced is white.

4. CONCLUSION

From the results of the study we found that the quality of briquettes in the compressive strength test found that the value of the best compressive strength is at 80 mesh ratio of 50 : 50 which is 10.110 kg/cm² and meets the SNI requirements. Whereas for the caloric value which has the highest caloric content is 100% canary briquettes, which is 6,354 kcal / kg with a size of 65 mesh. For the combustion rate of 100% canary size 80 mesh with burning time is 2 hours 23 minutes.

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