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Design and Build Innovative Maximum Simple Manual Briquette Printer (*Brimax*)

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ABSTRACT
This study aims to find out how to work (manual briquette printer with maximum results) the results of designs that use manual power and to find out how the effect of the number of presses on changes in print volume. The research method used is an experimental method by conducting direct experiments in the field. This study used a Complete Randomized Design (RAL) with a variety of treatments consisting of P1 (3 times the number of presses), P2 (2 times the number of presses), and P3 (1 times the number of presses). Each treatment was repeated nine times, resulting in a total of 27 experimental units. The parameter observed is the effect of the number of presses on the change in the volume of the printout. The research data were analyzed using diversity analysis (Anova Table) at the level of 5%. The results showed that the treatment had a significant effect on the pressure count parameter on the change in print height. The best results were obtained in treatment 1 and 2, namely 3 and 2 times the number of presses with an average height of 1.8 cm, while the lowest results were obtained in treatment 3, which was 1 time the number of presses with an average height of 2.1 cm, because it was lower briquettes, the better the quality. The advantage of Brimax is that it is efficient in labor and cost and allows setting the quality of printouts.

Keywords: *Design, briquettes, brimax, manual briquette printer*

INTRODUCTION
Energy in today's life is needed for humans to meet their needs. The high use of energy causes fossil fuel energy reserves to decrease. Fossil fuel energy is non-renewable energy and has an important role in meeting daily needs (Taufik *et al*, 2018). Indonesia is one of the countries that is experiencing serious energy problems due to its heavy dependence on fossil energy, while the development of bioenergy derived from biomass still receives less attention. On the other hand, there are many kinds of alternative renewable energy available, abundant in quantity and available for a long time and environmentally friendly. These include wind energy, solar energy, water energy, and so on (Razi, 2021).

Biobriquette printing is a tool that can convert organic waste into one of the new and renewable alternative energy by proper and correct processing. Therefore we need tools that can be used as briquette production helpers. Energy needs in Indonesia still depend on non-renewable energy (Aisyarahmi *et al*, 2017). So efforts to find breakthrough fuels that can be renewed, economically valuable, and environmentally friendly, more and more are being done. Rice husks until now have not been fully utilized to be used as alternative fuel. In fact, rice husks are biomass with a relatively large calorific value and are very abundant in various regions in Indonesia (Jazuli and Wibowo, 2020).

The utilization of rice husks needs to be realized immediately to replace or minimize the use of fossil fuels. The use of rice husks as alternative energy requires technological development in the production process of rice husks into biomass fuel that can be utilized by humans. Biomass briquette production equipment greatly affects the quantity and quality of the briquette production, so there is a need for research on briquette printers with economic and productive value (Samuel *et al*, 2016).

The design of a manual briquette printer is one solution to increase the quantity and quality of making briquette production manually. Manual briquette printers are designed as much as possible using the professional auto deks inventer application 2022 to get precise tool design results and can produce briquettes that have good quality. The manufacture of this manuual briquette printer is done as

economically as possible so that it can be reached by a wide circle of people who want to use this tool as a tool that helps to transition from fossil fuels to biomass energy.

METHOD

This research was conducted at the South Las Workshop of Tambakberas, Tambakrejo Village, Jombang District, Jombang Regency, East Java Province, Indonesia. The tools used in this study are Brimax designed results, digital scales, rulers. The materials used in this study were rice husks, tapioca flour, sago flour, and water.

In this study using experimental methods, by making a design for briquette printers and testing the performance of tools on rice husk briquette printers using kinetic power manually in the welding workshop. There are several methods of data collection procedures in this study, including:

- Brimax Design

  This brimax design process uses the professional autodeks inventor 2022 application, to get precise or accurate results when making tools. In order to produce good print results and maximum flame coals when applying briquette molds. (Anugrah dan Wisnujati, 2021).

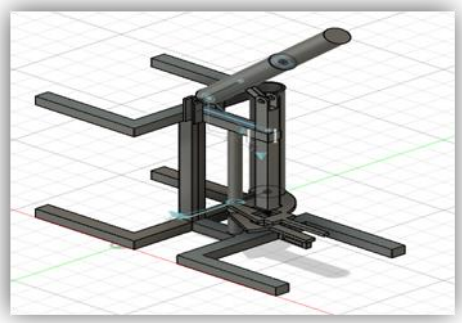

Figure 1. Brimax Design

- Test Brimax Design Results

  The test of the results of the brimax design is carried out after the tool work is complete. At this stage, the tool is given several different treatments when used to print briquettes, then it is known that the results of the mold produce different mold heights.

Data Analysis

This study used a complete randomized design (RAL). Which consists of 3 press treatments using designed tools:

P1 = 3 press times
P2 = 2 press times
P3 = 1 press

Each treatment was repeated 3 (three) times, resulting in 9 experimental units. The research data were analyzed using diversity analysis (Anova) at a real level of 5% and if there was a treatment that had a real effect, further tests were carried out using the Honest Real Difference Test (BNJ) at a real level of 5%.

RESULT AND DISCUSSION

Result

The brimax circuit is made based on the principle of kinetic energy or motion power from humans (manual) based on the power of each tool operator. In line with Suryajaya's research (2020), the pressure during the briquette printing process affects the strength and density of the briquette mold, so that the briquettes produced have qualities that are not easily broken and destroyed. Each printing time will produce one briquette and produce various sizes of briquette height based on each treatment given during the printing process.

Figure 2. Brimax Design Results

Discussion

This study applied a complete randomized design (RAL) trial design, which consisted of 3 treatments using tools from the design results.

P1 = Treatment 3 times pressure.
P2 = Treatment 2 times pressure.
P3 = Treatment 1 time pressure.

This study focuses on three treatments during the printing process and two variables, namely control and free. The independent variable in this study is the time lag when operating the tool, while the control variable is the high value of briquette prints. Here the researcher wants to find out whether there are differences in briquette prints in each treatment. The T-test or T-Test is one of the test methods of parametric statistical tests. According to Magdalena and Maria (2019), the statistical test t is a test that shows how far the influence of one independent variable individually in explaining the dependent variable. Statistical testing of t or t-test is carried out using a significance level of 0.05 (α=5%). Acceptance or rejection of this hypothesis test is carried out with the following criteria:

- If the Sig (2-tailed) value < 0.05 then there is a significant difference between treatment 1 and 2 on the independent variable
- If the Sig (2-tailed) value > 0.05 then there is no significant difference between treatment 1 and 2 on the independent variable.

The results of the Independent Sample T-test are as follows:

Table 1. Test Results Independent Sample T-Test

Group Statistics					
	Free Variable	N	Mean	Std. Deviation	Std. Error Mean
Pressure Results	Treatment 1	9	24.5556	.72648	.24216
	Treatment 2	9	24.5556	8.12575	2.70858

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Pressure Results	Equal variances assumed	3.930	.065	.000	16	1.000
	Equal variances not assumed			.000	8.128	1.000

Source : Primary data (processed 2023)

From the results of this SPSS test it can be seen that the average core weight of tablets with tablet weight is actually not significantly different because the result of Sig. (2-tailed) is greater than α (1,000 > 0.05).

After the independent sample T-Test has been carried out and the results are known, the brimax performance test is carried out using three predetermined treatments. So obtained varying values from three treatments.

Below is a table of results from each treatment:

Tabel 1. High Value Yield Briquette

Briquette printout on a simple printer											
Treatment	**Deuteronomy**										
	I	II	III	IV	V	VI	VII	VIII	IX	**Total**	**Average**
p1	2	1,8	1,8	1,7	1,9	2	1,8	2	1,8	16,8	1,866667
p2	2	2	1,8	1,9	1,8	1,8	2	1,7	1,8	16,8	1,866667
p3	2	2	2,1	2,1	2,2	2,1	2,2	2,3	2,2	19,2	2,133333
Grand Total										**52,8**	1,955556

Source : Primary Data (processed 2023)

The values in table 1 show that each variation of treatment repeated 9 times found different values in each treatment. P1 got an average result of 1.8cm from 9 repetitions, while P2 got a result of 1.8cm also from 9 repetitions, and P3 got 2.1cm from 9 repetitions.

Tabel 2. Table Anova

Table Anova							
	DB	**JK**	**KT**	**Fhit**	**Ftab**		**Information**
					5%	**1%**	
Treatment	2	12,98217	6,491084	**8,345679012**	3,402826	5,613591	**
Error	24	18,66667	0,777778				
Total	26	31,64883					

After knowing the value of each treatment, it was found that anova in table 2 showed that the treatment had a very real effect on the high value of briquette prints with three treatment models. So it is necessary to carry out further tests to find out whether each treatment has a real effect or not on the parameters, namely the effect of the amount of pressure on the high value of the briquette mold. The table below is the result of further tests:

Table 3. BNJ Advanced Test Table

Treatment	**Average**	**BNJ+ Average**	**Notation**
p1	1,866666667	0,105132016	**a**
p2	1,866666667	1,971798682	**ab**
p3	2,133333333	2,238465349	**c**

Primary data processed 2023

The letters in the advanced test table indicate that the treatment applied to each print has a significant effect on the results of the resulting print height. The best results can be obtained by applying treatments 1 and 2. From such treatment can produce briquette molds with good high value. While treatment 3 produced the lowest value with an average height yield of 2.1cm.

In line with the results of research conducted by (Kukuh Pambudi and Nuriana, 2018) shows that the greater the printing pressure, the greater the density. The highest density value is 0.47 g/cm³ at a pressure of 150 kg/cm2. The lowest density value is 0.39 g/cm3 at a pressure of 45 kg/cm2. The above discussion can be concluded that density is affected by printing pressure. The greater the printing pressure, the higher the resulting density. The greater the pressure causes the particles to be pushed to fill the empty cavity, resulting in reduced porosity of the briquettes.

CONCLUSION

Brimax designed is designed simply without requiring a lot of costs and is also very efficient to make it easier for business people or ordinary people to increase briquette production.

Brimax performance based on the design starts with filling the briquette material tube, then directing the briquette mold to the material tube and directing it back to the pressing place for the pressing process. After the pressing process is complete, the base of the press is directed to the side to remove the briquette print. Brimax performance runs well and can produce good briquette molds when brimax performance test.

Based on the results of the independent sample t t-test, Sig (2-tailed) values of 1,000 > 0.05 were obtained, which there was no significant difference in the two independent variable treatments. Based on the results of BNJ analysis, pressure results are partially affected by each treatment of parameters, with changes in briquette height. The more the number of presses given, the shorter the height of the printout. The best treatment was obtained at P1 and P2, with 3 and 2 presses correlated with the average amount of print height of 1.8 cm. P3 is the treatment with the lowest quality results.

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