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UTILIZATION OF RICE HUSK IN PRODUCTION OF RED CLAY BRICKS

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Abstract: This study focus on reuse and recycle the available waste generated to find a socio-economic, eco-friendly and cleaner environment and also to study the feasibility of producing bricks using agricultural waste material rice husk in varying percentages. Properties such as compressive strength, water Absorption,hardness, soundness is determined.

Index Terms - **compressive strength, hardness, rice husk ash, soundness, water Absorption.**

I. INTRODUCTION

Brick is a major component for building work. Reuse of waste generated from industrial & agricultural activities as building materials appear to be visible solution to problem of pollution and waste disposal. In india estimated that nearly 30% of the daily production turns on waste during the manufacturing, transportation and uage. From decades burnt clay bricks have been used in the building construction and it helps reduce the energy consumption of buildings due to its thermal insulation property. As a result of this, there is still an existing demand for clay bricks and good quantity of soil is being exploited for its production. The rice milling industry generates rice husk ash which is also considered as a water product. This study focus on the investigation of properties of clay bricks produced by the partial replacement of the clay with Rice Hush (RH).

II. LITERATURE SURVEY

2.1 Manufacturing of bricks using rice husk ash

Sudarshan S. Shankare et.al (2019) have published a paper "Manufacturing of Bricks Using Rice Husk Ash". In there research rice husk ash was varied by 4, 8, 12, 16 and 20 percentage by weight and Engineering properties like compressive strength, water absorption, soundness, shape and size have been studied according to Indian Standard Specifications and compared to all other proportions. The test outcomes discussed that increasing rice husk in product decline the compressive strength because the combusted rice husk replace with the space in the product which effect the density and compressive strength.

2.2 Use of Rice Husk Ash as Substitute to Make Clay Bricks

Rafid Shams Huq et.al (2018) studied the usage of rice husk ash as supplementary material in production of bricks. The focus of there paper is not identifying the best production process but to explore the effectiveness of one of the possible uses of RHA in the construction industry. Bricks of different percentage of RHA (15%, 25%, 35%) were made and tested for Water Absorption, Crushing Strength, Los Angles Abrasion Value & Aggregate Impact Value. It was observed that although porosity increases due RHA, it is still acceptable to use RHA in brick.

2.3 Recycling of bagasse ash and rice husk ash in the production of bricks

Mrs.K.Saranya et.al (2016) examined the usage of sugarcane bagasse ash and rice husk in manufacturing of bricks. In this study SCBA & RHA are mixed in particular proportion (2.5%,5%,10%,15%,20%) is provided as the replacement of clay in the production of bricks. The experimental results showed that the use of SCBA-RHA-CLAY combination bricks is lighter in weight, durable, non hazardous energy efficient, additional strength gains due to pozzolanic properties and reduction in permeability because of pore refinement.

2.4 Effect of Rice Husk and Rice Husk Ash to Properties of Bricks

J. Sutas et.al (2011) There research has aims to study effect between rice husk and rice husk ash on properties of bricks. Comparative adding between rice husk and rice husk ash were varied by 0 -10% by weight. The results showed that more adding rice husk less compressive strength and density of specimens.

III MATERIALS USED

In this chapter different materials and methods has been use for preparation of bricks.

1. Red Clay
2. Rice Husk
3. Water

IV METHODOLOGY

i.To study the properties of materials used by referring the relevant IS codes and Manuals
ii.Comparing and arriving at the proper proportions using the raw materials
iii.Manufacturing of bricks by series of trials using various proportions
iv.Conducting tests on manufactured bricks as per relevant IS codes.

4.1Material Characterization

Red Clay was tested according to IS 2386-Part III (1963).

4.2 Development of Bricks

A mould of standard brick dimension was used to prepare the bricks. The set of blocks were manufactured using red clay with rice husk ash with proportion varying from10%-30%.

Table 4.1: Proportions of Bricks

Trial No.	Name of the brick for identification	Percentage of materials (%)	
		Red Clay	Rice Husk
1	RCB	100	Nil
2	90RCB+10RH	90	10
3	80RCB+20RH	80	20
4	70RCB+30RH	70	30

4.3 Manufacturing of Bricks

4.3.1 Procurement of Raw Materials

All raw materials say rice husk ash, soil will be collected from the respective sources and will be batched according to the given proportion.

4. 3.2 Preparation of Clay

Top soil upto 20mm should be removed, the soil below 20mm should be used for making bricks.Stones are removed and screened from the soil and clay is obtained. Further the clay is kneaded with hands or feet after adding water. This is also called as pugging. It can also be done mechanical means.

4.3.3 Addition of waste Material

First rice husk is collected from the rice milling industry and then the rice husk is dried. Then this is grinded to obtain a uniform fine powder and added to the red clay as per the given proportions (10%, 20% and 30%).

4.3.4 Mixing

The rice husk and clay is mixed thoroughly until a uniform colour homogeneous mixture is obtained. The mixing can be done by hand or by a blender.

4.3.5 Moulding:

A mould of standard size 190mm x 90mm x 90mm is prepared. The clay is pressed into the mould with hands and excess is removed from the top of mould with strike.

4.3.6 Drying

The moulded brick is left to dry for two days to facilitate uniform drying and prevent warping. After drying of bricks they are sufficiently hard to allow them to stack. This stack is then covered under roof or with straw to protect them from rain or harsh sun. After two weeks the bricks are ready to be tested.

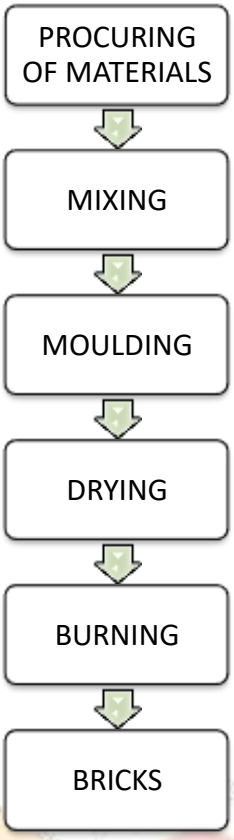


Fig 1: Flowchart of Manufacturing of Bricks

4.4 Testing of Bricks

To know the quality of bricks following 8 tests can be performed. In these tests some are performed in laboratory and the rest are on field.

4.4.1. Size and Shape Test:

In this test bricks are closely inspected for its shape. The bricks of good quality should be uniform in shape and should have truly rectangular shape with sharp edges.

4.4.2. Colour Test:

A good quality brick should have bright and uniform color throughout.

4.4.3.Soundness Test

Two bricks are taken, one in each hand, and they are struck with each other lightly. A brick of good quality should not break and a clear ringing sound be produced.

4.4.4. Structure Test

A brick is Broken and its structure is examined. It should be homogeneous, compact and free from any defects such as holes, lumps etc.

4.4.5. Hardness Test

In this test, a scratch is made on brick surface with the help of finger nail. If no impression is left on the surface, brick is treated as to be sufficiently hard.

4.4.6.Flame Test

Brick which is used for construction should not flammable in open flame, so this was carried out for the brick. The following are the steps involve in this test,

First, the brick was wiped with cloths and all the¬ foreign matters were removed

Then the flammable sticks were fired.

After that, the¬ bricks held on the flame for five minutes.

After five minutes fixing was stopped and the brick¬ were observed.

4.4.7.Compressive Strength Test

This test is done to know the compressive strength of brick. It is also called crushing strength of brick. Generally 5 specimens of bricks are taken to laboratory for testing and tested one by one. In this test a brick specimen is put on crushing machine and applied pressure till it breaks. The ultimate pressure at which brick is crushed is taken into account. All five brick specimens are tested one by one and average result is taken as brick's compressive/crushing strength

$$\text{Compressive strength} = \frac{Maximum\ load\ at\ failure}{Average\ \ area\ of\ bed\ face}$$

4.4.8.Water Absorption Test:

In this test bricks are weighed in dry condition and let them immersed in fresh water for 24 hours. After 24 hours of immersion those are taken out from water and wipe out with cloth. Then brick is weighed in wet condition. The difference between weights is the water

absorbed by brick. The percentage of water absorption is then calculated. The less water absorbed by brick the greater its quality. Good quality brick doesn't absorb more than 20% water of its own weight.

V.RESULTS AND DISCUSSION

5.1 Results of Shape & Size Test

Table 5.1 Shape & Size Test

Rice Husk Ash Proportions	Length	Width	Height
0%	189.00	93.70	77.80
10%	188.00	94.00	78.00
20%	188.90	92.80	78.90
30%	188.70	94.00	77.50

5.2 Colour Test

Upto 20% proportion for rice husk ash, bricks posses good red uniform colour. but after 20% proportion, bricks have dull colour.

5.3 soundness test

Up to 20% proportion, when two bricks are struck with one another they give metallic sound. but after 20% proportion bricks gives dull sound.

5.4 Structure Test

Sample of 3 bricks are taken and all the bricks when brokens shows homogenous structure with no voids.

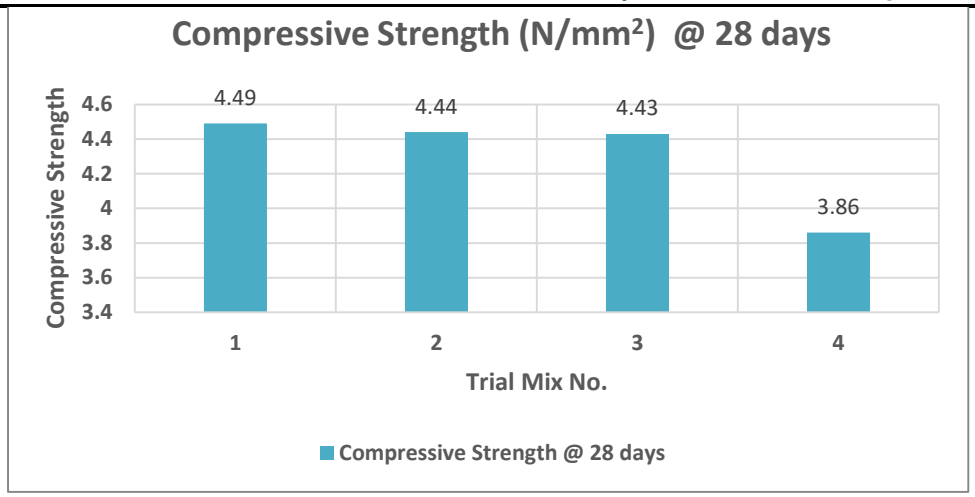
5.5 Hardness Test

In this test a scratch is made on brick surface with a nail. But steel rod (any hard material can be used) which was difficult to imply the bricks or blocks were hard. No nail impression was made on bricks when scratched up to replacement of 20% rice husk. This shows the brick possess high quality upto 20% replacement of rice husk.

5.6 Compressive Strength Test

Table 5.2 Compressive Strength Results

Trial Mix	Proportion (% of rice husk)	Compressive Strength at 28 days (N/mm^2)	Avg. Compressive Strength (N/mm^2)
1	0%	4.50	4.49
		4.48	
		4.50	
2	10%	4.45	4.44
		4.41	
		4.43	
3	20%	4.44	4.43
		4.42	
		4.43	
4	30%	3.84	3.86
		3.89	
		3.86	

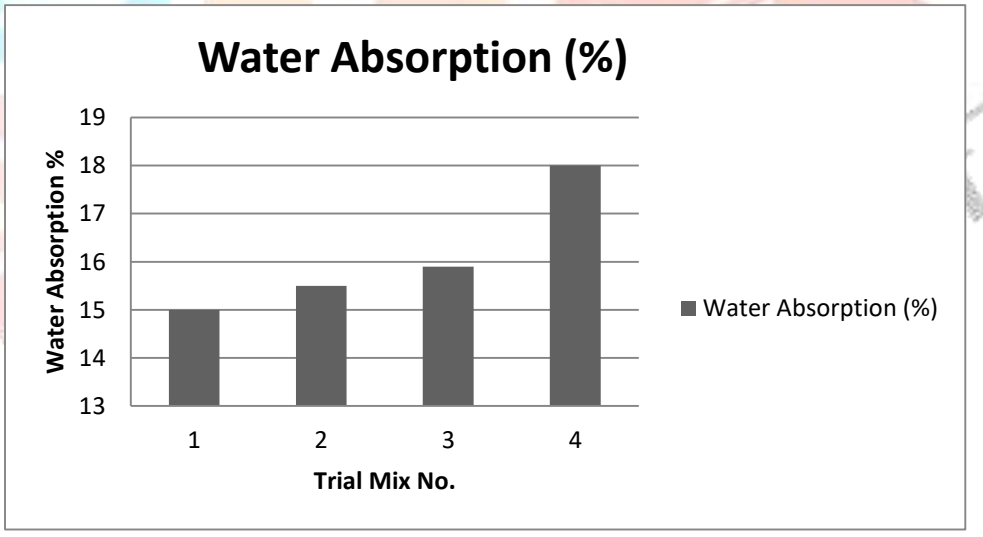


Graph 1: Compressive Strength Results at 28 days

5.7 Water Absorption Test

Table 2: Water Absorption Test Results of bricks

Trial No	Water Absorption (%)
1	15.0
2	15.5
3	15.9
4	18.0



Graph 2: Water Absorption Test Results of bricks

.VI CONCLUSIONS

1. By the addition of Rice Husk upto 20% to clay, the strength gradually decreases and beyond the addition of 20% Rice Husk the compressive strengths decreased rapidly.
2. Optimum proportion for (RH + Clay) bricks was observed as 20% Rice Husk and 30% Clay
3. As the percentage of RHA increased, water absorption of RHA-Clay bricks also increased.
4. Environmental effects of wastes and disposal problems of waste can be reduced through this brick manufacturing process.
5. Use of rice husk in brick can solve the disposal problem, reduce cost and produce a 'greener' Eco- friendly bricks for construction.

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