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Vol.1 No.5; 2020 THE EFFECT OF USING STARCH GLUE AS ADHESIVE ON THE QUALITY OF HORSE FESES BIOMASS BRICKETS Rudy Sutanto1 and Sujita2 1,2 Department of Mechanical Engineering, Mataram University, Mataram, Indonesia. ABSTRACT Energy demand on an international scale continues to increase from time to time with the industrialization process around the world. The economic pattern that focuses on the agricultural sector becomes an economic pattern that is based on the industrial sector. So, what needs to be considered together is how to avoid giving energy in addition to looking for alternative energy sources to reduce dependence on petroleum. This requires the basis for creative efforts to use horse feses into biomass briquettes. Biomass briquettes are a renewable and environmentally friendly alternative energy source. The raw material in this study uses dried horse feses with a drying percentage of 26.4%. Then the horses beat each other. The ratio between horse feses (B) and starch glue (A) or the B / A ratio is 3, 5, 7, and 10. Next, the mixture is made with a pressure of 10 bar to obtain biomass briquettes with a weight of 10 grams each then dried under light sun for 3 days. The results showed that the average air content of the biomass samples was 12.357%, while the dry content was obtained 87.643%. The largest energy content is obtained at a ratio of 0.33 which is equal to 4688.991 kcal / kg. KEYWORDS: horse feses, biomass, starch glue, moisture content, energy content 1. INTRODUCTION Energy demand, both on a national and international scale, continues to increase from time to time in line with the increasing industrialization process around the world. The economic pattern, which initially focused on the agricultural sector, is now changing to an economic pattern that is based on an industrial pattern. The increasing progress of the industrial sector can be seen from the number of factories that continue to emerge both on a small scale (home industry) and on a large scale involving thousands of employees. With changes in economic patterns, it is necessary to think together how to save energy in addition to finding alternative energy to replace fuel oil. One of the efforts is to utilize horse feses for the manufacture of biomass briquettes. Biomass energy can be an alternative energy source to replace fossil fuels (petroleum) because of its several beneficial properties, namely that it can be used sustainably because it is renewable, relatively not containing sulfur so that it does not cause air pollution, and is able to increase utilization efficiency. forest and agricultural resources [1]. Biomass is a complex mixture of organic materials, consisting of Vol.1 No.5; 2020 carbohydrates, fats, proteins, and a few other minerals such as sodium, phosphorus, calcium and iron [2]. The main components of biomass are cellulose and lignin [3]. Biomass is organic material produced through photosynthesis, either in the form of products or waste. Examples of biomass include plants, trees, grass, sweet potatoes, agricultural waste, forest waste, feces, and livestock feses. Apart from being used for food, animal feed, vegetable oil, building materials and so on, biomass is also used as a source of energy (fuel). Biomass commonly used as fuel is that which has low economic value or is a waste after the primary product has been taken. The source of biomass energy has several advantages, including being a renewable energy source so that it can provide a sustainable source of energy. The use of biomass to produce heat is simple, that is, biomass is directly burned and produces heat. And the heat from combustion will be converted into electrical energy through turbines and generators. The

heat from burning biomass will produce steam in the boiler. The steam will be transferred into the turbine so that it will produce rotation and drive the generator. The rotation of the turbine is converted into electrical energy through magnets in the generator. In order to be used as fuel, technology is needed to convert biomass, including several technologies for biomass conversion, namely biomass briquettes. Briquettes are one of the methods used to convert biomass energy sources into other forms of biomass by compressing them so that the shape becomes more regular. The famous briquettes are coal briquettes, but not only coal can be made into briquettes. Other examples of biomass that are made into briquettes are husks, husk charcoal, sawdust, sawdust, and livestock waste. Making briquettes is not too difficult, the tools used are also not too complicated. There are many types of briquette presses ranging from manual, semi-mechanical, and machine-used. Horse feses contains a lot of carbohydrates, especially types of cellulose or fiber, in addition to protein and fat. These chemical compounds are very potential for carbon sources, which are the main constituents of bioarang briquettes. The way to get this carbon source is by burning organic material in anaerobic conditions or known as pyrolysis, this method is intended to increase the energy value and improve combustion properties [4]. Utilization of the potential of biomass as a source of electrical energy has begun to be developed in several countries in the world. As in China, with the available biomass potential, it is possible to generate electrical energy with a capacity of 30 GW [5]. Likewise, in the European Union, the demand for biomass raw materials exceeds the supply capacity that can be provided for electricity generation needs [6]. Vol.1 No.5; 2020 The heat analysis of a fuel is intended to obtain data about the heat energy that can be released by a fuel by the reaction / combustion process. The calorific value of fuel can be interpreted by carrying out tests on the adiabatic bomb calorimeter, various data from the calorific value test results can then be used to form empirical / semi-empirical equations [7]. 2. RESEARCH METHODS In this study, an experimental method was used, namely direct biomass briquette testing. The test material used is horse feses biomass mixed with starch glue which is formed into biomass briquettes. The ratio between horse feses (B) and starch glue (A) or the ratio B / A is 3, 5, 7, and 10. Then the mixture is pressed with a pressure of 10 bar to obtain biomass briquettes with a weight of 10 grams each then dried. under the sun for 3 days. Table 1: Tools and materials Name Specification Biomassa Horse feses Adhesive Starch glue briquette pressing device 10 bar Analytical scales 0,1 mg Adiabatic Bomb Calorimeter Model-IKA C2000 Figure 1: Adiabatic bomb calorimeter Vol.1 No.5; 2020 The stage of the research procedure was to make biomass briquettes by mixing starch with enough boiling water until the mixture turned like glue. Mixing dried horse feses with starch glue with a ratio of 10 grams of starch glue to 30 grams of horse feses, 6 grams of starch glue with 30 grams of horse feses, 4.3 grams of starch glue with 30 grams of horse feses and 3 grams of starch glue and 30 grams of horse feses. Furthermore, the mixture is formed or pressed with a pressure of 10 bar into biomass briquettes with a weight of 10 grams each then dried under the sun for 3 days. In this study, the variables studied were the moisture content of biomass briquettes, dry weight of biomass briquettes, and gross energy of biomass briquettes. Testing the quality of horse feses biomass briquettes includes moisture content, dry matter and gross energy. Testing of moisture and dry matter content used proximate analysis, while gross energy testing used the Model-IKA C2000 bomb calorimeter (Figure 1). 3. RESULTS AND DISCUSSION This research was conducted to determine the characteristics of briquettes. Several analyzes were carried out, namely proximate analysis and heating value. There was a decrease in the moisture content of the horse feses biomass when it was made into briquettes. Moisture content of raw horse dung biomass was 26.4%, when it became briquette, the average moisture content was 12.6%. The effect of using starch glue for making horse feses biomass briquettes is shown in Figure 2. The more starch glue content in horse feses biomass briquettes, the more water content contained in the briquettes. This is because the porosity of the biomass briquettes is getting smaller along with the increasing amount of starch glue contained in the biomass briquettes. The greater porosity will cause water vapor to easily escape or evaporate

from the biomass briquettes. The factors that affect the moisture content contained in the biomass briquettes are the amount of water vapor in the air, the drying process time, and the hygroscopic nature of the briquettes. For briquettes with a ratio of B / A = 3, the highest moisture content was obtained, namely 13.85%. The greater the water content in horse feses biomass briquettes, the lower or less dry content of biomass briquettes, this is as shown in Figure 3. Figure 2: Graph of the relationship between ratio B/A that water content Vol.1 No.5; 2020 Figure 3: Graph of the relationship between ratio B/A that dry content Figure 4 shows the quality of the horse dung biomass briquettes produced in this study has a calorific value that is still below the standard quality standard, namely the briquette quality standard based on SNI- 01-6235-2000 of 5000 cal / g. The greater the B / A ratio, the greater the amount of horse feses in the biomass briquettes. Horse dung biomass briquettes have higher gross energy along with the increasing amount of horse feses in the biomass briquettes, as shown in Figure 4. The gross energy of horse feses biomass briquettes has increased by 6.34% for each increase in the B / A ratio. The highest gross energy was obtained in biomass briquettes with a ratio of B / A = 10, namely 4708.76 kcal / kg. This occurs due to the very high volatile matter content in the biomass briquettes along with the greater the B / A ratio. It is possible that the volatile matter contained in the briquettes is flammable gases, causing a high gross energy. In addition, it is also influenced by the carbohydrate and fat content which function as energy sources in the biomass briquettes. Figure 4: Graph of the relationship between ratio B/A that gross energy 4. CONCLUSION Based on the research results, it can be concluded that the gross energy of horse feses biomass briquettes has increased by 6.34% for each increase in the B / A ratio. The highest gross energy was obtained in Vol.1 No.5; 2020 biomass briquettes with a ratio of B / A = 10 is 4708.76 kcal / kg. Meanwhile, the decrease in water content in biomass briquettes has an effect on the increase in the gross energy of briquettes. This implies that the less water content contained in the biomass briquettes, the greater the gross energy content. REFERENCES [1] Ndraha N, Uji Komposisi Bahan Pembuat Briket Bioarang Tempurung Kelapa Dan Serbuk Kayu Terhadap Mutu Yang Dihasilkan. Sumatera Utara, USU, 2009. [2] Silalahi, Penelitian Pembuatan Briket Kayu dari Serbuk Gergajian Kayu, Hasil Penelitian Industri DEPERINDAG, Bogor, 2000. [3] Arni L, Hosiana MD, Nismayanti A, "Studi Uji Karakteristik Fisis Briket Bioarang Sebagai Sumber Energi Alternatif,". Journal of Natural Science, 3(1), pp. 89-98, 2014. [4] Widarto L dan Sudarto FX, , Membuat Biogass, Kanisius Yogyakarta, 1997. [5] Xingang, Z., Zhongfu, T., & Pingkuo, L., "Development goal of 30 GW for China's biomass power generation: Will it be achieved," Journal of Renewable and Sustainable Energy Reviews, Vol. 25, pp. 10-317, 2013. [6] Bertrand, V., Dequiedt, B., & Cadre, E., L, " Biomass For Electricity In The EU-27: Potential Demand CO2 Abatements and Break Even Prices for Co-Firing," Journal of Energy Policy, Vol. 73, pp. 631- 644, 2014. [7] Tjokrowisastro, E. H, Ir dan M E. Widodo Kukuh, B. U, Ir, Teknik Pembakaran Dasar dan Bahan Bakar, ITS, Surabaya, 1990. International Journal of Applied Science and Engineering Review ISSN: 2582-6271 International Journal of Applied Science and Engineering Review ISSN: 2582-6271 International Journal of Applied Science and Engineering Review ISSN: 2582-6271 International Journal of Applied Science and Engineering Review ISSN: 2582-6271 International Journal of Applied Science and Engineering Review ISSN: 2582-6271 International Journal of Applied Science and Engineering Review ISSN: 2582-6271