

## Research Article

# Eco Friendly Recycle Bricks

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**Abstract:** Eco Friendly Recycle Bricks is an innovation bricks product used recycle materials to reduce manufacturing cost and mainly to reduce the waste also to avoid air pollution. This product can be used for panel partition construction and internal party wall. This product is light, easy to cut, high compression value and eco friendly. The recycle materials used in this product is rice husk to replace the used of sand in the manufacturing process. Usually rice husk is just thrown away or burnt, this is the main problem statement in this project. The waste can be used as added material to produce bricks hence can reduce the used of cement in it. The benefit of this product are it can reduce pollution, reduces cost, produced lightweight and easy to cut bricks, high compression value and eco friendly. The instruments used in this research is questionnaire and the populations are focusing on construction industry. The respondents are contractors and education which offer construction course. The selection of the respondent is to minimize the scope and they are the main focus to promote this product. There are total 65 respondents who are 25 respondent from education and 40 respondents from construction industry.

**Keywords:** Recycle; Rice husk; Bricks.



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## 1. INTRODUCTION

Eco Friendly Recycle Bricks is an innovation bricks product used recycle materials to reduce manufacturing cost and mainly to reduce the waste also to avoid air pollution. This product can be used for panel partition construction and internal party wall. This product is light, easy to cut, high compression value and eco-friendly. The recycle materials used in this product is rice husk to replace the used of sand in the manufacturing process. Usually rice husk is just thrown away or burned, this is the main problem statement in this project. The waste can be used as added material to produce bricks hence can reduce the use of cement in it. There are two (2) objectives in this project which are to produce bricks using recycle material which is rice husk and to produce a lightweight brick and easy to cut. The benefit of this product are it can reduce pollution, reduces cost, produced lightweight and easy to cut bricks, high compression value and eco-friendly.

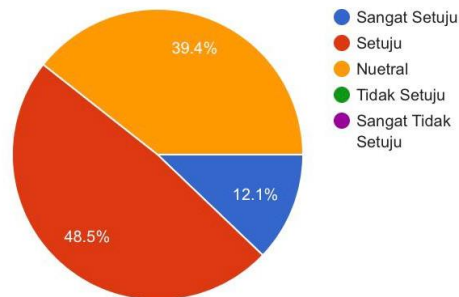
## 2. METHOD & MATERIAL

The instruments used in this research is questionnaire and the populations are focusing on construction industry. The respondents are contractors and education which offer construction course. The selection of the respondent is to minimize the scope and they are the main focus to promote this product. There is total 65 respondents who are 25 respondents from education and 40 respondents from construction industry. The questionnaire is divided into two (2) part. Part 1 is on the existing product and Part 2 is questionnaire after the product design. The results of the questionnaire are as below:

## 2.1 Analysis result on the existing product

Adakah bata sedia ada ini berat?

33 responses

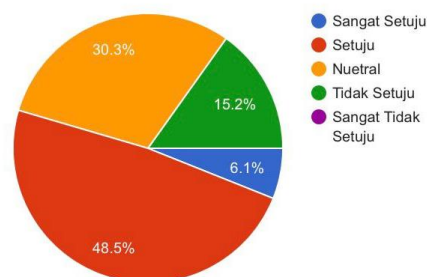


**Figure 1.** Questionnaire 1

Figure above show the result analysis on question 1 Is the existing brick heavy? 12.1% of the respondent totally agree, 48.5% agree, 39.4% neutral, 12.1% disagree and 0% totally disagree. The result shows that respondent agreed the existing brick is heavy.

adakah bata simen sedia ini mudah patah?

33 responses

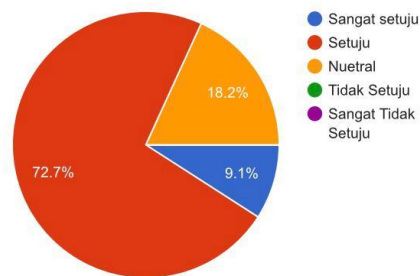


**Figure 2.** Questionnaire 2

Question 2 asked Is cement brick easy to break? 6.1% of the respondent totally agree, 48.5% agree, 30.3% neutral, 15.2% disagree and 0% totally disagree. The result analysis shows that more than 50% agree that cement brick is easy to break.

Adakah bata simen ini mampu menahan beban?

33 responses



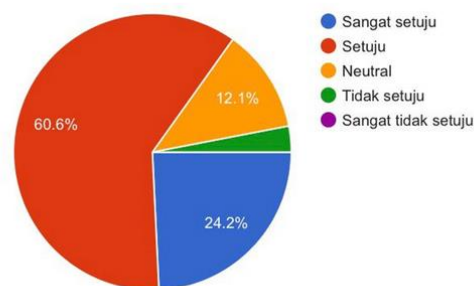
**Figure 3.** Questionnaire 3

Figure above shows the result analysis for question 3 Is cement brick able to withstand the load? 9.1% totally agree, 72.7% agree, 18.2% neutral, 0% disagree and 0% totally disagree. It shows that majority of the respondent agree that cement brick is able to withstand the load but a test has been carried out to know the compressive strength of eco-friendly recycle brick.

## 2.2 Analysis result after the product design

Adakah bata bahan kitar semula boleh mengurangkan kos?

33 responses

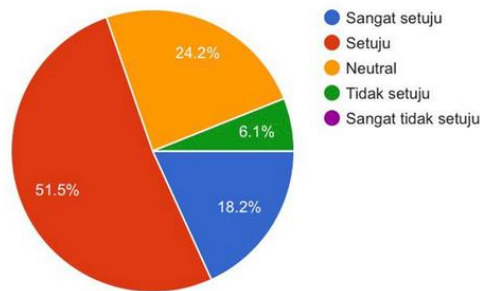


**Figure 4.** Questionnaire 1

Figure above shows the analysis result for question 1 which asked whether eco friendly recycle bricks can reduce the cost of brick manufacturing. 24.2% of respondent totally agree, 60.6% agree, 12.1% neutral, 3.1% disagree and 0% totally disagree. The result shows that the respondent agreed that eco friendly recycle brick reduce the cost of brick manufacturing.

Adakah bahan kitar semula lebih ringan daripada simen?

33 responses

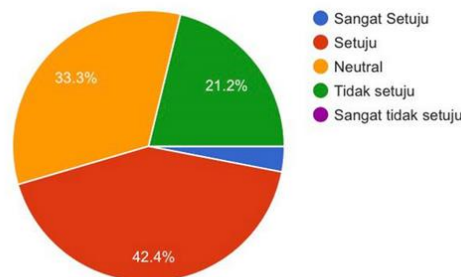


**Figure 5. Questionnaire 2**

Question 2 asked Is this eco-friendly recycle brick is lighter than cement brick? 18.2% of the respondent totally agree, 51.5% agree, 24.2% neutral, 6.1% disagree and 0% totally disagree. Results show that majority of the respondents agreed that eco-friendly recycle brick is lighter than cement brick.

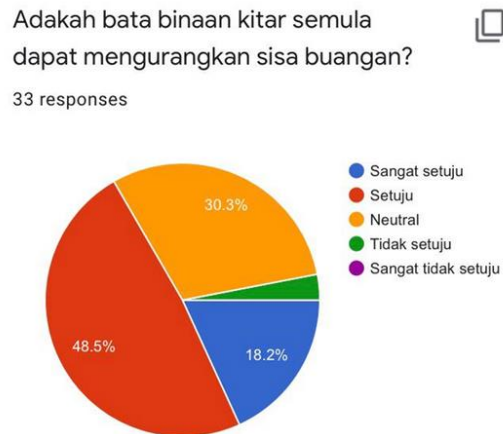
Adakah bata bahan kitar semula tahan lasak?

33 responses



**Figure 6. Questionnaire 3**

Figure 6 shows the result analysis for question 3 which as Is this eco-friendly recycle bricks is durable? 3.1% is totally agree, 42.4% agree, 33.3% agree and 21.2% disagree and 0% totally disagree. The number of respondents disagree is higher than agree hence a test has been conducted on the durability of the recycle brick.



**Figure 7.** Questionnaire 4

Questionnaire 4 asked Is eco-friendly recycle brick can reduce the wastage? 18.2% of respondent totally agree, 48.5% agree, 30.3% neutral and 3% totally disagree. Results shows that most of the respondent agreed that by produce eco-friendly recycle brick it can reduce the wastage hence can reduce the pollution.

### 3. FINDINGS

Through research by Oyetola & Abdulahi (2006) they produced bricks by replacing cement with 20% of burn rice husk and produced bricks with compression value 35.4N/mm<sup>2</sup>. Second research by Chindaprasit (2007) which replace also 20% of burnt rice husk form cement and using silika sand produced bricks with compression value 54N/ mm<sup>2</sup>. The standard compression value from British Standard 3291 is 2.5 N/ mm<sup>2</sup>, Australia AS 1225 4 N/ mm<sup>2</sup> and Jabatan Kerja Raya Malaysia 5.2 N/ mm<sup>2</sup>. The novelty of this project is rice husk is used to replace the usage of sand in the manufacturing process. It can reduce the wastage and also reduce carbon footprint through burned rice husk. The ratio used to produce this product is two (2) ratio of cement and four (4) ratio of unburned rice husk. This is an innovation of brick production which used recycle materials.

### 4. DISCUSSION

Five (5) different types of testing have been carried out to check the efficiency and effectiveness of this product. The results of test ad analysis are as below:

#### *Test and analysis 1 : Weight Analysis*

Table 1 show weight analysis shows that Eco Friendly Recycle Bricks is lighter than other bricks which is 2.05kg only.

**Table 1.** Weight analysis

| No. | Brick type                 | Weight (kg) |
|-----|----------------------------|-------------|
| 1.  | Clay brick                 | 2.75        |
| 2.  | Cement brick               | 2.70        |
| 3.  | Eco Friendly Recycle brick | 2.05        |

*Test and analysis 2 : Bricks cutting analysis*

The bricks were cut using saw and the result shows that time taken to cut clay brick and cement brick are equal which is 180 second meanwhile time used to cut Eco Friendly Recycle Brick is 40 second only.

**Table 2.** Brick cutting analysis

| No. | Brick type                 | Time (second) |
|-----|----------------------------|---------------|
| 1.  | Clay brick                 | 180           |
| 2.  | Cement brick               | 180           |
| 3.  | Eco Friendly Recycle brick | 40            |

*Test and analysis 3 : Crushing Strength Test*

During this test bricks are dropped from a height of four (4) feet three (3) time each. The pictures above shows the last result for this testing. Result shows that clay brick is fragile meanwhile cement brick and Eco Friendly Recycle brick are not broken.

**Table 3.** Crushing Strength Test Analysis

| No. | Brick type                 | Picture                                                                              |
|-----|----------------------------|--------------------------------------------------------------------------------------|
| 1.  | Clay brick                 |   |
| 2.  | Cement brick               |  |
| 3.  | Eco Friendly Recycle brick |  |

*Result and analysis 4 : Compression Strength Test*

The results show that bricks from research 1 & 2 are strengthen than Eco Friendly Recycle brick but the materials used from the research is burned rice hush which can harm the environment. Eco Friendly Recycle brick strength is above the British Standard which is 2.5N/mm<sup>2</sup>.

**Table 4.** Compression Strength Test Analysis

| No. | Brick type                              | Strength (N/mm <sup>2</sup> ) |
|-----|-----------------------------------------|-------------------------------|
| 1.  | 1st research (Oyetela & Abdulahi, 2006) | 36.40                         |
| 2.  | 2nd Research (Chindaprasit, 2007)       | 54.00                         |
| 3.  | Eco Friendly Recycle brick              | 23.02                         |

*Result and analysis 5 : Fire Resistance Test*

Table 5 shows the picture of Eco Friendly Recycle Bricks after 1 and 2 hours burnt. Results shows that this brick can resist fire for 2 hours.

**Table 5.** Fire Resistance Test Analysis

| No. | Duration | Picture                                                                            |
|-----|----------|------------------------------------------------------------------------------------|
| 1.  | 1 hour   |  |
| 2.  | 2 hours  |  |

## 5. CONCLUSION

Based on the result and analysis above it shows that Eco Friendly Recycle Bricks is better than clay brick and cement brick because it is lighter, easy to cut, high value of compression test and can resist fire up to 2 hours. The properties of rice husk are renewable, resist moisture penetration, insulates well, resist fungal decomposition and high of silica content. Our target market are contractors, skills institution and construction civilian workers. We can save our environment and reduce carbon footprint through burned rice husk. The capital cost for the production of a brick is RM0.81 meanwhile the selling price is RM1.30 only.

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