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PERFORMANCE ANALYSIS OF COCONUT SHELL CHARCOAL BRIQUETTES IN TERMS OF VARIATIONS IN IMMERSION TIME AS AN ALTERNATIVE ENERGY SOURCE

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ABSTRACT

The utilization of coconut as one of the plantation crops is a very promising export commodity. Almost all parts of the coconut plant can be used optimally, whether it is made of copra, food, crafts, and others. It's just that in the process of utilizing coconut skin, the coconut shell which is in the form of flakes or fragments is sometimes used as useless garbage. Therefore, coconut shell flakes will be used as an alternative fuel in the form of coconut shell charcoal briquettes. In the previous research process as an alternative fuel is sometimes less effective because it depends on variations in materials or additives. This study aims to obtain the maximum thermal efficiency with several variations of immersion. The research method is an experimental method by utilizing coconut shell as an alternative fuel on the stove with variations in soaking time. The results showed that the variation of immersion 20 minutes was superior in terms of length of ignition time, the mass of burned briquettes, ability to boil water, and thermal efficiency, respectively, 196 minutes, 0.38 kg, 12 kg, and 52.12% were obtained.

Keyword: coconut shell briquette, variations of immersion, length of ignition time, ability to boil water, thermal efficiency.

1. INTRODUCTIONS

The degree of utilization of petroleum derivatives on the planet is expanding alongside the expansion in the human populace and the expanding pace of industrialization. Decreasing petroleum product utilization as per the public energy the executive diagram 2005-2025, Indonesia's arrangement has an objective, one of which is to increment environmentally friendly power (biomass energy use) to 15% of complete fuel source use. One of the sustainable power that is effectively used is biomass energy. Since the number is plentiful in nature. One of the biomass energy that will be used in this exploration comes from the manor area, to be specific coconut shell squander.

Coconut shell charcoal is an item gotten from the inadequate burning of coconut shells. Charcoal gives higher warmth and less smoke, charcoal can be ground and afterward packed into briquettes in different structures, where the utilization of these briquettes will be more functional, efficient, and practical, and simple to get contrasted with kindling.

Concerning the investigations completed regarding coconut shell briquettes which have more worth than other biomass briquettes, to be specific leading examination on [1] working on the exhibition of different ovens utilizing coconut shell briquettes as fuel with a warming worth of 4949 cal/gram. [2] Directing examination on a combination of coconut shell briquettes with an assortment of supporting specialists like sand, dirt, and mud brought about a calorific worth of 5839.33 cal/gram and a productivity of 64.15% in a combination of coconut shell briquettes with sand building up specialists. [3] Exploration on 3 varieties of the combination of coconut coir and coconut shell charcoal briquettes brought about a calorific worth of 5676 cal/gram and warm proficiency of 43.82% at a 20%:60% coconut shell proportion. [4] Exploration on briquette ovens utilizing coconut shell charcoal briquettes brought about a warm productivity of 71.03%. [5] Adjusting 3 kinds of stove with guide chambers and up, down grind utilizing coconut shell briquettes to create 65.16% warm productivity. [6] Examination by adjusting an stove with 5 kinds of aluminum chambers on a stove utilizing coconut shell briquettes which has a warming worth of 5840 cal/gram creates the most noteworthy oven proficiency of 58.12% at a chamber breadth of 180mm. [7] Conducted research on a mixture of rice husks and coconut shells with a ratio of 50:50 to produce a calorific value of 4966 kcal/kg. And finally, [8] conducted a study on rice husks and coconut shells with paper powder adhesives resulting in a calorific value of 4214.86 kcal/kg.

Utilization of charcoal briquettes in several previous studies was less effective in the combustion process, although various things have been attempted, one of which is mixing the composition of charcoal briquettes with one another and modifying the combustion chamber of the stove but it is not yet maximal. The length of immersion of briquettes because there has been no similar research, so that in the future a more effective thermal efficiency of briquette material will be obtained.

2. BASIC THEORY

Coconut shell is one of the dynamic carbon materials which has great quality as enacted charcoal. Physiologically, the shell is the hardest part contrasted with

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other coconut parts. The hard construction is brought about by silicate (SiO_2) which is very high in the coconut shell [9].

Briquettes are strong powers with a specific shape and size, which are made out of fine particles that have gone through a pressure interaction with a specific compressive force so the fuel is simpler to deal with in its use [10].

3. MATERIALS AND METHODS

The investigation utilized biomass briquettes, particularly coconut shells. The exploration was done utilizing an exploratory strategy by using coconut shell waste to be utilized as fuel for the oven. The structure of the coconut shell charcoal briquette blend can be found in the table beneath:

Table-1.

Sample	Material Composition (Gram)			Hot Water (ml)
	Coconut Shell	Starch	Clay	
Briquete	800	100	100	700

Table-1 above shows a combination of coconut shell charcoal briquettes comprising of 800 grams of coconut shell charcoal blended in with 100 grams of dirt and 100 grams of starch with boiling water. Moreover, coconut shell briquettes have been tried for proximation, calorific worth, and ignition testing on a biomass oven with varieties in submersion time as numerous sorts.

4. DISCUSSIONS AND RESULT

The consequences of the examination have been done by creating coconut shell briquettes with a proximation and calorific worth testing measure in the Nourishment and Creature Feed research facility.

The after effects of handling and investigation of burning information on conventional ovens can be found in Table 2 below:

Table-2.

Symbol/unit	Immersion Time Variotion (Minute)				
	0	5	10	15	20
L. I Time, Tli (Menit)	125	125	142	169	196
Burning B Mass, mbb (Kg)	0.264	0.275	0.3	0.365	0.38
W. B. Ability, mw (kg)	6	6	9	9	12
Thermal Efficiency, ηth(%)	32.18	37.96	45.45	47.15	52,12

In Table-2 above, it can be seen that the best immersion time was obtained at a 20-minute immersion time with the highest efficiency of 52.12%.

Furthermore, for the process of depicting the real results of the research that has been carried out, it can be seen in the image below:

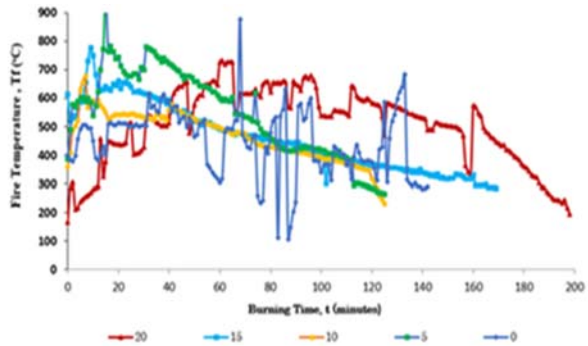

Figure-1. History of fire temperature.

The more drawn out the drenching time, the higher the fire temperature created during the fuel burning cycle. It very well may be seen that the greatest inundation time was created at 989°C at a drenching season of 15 minutes and the second spot at a submersion season of 20 minutes at 878°C. Albeit the consuming time is more limited than the typical dousing time (no splashing time needed) for 200 minutes. Apparent increment and decline in every variety of inundation time isn't steady alongside the change.

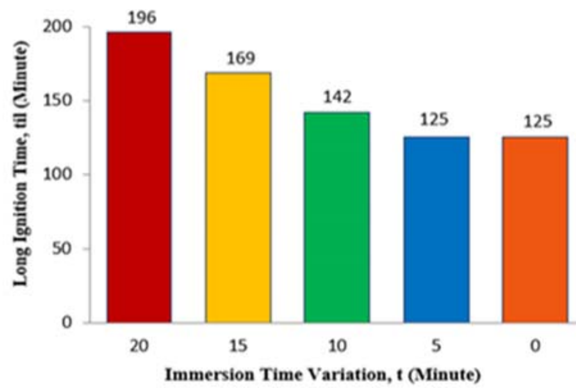

Figure-2. Long ingition time diagram.

The more drawn out the drenching time, the more extended the interaction of start of the subsequent fire. The greatest time allotment for start is delivered at a drenching season of 20 minutes for 196 minutes. This happens due to the high calorific worth of coconut shell briquette fuel so it can keep up with the greatest fire of the briquettes.

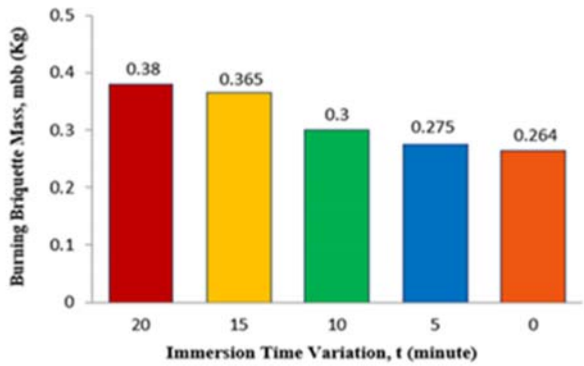

Figure-3. Burning briquette mass diagram.

The more extended the submersion time is completed, the more fuel is scorched. The mass of briquette fuel that consumed the most was 0.38 kg at the hour of submersion for 20 minutes. The wonder that happens in the mass outline of briquettes that are worn out is pretty much as trademark as the capacity to bubble water

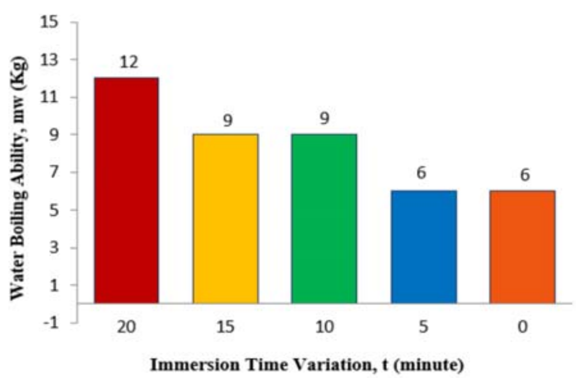

Figure-4. Water boiling ability diagram.

The more extended the dousing time, the more the water will bubble. The best water bubbling capacity is to deliver however much 12 liters at a brief drenching time. This occurs alongside the time allotment the fuel fire is touched off in the biomass briquette oven.

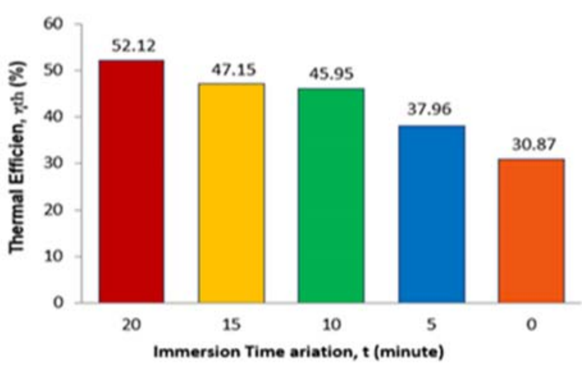

Figure-5. Thermal efficiency diagram.

The more extended the submersion time, the higher the warm proficiency delivered. The most extreme warm productivity delivered is 52.12% at 20 minutes of inundation. This happens in light of the fact that a steady and enduring start measure makes more fuel consume, bringing about higher ignition effectiveness too.

5. CONCLUSIONS

Based on the results of calculations and discussions that have been carried out, it can be concluded in the study as follows:

a) The maximum length of time for ignition in the combustion process is 196 minutes at a time of immersion of 20 minutes.
b) The mass of briquettes burned (used) during the combustion process is 0.38 kg at a time of immersion for 20 minutes
c) The ability to boil water up to a maximum of 12 liters at a time of immersion for 20 minutes.
d) The maximum thermal efficiency produced is 52.12% at a 20 minute immersion time

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