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ANALYSIS OF CHEMICAL COMPOSITION OF RICE HUSK USED AS ABSORBER PLATES SEA WATER INTO CLEAN WATER

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ABSTRACT

Chaff is part of the grain grains (cereals) in the form of dry sheets, scaly, and can not be eaten, which protects the inside (endospermium and embryo). Husk can be found in almost all members of grasses (poaceae), although in some kinds of cultivation were also found that the variation of grain without husk (eg maize and wheat). This husk is a waste of life from the Plant. In agriculture, rice husk can be used as a mixed feed, litter, mixed in the soil as fertilizer, burned, or ashes are used as growing media, in print used as a fuel substitute for oil. In this study, rice husk fuel and charcoal briquettes will be used as the absorber. The results showed that the composition of rice husk after being submerged in sea water distillation process and experience a decline. The conclusion was that the actual rice husk as waste can be made as briquettes, fertilizer, fuel and others but also it can be used as an absorber plate in the distillation process sea water into clean water. The results obtained in which the chemical composition of all decreased for example Cl = 36.41 mm% decreased to 23.71mm%, Si = 30.48mm% to 22.27mm% and Fe = 17.27mm% to 9.62mm% and so on. This was due to rice husk briquettes as an absorber plate in the container of distilled lead compounds dissolved therein participate after undergoing a process of condensation.

Keywords: rice husk, adsorbents, sea water.

1. INTRODUCTION

Indonesia is an agricultural country where agriculture sizeable 8.1% of agricultural land is 45 764 km2. This lead to more than a grain of rice production is obtained. The rice husk is a waste of grain that can be used. Whether in the form of fertilizers, as a substitute for fuel oil, and also can be used as an absorber plate made for the desalination process into clean water. This process can happen by doing research on the material that has been used as an absorbent rice husk briquettes. Chaff is part of the grain grains (cereals) in the form of sheets dry, scaly, and cannot be eaten, which protects the inside (endospermium and embryo). Husk can be found in almost all members of grasses (Poaceae), although in some kind of cultivation was also found that the variation of grain without husk (eg maize and wheat). In agriculture, the chaff can be used as a mixed feed, litter, mixed in the soil as fertilizer, burned, or charcoal used as a planting medium. Rice (Latin: Oryza sativa L.) is one of the most important crops in civilization. Although primarily refers to the type of crop, rice is also used to refer to some kind of genera (genus) are the same, which is commonly referred to as wild rice. Rice thought to have come from India or Indochina and into Indonesia brought by ancestors who migrated from the mainland of Asia about 1500 BC.

World rice production ranks third of all cereals, after maize and wheat. However, rice is the main carbohydrate source for the majority of the world population. The results of processing paddy rice called. Rice husk is used as absorber in seawater distillation process into clean water. For that we need a clean alternative water supply and quality of drinking water and do not endanger the public. Given the abundance of water resources from the sea, it is necessary to study about the possibility exploited sea water as raw materials meet the needs of clean water for the community as well as the advantages which may be obtained when using sea water as raw material for water taps. The processing of salt water into clean water called seawater desalination processes, one of which is done with rice husk absorber system.

The purpose of this study was to analyzed the chemical and physical composition of rice husk which has been burned and made into briquettes and analyzed its influence on the distillation process is done with the help of sunlight to make sea water into clean water.

2. THEORETICAL

2.1. Rice husk

Rice husk is berlignoselulosa like other biomass materials but siliceous high. Chemical content of rice husk consists of 50% cellulose, 25-30% lignin, and 15-20% silica [1]. Rice husk has now been developed as a raw material to produce ash that is known in the world as the RHA (rice husk ask). Rice husk ash produced from burning rice husks at a temperature of 400o - 500o C will

become amorphous silica and at temperatures greater than 1.000o C will become crystalline silica. The resulting amorphous silica from rice husk ash is suspected as an important source to produce pure silicon, silicon carbide, and silicon nitrid flour [2]. The burning of rice husk using conventional methods such as fluidised bed combustors produce CO emission between 200 - 2000 mg / Nm3 and NOx emissions between 200-300 mg / Nm3 [3]. Rice husk combustion method developed by Cogen-AIT is able to reduce the potential for CO2 emissions by 14 762 tonnes, 74 tonnes of CH4 and NO2 of 0.16 tons per year from burning rice husks of 34 919 tonnes per year [4]. Husk has a density of type (bulk Densil) 1125 kg / m3, with a calorific value of 1 kg of rice husk of 3300 k. calories, and has a bulk density of 0.100 g / ml, calorific value between 3300 -3600 kkalori / kg chaff with thermal conductivity of 0.271 BTU [5]. Chaff is categorized as a biomass that can be used for a variety of needs such as industrial raw materials, feed and energy or fuel or as adsorption on heavy metals. Chaff is composed of a network of cellulose fibers which contains a lot of silica in the form of fibers that are very hard. In normal circumstances, an important role to protect the seed husks of rice from damage caused by a fungus can prevent rancidity reactions because it can protect the oil-rich thin layer against mechanical damage during harvesting, milling and transport [6]. Husk cellulose content high enough to provide a uniform and stable combustion, to facilitate the diversification of its use, the chaff advance through the process of making rice husk and then compacted, molded and dried, called Rice Husk Briquette.

2.2. Absorber

Absorber is a tool used for absorption processes, namely the process of fluid absorption by gas throughout the liquid as an absorbent. Absorption process is used to separate a gas component of the gas mixture using a liquid as absorbent / absorbent. Absorbent used is determined from the solubility of a gas in a liquid substance specific. The example of the absorption process is the separation of oxygen from gas mixtures by using water as the absorbent. As previously described absorber is a component of the gas separation apparatus by liquid as solvent. Its working principle is a gas mixture is fed from the bottom (bottom) absorber tower, to be contacted with the liquid from the top (top) absorber. Kompenen gas having the largest solubility in the liquid will dissolve along with the adsorbent (liquid) and into the bottom product, while the other gas components which are not dissolved in the absorbent will be upward as the top product. Because the working principle Absorber by the solubility of gases in liquids, the operating conditions Absorber is at a low temperature and high pressure. Where in these conditions, the solubility of the gas in the liquid phase will be a maximum (remember the ideal gas law).

2.3. Clean water

Clean water is the water that is used for everyday purposes and will be drinking water after it is cooked first. As the limit, water is water that meets the requirements for drinking water supply system. The requirements in question are the requirements in terms of water quality include physical, chemical, biological and radiological, so if consumption does not cause any side effects (General Provisions Permenkes 416 / Menkes/Per/IX/1990. The system must meet the clean water some major persyarakat. Persyarakat include qualitative requirements, quantitative requirements and continuity requirements. Requirements describe the quality of the quality or the quality of the raw water clean water. These requirements include physical requirements, the requirements of chemical, biological requirements and requirements of radiological. The terms are based Permenkes No.416/Menkes/Per/IX/1990 stated that the water quality requirements are as follows:

Physically: Clean water should be clear, odorless and tasteless. In addition, the water temperature should be equal to the air temperature is 25 ° C or less, and if there is a difference then the exposure limit is 25°C ± 3°C.

The terms of Chemistry: clean water should not contain chemicals that exceed the limit quantities. Some chemical requirements include: pH, total solid, organic substances, CO2agresif, hardness, calcium (Ca), iron (Fe), manganese (Mn), copper (Cu), zinc (Zn), chloride (Cl), nitrite, fluoride (F), as well as heavy metals.

The terms of bacteriological and microbiological that clean water should not contain bacteria and parasitic pathogens which affect health. A bacteriological requirement is characterized by the absence of the bacteria E. coli or fecal coli in water. The terms of Radiological were the radiological condition requires that clean water should not contain substances that produce materials containing radioactive, such as alpha rays, beta and gamma.

2.4. Definition of sea water

Sea is a collection of salty sea water in large numbers and wide that bathes and divides the land on the continent or island. (Dictionary of Indonesian Edidi fourth-2008). So the water covers the sea is very spacious ground level and generally contain salt and salty. Usually the water flowing in the land will lead to the sea. Sea water is a mixture of 96.5% pure water and 3.5% other materials such as salts, dissolved gases, organic ingredients and no terlarut.Air particles containing sea salt, therefore it was to be salty . The average sea water is containing 3.5% salt. This means that in every 1 kg of salt content of sea water as much as 35 grams.

Sea Water differences with Freshwater:

a) Sea water has a salty taste, while clean water is not. This is because the sea water containing salt content of 3.5%, while the clean water does not contain salt.
b) The quantity of sea water on earth is much greater than the amount of clean water. 97% of the water on Earth is sea water and only 3% in the form of clean water.
c) The sea water is denser than clean water, because the levels of salt contained in seawater add mass but does not affect the volume of the sea water.
d) Sea water contains dissolved ions is greater than freshwater. Ions whose existence is abundant in sea water are sodium, chloride, magnesium, sulfate, and calcium.
e) The content of chemical elements in sea water: Cloride (Cl), sodium (Na), magnesium (Mg), sulfur (S), calium (Ca), Calcium (K), bromine (Br), Carbon (C), Cr, B . While the content of chemical elements in clean water: calcium, iron, lead, magnesium, copper, sodium, chloride, and chlorine.

Benefits of Sea Water Management:

a) Providing solutions to the water crisis. With the management of sea water into clean water that can be consumed by people can overcome their water crisis.
b) Management of sea water into clean water that is fit for consumption can reduce the use of underground water which is believed to be the main cause of soil degradation in several places in Indonesia.
c) In management sea water containing salt into clean water can produce a salt which can also be consumed.
d) Management of sea water into clean water can also be a profitable business opportunity for companies of national and international drinking water to be able to provide safe drinking water to its customers.

3. METHODOLOGY

Rice husk is obtained in an agricultural area in Maros, South Sulawesi Province, Indonesia. Rice husks from rice milling plant, then burned to make charcoal in. After becoming charcoal, then it mixed with clay and starch to be used as briquettes. Rectangular shaped briquettes with size (20x20x8) cm, which is the absorber. Briquettes were mixed and then studied in laboratory by using ARL QUANT'X ED, XRF ANALYZER. A briquette is an absorber made of sea water into clean water. Produced water was tested by chemical and physical properties. Rice husk briquettes compound composition before and after the distillation process using XRF methods are shown in graphical form.

4. RESULTS AND DISCUSSIONS

Rice husk results after the combustion process into charcoal, then printed with size (20x20x8) cm to be used as absorber in the distillation process. Rice husk is used as the absorber is studied in the Laboratory of Physics at Hasanuddin University, Makassar, Indonesia. Rice husk briquettes were shown in Figure-1.

Figure-1. Rice husk briquettes until press.

Physical and chemical compositions were produced before and after the distillation process is obtained by results XRF as follows (Table-1).

Table-1. Chemical composition of the XRF results Chaff.

No.	Element	Before seawater immersed		After seawater immersed		Remarks
		m/m%	StrErr	m/m%	StrErr	
1	Cl	36.41	0.37	23.71	0.36	
2	Si	30.48	0.51	22.27	0.29	
3	Fe	17.27	0.19	9.62	0.13	
4	Ca	4.88	0.17	2.84	0.1	
5	K	3.88	0.11	2.3	0.07	
6	Sx	1.71	0.79	1.39	0.51	
7	Px	1.62	0.18	0.89	0.12	
8	Sr	0.849	0.044	0.442	0.023	
9	Ti	0.65	0.17	0.376	0.097	
10	Mn	0.635	0.097	0.359	0.055	
11	Zn	0.533	0.052	0.279	0.028	
12	Ba	0.4	0.18	0.224	0.098	
13	Br	0.392	0.048	0.205	0.026	
14	Nb	0.102	0.02	0.053	0.01	
15	Mo	0.066	0.019	0.034	0.01	
16	In	0.0511	0.0051	0.0268	0.0028	
17	Sn	0.0429	0.0094	0.0224	0.0052	
18	Sb	0.032	0.015			

The chemical composition of rice husk briquettes after being used as absorber in the distillation process is decreased as a result of the evaporation of sea water into clean water.

The results obtained by using XRF showed that rice husk contains Cl sizeable and Silica second. While the SEM tool, it was large enough to contain silica and oxygen to the two sequences. XRF instrument showed that the composition of Si compound after undergoing a process of distillation is used as the absorber was experiencing a decline in value of Si = 30.48 m/m% (before the distillation process) turn into Si = 22:27 m/m%. (after the distillation process).

The compounds that are the rice husks from the results of SEM analysis (EDAX) was obtained as follows:

Si (silica), C (carbon), N (nitrogen), O (Oxygen), Fe (Feron), Na (sodium), Mg (magnesium) and Al (aluminum), During the process of distillation, rice husk charcoal briquettes that have been created as an absorbent in the distillation process sea water into clean water. Compounds in rice husk is a compound that can be used in the distillation process. This showed in Table-2 and Table-3, where compound Nitrogen (N), Oxygen (O), Feron (Fe), magnesium (Mg) and aluminum (Al) increased Wt% and At% on this distillation process. While Silica compound (Si), nitrogen (N) and Sodium (Na) has decreased. This is due to the elements related to the boiling point and melting point of the compound owned.

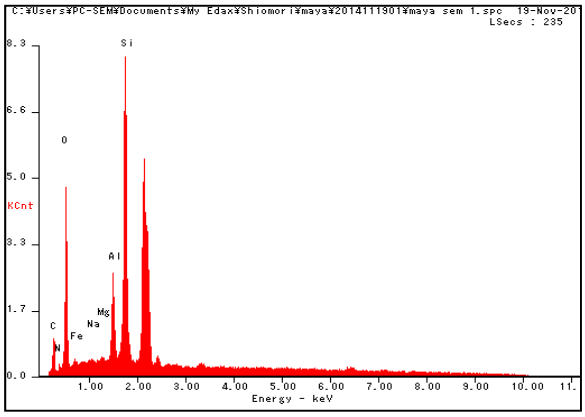

Figure-2. Results Graph Value Si ≤ 8.3 as adsorbent before undergoing a process of distillation.

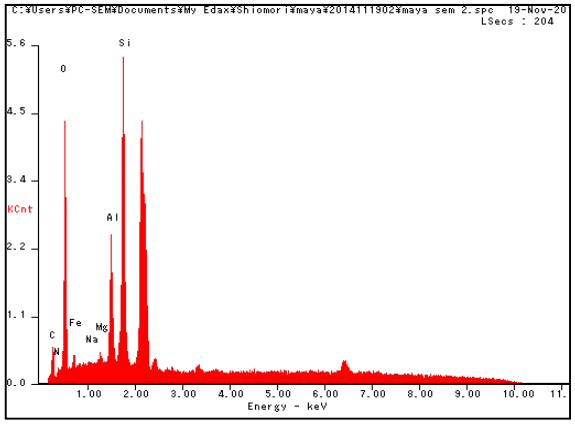

Figure-3. Results Graph Value Si ≤ 5.6 as adsorbent before undergoing a process of distillation.

Results obtained by using a SEM study showed also that the results of the graph show the value of the largest silica, and smaller Cl. The chemical composition of rice husk briquettes was shown in Figure-2 and Figure-3. Ions whose existence is abundant in sea water are sodium, chloride, magnesium, sulfate, and calcium. While the existing chart based on the results of the research we do, the ions before undergoing a process of absorbent has a value of 5%, while after processing absorbent made from rice husks undergone a process of decline of 4%. While the value of the element silica decreased from 8.3% to 5.6% after the absorber by rice husk.

Table-2. Chemical composition of the SEM results before undergoing a process of distillation.

Element	Wt %	At %
CK	13.58	22.72
NK	2.13	3.05
OK	27.16	34.13
FeL	3.41	1.23
NaK	0.43	0.37
MgK	0.40	0.33
AlK	10.66	7.94
SiK	42.23	30.23
Matrix	Correction	ZAF

Table-3. Chemical composition of the SEM results after undergoing a process of distillation.

Element	Wt %	At %
CK	10.18	17.47
NK	2.34	3.44
OK	30.41	39.18
FeL	6.83	2.52
NaK	0.19	0.17
MgK	0.74	0.63
AlK	13.82	10.56
SiK	35.49	26.04
Matrix	Correction	ZAF

As the SEM tool on the Table-2 shows the Wt% of Si = 42.23% and At % Si = 30.23% (before the distillation process) and Wt% of Si = 35.49%, and At% of Si = 26.04% (After the distillation process). It showed that rice husk rice husks undergone a process of decreased of Wt% = 6.74% and At % = 4.19% could be used as an absorber in seawater distillation process into clean water. And the SEM tool on the Table-2 shows the Wt% and At % a process of increased ie: Si (Silika), C (Carbon), and Na (Natrium).

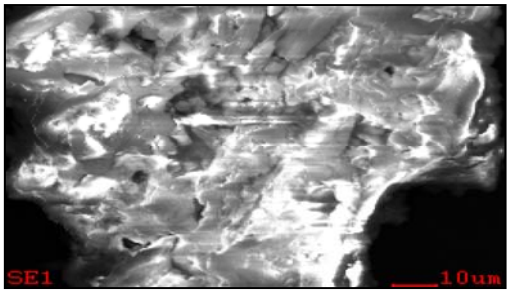

Figure-4. Rice husk briquettes as adsorbent before undergoing a process of distillation.

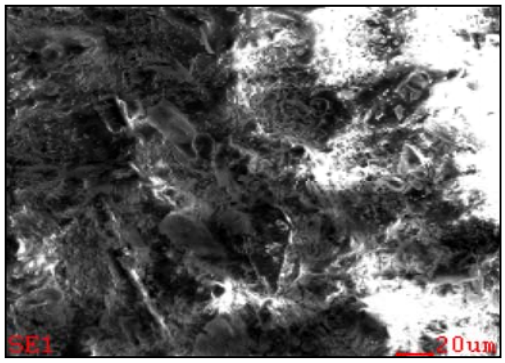

Figure-5. Rice husk briquettes as adsorbent after undergoing a process of distillation.

The results obtained in image analysis of SEM photos show the change of shape. In Figure-4 shows that the shape of rice husk before it is used as absorbent the distillation process looks solid and not hollow. In Figure-5 shows that the shape of rice husk is used as the absorbent after the distillation process sea water into clean water turns into a hollow.

5. CONCLUSIONS

a) The results of the above studies concluded that rice husk briquettes made it a waste that can be used not only as a substitute for kerosene fuel, fertilizer, cement, but also can be used as an absorber plate in the distillation process that makes sea water into clean water.

b) It is seen that the composition of rice husk before and after use in the process of distillation decreased significantly chemical composition. The compounds that are the rice husks from the results of SEM analysis (EDAX) was obtained as follows: Si (silica), C (carbon), N (nitrogen), O (Oxygen), Fe (Feron), Na (sodium), Mg (magnesium) and Al (aluminum).during the process of distillation, rice husk charcoal briquettes that have been created as an absorbent in the distillation process sea water into clean water.

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