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MANUFACTURING OF BRICKS USING RICE HUSK ASH

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Abstract— Rice is produced on a large scale in the Konkan Region which ultimately results large production of rice husk, which gives rise to disposal problem of rice husk. Mostly rice husk is burnt in the open air and left on the land which makes the land infertile. So to avoid the infertility and decrease the agricultural waste it can be used for manufacturing of bricks which can be used for low cost housing. Bricks using rice husk are more economical than the ordinary brick. The aim of the research is to study the bricks with the composition of clay and rice husk ash. Comparative adding of the rice husk ash was varied by 4, 8, 12, 16 and 20 percentage by weight. 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.

Keywords— Brick, Rice Husk Ash, Clay, Compressive Strength, Water Absorption

1. INTRODUCTION

Shelter is a basic human need and owning a house becomes a life long struggle as majority of Indians find housing costs prohibitively expensive. This problem becomes even more acute when considering the low income families who accounts for about 60-70% of Indian population. This brings out the need to reduce the cost of the housing and make it affordable for the booming population. This brings out the requirement to scale back the value of the housing and create it cheap for the booming population. Presuming a weight of 3 kg per brick, the total clay taken out from agriculture lands per year for such brick works out to over 300 million tonnes. So to reduce the expense and consumption of clay, bricks using rice husk ash can be used. By burning of rice husk, rice husk ash is obtained. Physical properties of RHA are greatly full of burning conditions. Once the combustion is incomplete, great deal of unburnt carbon is found within the ash. Once combustion is completed, grey to whitish ash is obtained. The amorphous content depends on burning temperature and holding time. Disposal of solid waste generated from agricultural and industrial production activity is another serious problem in developing countries like India. The wastes generated from agricultural sources are sugarcane bagasse, paddy and wheat straw and husk, wastes of vegetables, food products, tea, oil production, jute fibre, groundnut shell, wooden mill waste, coconut husk, cotton stalk etc. ; out of these one of the major quantity of rice husk annually generated about 20 million tonnes per year respectively.

1.1 Objectives

- To reduce the amount of clay required in brick manufacturing
- To eliminate the disposal problem of RHA
- To reduce the infertility caused by mixing RHA in soil
- To reduce the agricultural waste.

2. MATERIAL SPECIFICATIONS

2.1 Rice Husk Ash

Rice milling generates a by-product know as husk. This surrounds the paddy grain. During edge of paddy concerning 78% weight is received as rice, broken rice and bran .Rest 22% the load of paddy is received as husk. This husk contains concerning 75% organic volatile matter and also the balance 25% the load of this husk is reborn into ash throughout the firing method, is understood as rice husk ash (RHA). This RHA in turn contains around 85 % - 90 % amorphous silica. So for each one 1000 kgs of paddy processed, regarding 22 kgs of husk is created and once this husk is burnt within the boilers, regarding 55 kgs of RHA is generated.
India is a major rice producing country and also the husk generated throughout it is usually used as fuel within the boilers for processing padding, manufacturing energy through direct combustion and / or by chemical process about 20 million tonnes of RHA is produced annually. This RHA is great environment threat causing damage to

the land and surrounding area in which it is dumped. Lots of ways that area unit being thought of for disposing them by creating business use of this RHA.

2.2 Clay

Clay is a fine mixture of decompose igneous rock mineral and organic matter. "Clay refers to present material composed primarily of fine-grained minerals, that is mostly plastic at acceptable water contents and can harden once unemployed or dried." Technological properties of clay materials in the main depend upon their degree of dispersion. Granulometric composition of clay affects the amount of properties like density, softness, porosity, etc. The clay material for brick samples will be taken from one of the brick manufacturing plant from Lonere, Raigarh. The constituents present in the clay are silica, quartz (SiO_2), metal oxides (Al_2O_3, MgO) and organic matter.

3. PROCEDURE

3.1 Procuring 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.

3.2 Preparation of Clay

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 mechanically.

3.3 Adding Rice Husk Ash

First rice husk ash is obtained by burning rice husk in open air at temperature about 6000C-9000C. Then this is grinded to obtain a uniform fine powder. This is added to the clay as per the given proportions.

3.4 Mixing

The RHA and clay is mixed thoroughly so as the RHA is mixed uniformly in the clay. The mixing can be done by hand.

3.5 Moulding

A clot of clay is prepared, rolled in sand and dashed into a sanded mould. The clay is pressed into the mould with hands and excess is removed from the top of mould with strike, which is a flat stick that had been soaked in water.

3.6 Drying

The moulded brick is left to dry for two days at which time they are turned over 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 done.

Fig-1: Drying of RHA bricks

3.7 Sintering
These dried bricks are burned in kilns using wood or coal as fuel. There are burned for 24-48 hours up to 900- 11000C.

4. TESTS ON THE BRICKS

4.1 Compression Strength Test (ISS 1077-1970)

Take three random bricks samples and immerse them in water for 24 hours at room temperature. After twenty four hours, take them out, permit them to empty and so clean the excess water. Now, fill their frogs (and the other voids) by a layer of normal one: 1 mortar (1 half cement and 1 half sand).Store these bricks under damp sacks for 24 hours (to allow setting of mortar). Place the bricks in water for seven days. (This is to allow the mortar to harden). Take the bricks out of the water, allow the water to drain and remove the surplus water. When surface dry, every brick is tested for compressive strength singly. Place the brick flat-wise, with frog end facing upward, between two plywood sheets. Brick therefore adjusted between the laminate sheets is placed on the bed of compressive strength of bricks testing machine and cargo is applied axially and at an identical rate of a hundred and forty kg/cm2/minute. (This is very important). Note the load at which the brick fails (gets broken). This load (P) is divided by cross-sectional area (A) of the brick gives the compressive strength (Co).

Compressive strength = Maximum load / Area of the specimen

= P/A

Where,

P -Maximum load (N)

A - Area of the specimen (mm^2)

The arithmetic mean of the compressive strength of bricks values of all the three bricks shall be taken as the compressive strength of that lot of bricks represented by the test samples.

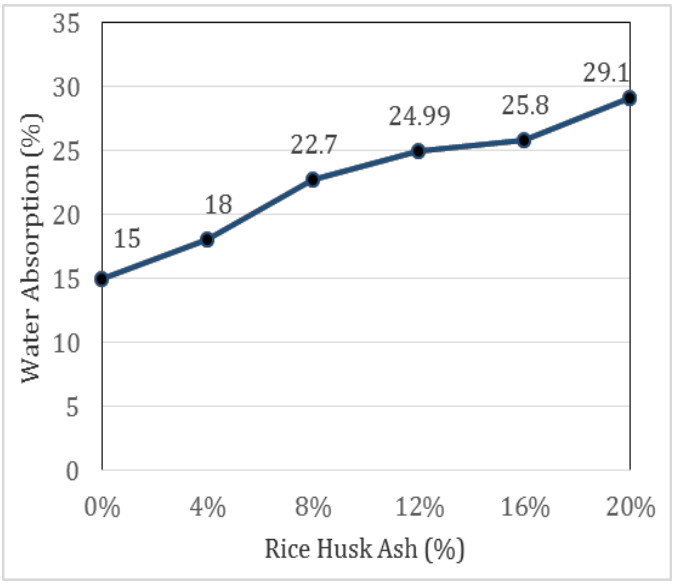

Chart-1: Compressive strength of brick specimens with difference addition of Rice Husk Ash (N/mm^2)

Fig-2: Compression Testing Machine (CTM)

4.2 Water Absorption Test (ISS 1077-1970)

Take three whole bricks randomly. Dry these samples to a continuing weight by inserting them in an exceedingly airy kitchen appliance at 110° C +- 5°C. This could take forty eight hours or longer. The specimens are weighed individually after cooling. The dry, weighed samples are then immersed in water, at room temperature, for 24 hours. After 24 hours the samples are taken out. Each sample is wiped dry and weighed individually within three minutes after it is taken out from the water. Absorption value is calculated by the simple relationship.
Water absorption = {[W2 – W1] / W1} x 100
Where,
W1 = Weight of dry brick (kg)
W2 = Weight of wet brick after immersion for 24 hours. (kg)
The average of three values for the three samples shall be taken as the water absorption of the brick. It shall be within the specified limits for the classification of the bricks.

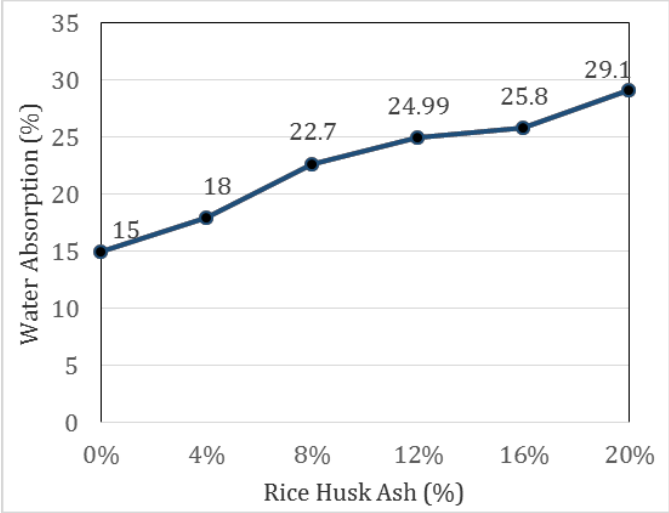

Chart-2: Water Absorption of brick specimens with difference addition of Rice Husk Ash (%)

4.3 Efflorescence Test (ISS 1077-1970)

Take three bricks at randomly. Place every brick on finish during a separate shallow flat bottom dish containing H2O. Note that depth of immersion of bricks mustn't be but a pair of.5 cm in every case. Keep the on top of dishes (containing water and bricks) during a heat (18°C to 30°C) area that has adequate Ventilation. The water from the dishes will be lost due to absorption by bricks and subsequent evaporation). Add recent amount of water once the bricks seem having dried. At the top of the second drying, every brick is determined for efflorescence; that's a look of any white patch of salt on the surface of the brick.
The efflorescence is reported only by qualitative words as follows:
Serious- Salt deposition is all round and quite heavy and increases with repeated wetting and drying. Powdering of salt is prominent.
Heavy- Salt deposits cowl quite 50% of the extent. The tendency to powder is absent.
Moderate- Salt deposits cover 10-50 percent surface area. The salt forms thin layers without showing any tendency to peel off in flakes or become powdery.
Slight- Salt covers the area of but 10% and forms solely an awfully skinny sticky layer.
Nil- There is seen no deposit of any salt even once recurrent wetting.

Table 1: Efflorescence Test of Rice Husk Ash

Sr. No.	Rice Husk Ash (%)	Nill	Sight
1	4	✓	-
2	8	-	✓
3	12	✓	-
4	16	✓	-
5	20	✓	-

4.4 Hardness Test

In this test a scratch is made on brick surface with steel rod (any hard material can be used) which was difficult to imply the bricks or blocks were hard. This shows the brick possess high quality.

Table 2: Hardness Test of Rice Husk Ash

Sr. No.	Rice Husk Ash (%)	Result
1	4	OK
2	8	OK
3	12	OK
4	14	OK
5	20	OK

4.5 Soundness Test

The soundness test is also done in the field. After the manufacturing of the brick are allowed to dry in air for 2days.Then the bricks are made to hit each other the ring sound produced during the process, which denotes the quality of the brick that it is good. Good quality bricks produce the clear ringing sound. In our project both fly ash bricks and plastic sand bricks clear ringing sound produced.

Table 3: Soundness test of Rice Husk Ash

Sr. No.	Rice Husk Ash (%)	Result
1	4	OK
2	8	OK
3	12	OK
4	16	OK
5	20	OK

5. CONCLUSIONS

The 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. The 4 percent of rice husk ash by weight has maximum compressive strength and water absorption among the other percentages. The other percentages decrease the compressive strength and water absorption. Thus, the best composition of brick is 4 percent of rice husk ash by weight. The 4 percent of rice husk ash by weight obtain 2.72 MPa of compressive loading and 18 percent of water absorption. This ratio component nearly matches the proper properties of brick. These bricks are economic than the conventional bricks and have good appearance same as the conventional brick so they can be used for low cost housing.

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