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CHARACTERISTICS OF BRICKS WITH RICE HUSK ASH FROM BRICK PRODUCTION WASTE

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ABSTRACT

Concrete brick is one of the most widely used materials for walls. In fact, in the field, many bricks are damaged quickly, for example, broken or damp. This research aims to discover the process of making concrete brick using husk rice ash as additives and the difference in quality between ordinary brick and brick made from added rice husk ash. Adding rice husk ash is to utilize the husk waste, which is available in huge quantities. This research was conducted in a laboratory, using the analysis technique of compressive strength of the specimen and water absorption according to SNI 03-0349-1989. The results showed that adding rice husk ash percentage increased the absorption capacity of the bricks. Furthermore, the compressive strength of the bricks decreased with the addition of the percentage of rice husk ash. However, the compressive strength and absorption of the bricks with rice husk ash still meet the requirements SNI 03-0349-1989.

INTRODUCTION

Concrete brick is a building material from a mixture of cement, aggregate, and water. Because its physique has a hole in the middle, this can make the bricks easily break or crack when installed. The size of the bricks is more significant than the red bricks, so the use of bricks for walls can be more efficient than red bricks because the number of bricks used is less for the size per m^2 of a wall. However, it is not cover the deficiencies that exist in the brick.

Waste is one of the biggest problems in Indonesia, starting from light waste such as plastic waste to industrial waste and discarded agriculture. These wastes, if left unchecked, will risk causing environmental damage. For example, in rice mill waste, many rice husks are thrown away and not used optimally, even though this rice husk is good for manure or compost.

Using fly ash to manufacture brick specimens can effectively dispose of this much waste (Abbas et al., 2017). The usage of this waste can keep herbal assets like fertile soil and improve the homes of burnt clay bricks. Lighter bricks may be produced with the aid of incorporating fly ash in clay bricks. 18% discount in weight can be done after 25% substitute of clay with fly ash. It is far believed that iron ore tailings are fed on in huge portions, which solves their disposal-associated problems and saves natural substances for this creation and building substances. From the monetary factor of view, it also offers economic benefits with the aid of generating low-price production and building substances and reducing the disposal price of iron ore tailings (N Zhang, B Tang 2021). The experiment was conducted to determine the utilization of FGD gypsum, construction and demolition waste (CDW), and oil palm trunks (OPT) for concrete brick production (Phutthimethakul et al., 2020). An experimental investigation on crumb rubber-based concrete bricks and polypropylene and steel fibers was done by (A Thakur, K Senthil 2022). Up to 10% of crumb rubber, the initial rate of water absorption was found to increase thereafter, it is found to be decreased with the increase of crumb rubber (Thakur et al. 2020). It is observed that the slump and water absorption increased linearly with an increase in the percentage of crumb rubber.

Environmentally friendly materials are often used in research to reduce agricultural waste. Rice husk ash (RHA) is one of the ingredients that is often used as an environmentally friendly material. Therefore, the author tries to utilize RHA waste as an added ingredient in making bricks, which will then be tested for the quality of the bricks after the addition of RHA as a manufacturing material for concrete brick.

Based on previous research, many have used waste materials in the brick mixture. In this study, RHA will be used as an added ingredient in the brick mixture. The results of the characteristics of the bricks used are compared with the applicable requirements. Furthermore, the results will be compared with the requirements in the code SNI 03-0349-1989.

METHOD

This research is experimental in a laboratory. The specimen is concrete bricks with the addition of an RHA percentage of 0.5%, 1%, and 1.5% of the cement weight. For each variation in the percentage of RHA, 20 specimens were made. In addition, 20 control specimens were also made. The composition of the materials can be seen in Table 1.

Table 1. The Composition of Material Concrete Bricks

Specimen	Fine Aggregate (kg)	Cement (kg)	RHA (gr)	Water (kg)
RHA0%	50	10	0	5
RHA0,5%	50	10	500	5
RHA1%	50	10	1000	5
RHA1,5%	50	10	1500	5

The RHA comes from the combustion of red bricks burning using rice husks. The waste product from the combustion produces waste, namely RHA, which will be used in concrete brick.

The data taken are water absorption and compressive strength, carried out by absorption and compressive strength tests. The specimen is completely immersed in clean water at room temperature for 24 hours. Then the specimen is removed from the bath, and the remaining water is left to drain for approximately 1 (one) minute. Then, the surface of the specimen is wiped with a moist cloth so that excess water is still attached to the surface of the specimen absorbed by the damp cloth. The specimen is then weighed (A). Then, the specimen is dried in a tumble dryer at a temperature of 105 ± 5 °C, until the weight is at 2 (two) weighing times and does not differ by more than 0.2% from the previous weighing (B). The difference between weighing in the wet (A) and dry state (B) is the sum of water absorption and must be calculated based on the percent by weight of the dry specimen.

$$Absorption = \frac{A - B}{B} x100\%$$

The compression test is carried out with a press machine pressing speed can be adjusted. The speed of suppression from the start of giving the body until the specimen disintegrates set so that it is not less than 1 minute and not more than 2 minutes. The compressive strength of the specimen (fc') is calculated by dividing the maximum load (P) at the time of the crushing specimen, with gross compression area (A), expressed in kg/cm^2.

$$fc' = \frac{P}{A}$$

RESULT AND DISCUSSION

The comparison of water absorption with several percentages of RHA can be seen in Figure 1. The water absorption of a specimen using 0.5% RHA was 1.081 times higher than the control specimen. Meanwhile, the water absorption of a specimen using 1% RHA was 1.211 times higher than the control specimen. Furthermore, the water absorption of a specimen using 1.5% RHA was 1.269 times higher than the control specimen. The results of this study indicate that the higher the percentage of RHA, the higher the water absorption capacity. Using 0.5% RHA in the mixture caused the water absorption to increase by 8.21%.

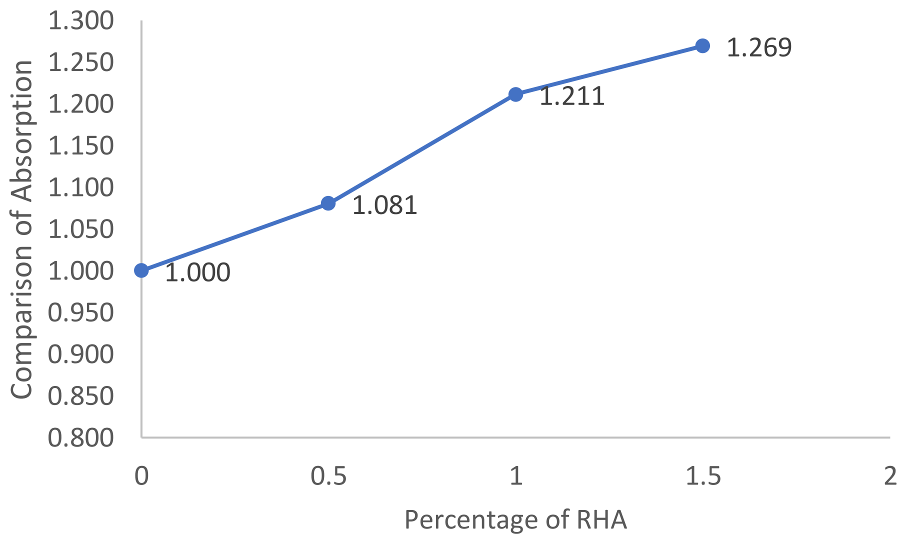

Figure 1. Comparison 0f Water Absorption

The results of this study indicate that the higher the percentage of RHA, the higher the water absorption capacity. Using 0.5%, RHA in the mixture caused the water absorption to increase by 8.21%. Using 1% RHA and 1,5% RHA caused the water absorption to increase by 12.11% and 12,89%, respectively.

Mixing with RHA in this study was carried out with the same amount of water. At the same time, it is known that RHA with finer particles has the opportunity to use more water. Insufficient water causes the hydration process not to take place ideally. SNI 03-0349-1989 requirements regarding water absorption are not more than 25% for grade I and not more than 35% for grade II. According to this code, bricks are included in grade I when viewed from the absorption capacity requirements.

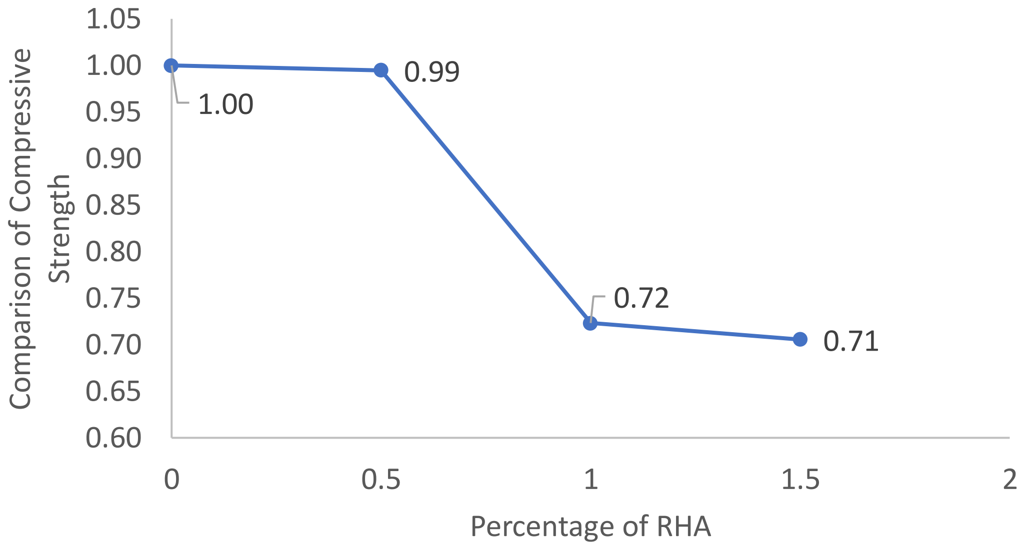

Figure 2. Comparison 0f Compressive Strength

Figure 2 describes the comparison of compressive strength with several percentages of RHA. This figure showed different trends from the absorption test results. The increase in the percentage of RHA causes a decrease in the compressive strength of the bricks. The addition of 0.5% RHA led to an insignificant decrease. The compressive strength only decreased to 0.99 times the compressive strength of the control specimen. Meanwhile, the compressive strength of the specimen using 1% RHA was 0,72 times lower than the control specimen. Furthermore, the compressive strength of the specimen using 1.5% RHA was 0,71 times lower than the control specimen.

This study showed that the compressive strength with the addition of 0.5% RHA was almost the same as the control bricks. Its compressive strength only decreased 1 percent. While the compressive strength of the addition of 1% RHA is almost the same as 1.5% RHA. Its compressive strength decreased by 28% and 29% percent, respectively.

The imperfect hydration process due to a lack of water affects the strength achieved. The resulting hydration matrix should be strong because of the opportunity for continued hydration pioneered by RHA. However, this cannot happen due to a lack of water availability. SNI 03-0349-1989 requirements regarding compressive strength are not less than 100 kg/cm2 and 70 kg/cm2 for grades I and II, respectively. According to this code, bricks are included in grades III and IV.

CONCLUSION

The addition of rice husk ash in the brick mix causes an increase in water absorption. Meanwhile, the compressive strength of the bricks decreases. The addition of rice husk ash up to 1.5% caused the water absorption to increase by 12.69%. At the same time, the compressive strength decreased by 29%. It is necessary to research to obtain an adequate amount of water on bricks using rice husk ash. Based on SNI 03-0349-1989, bricks with rice husk ash percentage of 1.5% are only classified as grade IV.

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