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EFFECTS OF RICE HUSK AND RICE HUSK ASH TO THE PROPERTIES OF UNBURNT BRICK

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Abstract - *The objective of our project is to study the effect between rice husk and rice husk ash to the properties of unburnt brick. Manufactured the brick with the different proportions of rice husk (2%, 5%, 10%, 15%, 20% by weight),*

rice husk ash (2%, 5%, 10%, 15%, 20% by weight) and the combination of rice husk and rice husk ash (1-1%, 1-2%, 5-5%, 5-10%). The result shows that rice husk and rice husk ash increases the compressive strength. By adding 10% rice husk, 10% rice husk ash, 1-1% combination shows the maximum compressive strength. Rice husk and rice husk ash can be used as construction materials so as to reduce the cost of materials, for the manufacture of bricks. The aim of our project is to study the compressive strength variations with different proportions of rice husk, rice husk ash and its combination.

Key Words: **Rice husk, Rice husk ash, Unburnt brick**

1. INTRODUCTION

Brick, may be defined as a small, solid or cored building unit in the shape of a rectangular block composed of inorganic, non-metallic substances of mineral origin and hardened by heat or chemical action. Bricks are of uniform size and hence they do not need any dressing. A good brick earth should be a mixture of pure clay and sand so that when prepared with water, it can be easily moulded and dried without shrinking, cracking, or warping. Brick is a building material used to make walls, pavements and other elements in masonry construction. The two basic categories of bricks are burnt and unburnt bricks. The brick is the main construction material due to its strength, durability, light weight, load carrying capacity etc. The brick is well- known and widespread due to its durability and local production by local composition and labour. But now a days the material cost of brick is very high. If we use rice husk and rice husk ash as construction materials we can reduce the cost of construction.

Using agricultural waste as construction material we can reduce the cost of construction, and reduce the environmental problems associated with the extraction of clay. Rice husk is the hard protecting covering of rice grains. Rice husk ash is obtained by burning the rice husk. The main aim of our project is to study the effects of rice husk and rice husk ash to the properties of unburnt brick. Unburnt bricks are those bricks which are dried with the help of heat received from the sun after the process of moulding. It is also called sun dried bricks.

2. MATERIALS AND METHODS

2.1 Characteristics of materials

The materials used for the manufacture of bricks are clay, soil, rice husk, rice husk ash and water etc.

Clay is one of the main construction material in the manufacture of brick. Clay is the finely grained natural rock or soil material that combines one or more clay minerals with possible traces of quartz, metal oxides and organic matter. Alumina is the chief constituent of every type of clay. Alumina is a tenacious finely- grained mineral compound which is plastic when wet, and is capable of being moulded to any shape, on drying it looses its plasticity and becomes hard. If alumina is present in excess with inadequate quantity of sand, the raw brick shrinks, cracks, warps during drying and becomes too hard when burned. Clay must have plasticity. All types of clay are composed of silica, alumina and varying amount of metallic oxides etc.

Soil is the upper layer of earth. It may be black or dark brown material, which is collected from the college. Silica is the main constituent. Silica responsible for strength, resistance to shrinkage and shape of the brick, hardness, and also to a great extent, for its durability or long life. But if we add too much free sand in the brick earth and thereby increase the proportion of total silica in the earth, resulting bricks would be very brittle and porous and may not burn easily.

Rice husk is also known as rice hull. Rice husks are the hard protecting outer cover of grains of rice. In growing season rice husk act as protecting cover, after that it can be use as building materials, insulation materials, fertilisers, fuel or gasoline. It includes sililca and lignin. The hull is mostly indigestible to humans.

Rice milling generates a byproduct know as rice husk. This surrounds the paddy grain. During milling of paddy about 78 % of weight is received as rice, broken rice and bran, and 22

% of the weight of paddy is husk, which is converted into ash during the firing process, is known as rice husk ash (RHA). This RHA in turn contains around 85 % - 90 % amorphous silica.

Tap water was used for the mixing and it was properly examined to ensure that it was clean, free from particles and good for drinking. Water is an important ingredient of this block. The quantity and quality of water is required to be watched into carefully so that it can form strength giving. Potable water is used for making the mix. The pH value of water lies between 6 and 8 that indicate the water is free from organic matter. The portable water from the college was used for mixing.

2.2 Preparation of brick samples

Brick manufactured in the size of 19mmx 9 mmx 9mm The brick is manufactured with the different proportions of rice husk such as 2%, 5%, 10%, 15% and 20%

Table -1 Brick manufactured with rice husk

	CLAY(Kg)	SOIL(g)	RH(g)
RH 2%	2.5	625	62.5
RH 5%	2.6	650	162.5
RH 10%	2.45	612.5	306.25
RH 15%	2.05	512.5	384
RH 20%	1.8	450	450

The brick is manufactured with the different proportions of rice husk ash such as 2%, 5%, 10%, 15%, and 20% by weight.

Table -2 Brick man

	CLAY(Kg)	SOIL(g)	RHA(g)
RHA 2%	2.5	625	625
RHA 5%	2.6	650	162.5
RHA 10%	2.45	612.5	306.25
RHA 15%	2.05	512.5	384
RHA 20%	1.8	450	450

ufactured with rice husk ash

The brick is manufactured with the different proportions of rice husk and rice husk ash such as 1%rice husk and 1% rice

husk ash, 1% rice husk and 2% rice husk ash, 5% rice husk and 5% rice husk ash, and 5% rice husk and 10% rice husk ash etc.

Table -3 Brick manufactured with the combination

	CLAY(Kg)	SOIL(g)	RH(g)	RHA(g)
RH- RHA:1- 1	2.65	662.5	33.125	33.125
RH- RHA:1- 2	2.5	625	31.25	62.5
RH- RHA:5- 5	2.4	600	150	150
RH- RHA:5- 10	2.05	512.5	128.125	256.25

Fig -1: Brick samples

3. RESULT AND DISCUSSIONS

3.1 Tests conducted on materials

The tests conducted on materials are specific gravity by pycnometer, particle size distribution by sieve analysis, and atterberg limits such as liquid limit, plastic limit etc.

Table -4 Tests conducted on materials

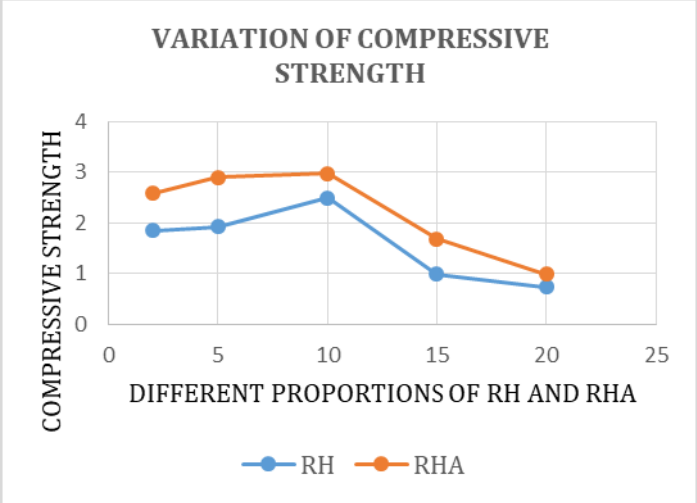
	SPECIFIC GRAVITY		PARTICLE SIZE DISTRIBUTION	ATTERBERG LIMITS
	Obtained value	Range	Obtained value	Obtained result
CLAY	2.692	2.44-2.92	Finely graded	Liquid limit>plastic limit
SOIL	2.476	<2.6-organic	Well graded	Liquid limit>plastic limit
RH	1.72	1.76	Well graded	No result
RHA	2.16	2.14-2.18	Well graded	No result

3.1 Tests conducted on specimen

The tests conducted on specimens are compressive strength and bulk density.

Table -5 Compressive strength test

RH (%)	RHA (%)	COMPRESSIVE STRENGTH (N/mm^2)
2	0	1.85
5	0	1.925
10	0	2.5
15	0	0.99
20	0	0.729
0	2	2.589
0	5	2.894



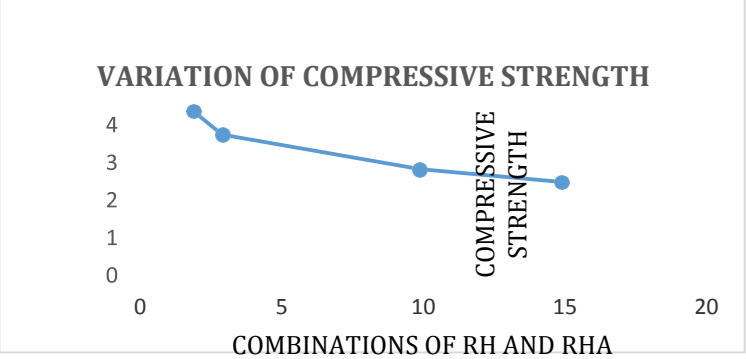


Chart-2: Compressive strength of combination

The compressive strength of unburnt brick is ranges from

1.5 N/mm^2 to 2.5 N/mm^2. The compressive strength of RH is increases from 2% to 10% in the ranges of 1.85 to 2.5 N/mm^2.The compressive strength of RHA is increases from 2% to 10% in the ranges of 2.589 to 2.975 N/mm^2. The compressive strength of combination is maximum in 1% RH and 1% RHA combination in the range of 3.305 N/mm^2. After that its value is decreases. The compressive strength of combination is greater than the separate RH and RHA proportions. But the compressive strength of RHA is greater than the compressive strength of RH.

Table -6 Bulk density

RH (%)	RHA (%)	BULK DENSITY
2	0	1784.609
5	0	1624.527
10	0	1505.427
15	0	1422.232
20	0	1356.484
0	2	1750.658
0	5	1684.391
0	10	1555.466
0	15	1395.935
0	20	1221.693
1	1	1823.113
1	2	1819.852
5	5	1653.409
5	10	1452.725

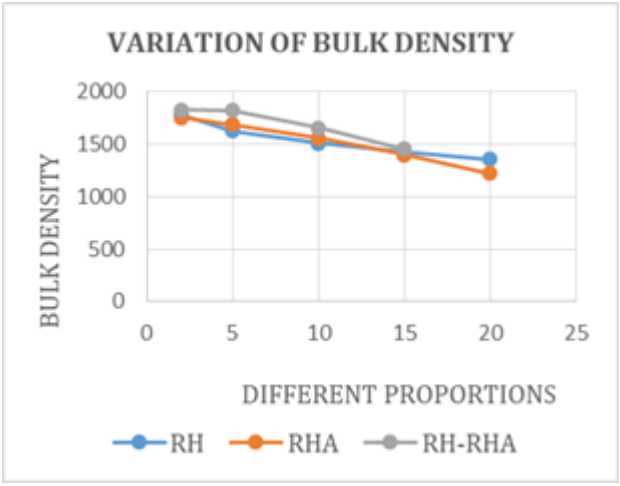


Chart 3: variation of bulk density

Bricks have a density in the range 1900-2100 kg/m^3 for common, facing and engineering quality and 1400 kg/m^3 for light weight bricks. The density value decreases with the increase in the percentage of rice husk and rice husk ash due to the decrease in the weight of brick. The maximum compressive strength is obtained in 10% of

RH, 10 % RHA, 1-1 combination of RH-RHA. In these percentages have desired values of bulk density.

4. CONCLUSIONS

Brick is the main construction material due to its strength, durability, load carrying capacity, light weight etc. To reduce the material cost of brick, we add rice husk and rice husk ash as construction material in the manufacture of brick. Strength characteristics of brick with rice husk and rice husk ash was found to be improved than normal unburnt brick. The brick manufactured with 10% rice husk gives 2.5 N/mm^2, which is the maximum compressive strength obtained from different rice husk proportions. The brick is manufactured with 10% rice husk ash gives 2.975 N/mm^2, which is the maximum compressive strength obtained from different proportions of rice husk ash. The brick is manufactured with 1-1% rice husk and rice husk ash combination gives 3.305N/mm^2, which is the maximum compressive strength obtained from the combination. Rice husk ash has more compressive strength than rice husk.

The combination obtained as more compressive strength than rice husk and rice husk ash.

The bulk density value decreases with the increase of rice husk and rice husk ash addition. Weight of brick decreases with the increase in the proportions. But the bulk density is suitable for 10% rice husk, 10% rice husk ash, 1-1% combinations, which are the good proportions.

Due to the use of agricultural waste like rice husk and rice husk ash, we can minimise the waste and environmental problems associated with the extraction of clay and becomes more environmental friendly . We can use these bricks in the construction of temporary structures.

The compressive strength of unburnt brick is ranges from 1.5 to 2.5 N/mm^2. In our best combination we obtained the value as 2.5, 2.975 and 3.305 N/mm^2. So if we use these proportions in the manufacture of burnt bricks, it can obtain more strength than normal burnt bricks.

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