INVESTIGATION OF THERMAL CONDUCTIVITY OF FLY ASH BRICKS COMPOSITION MIX WITH CORN HUSK

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Abstract - Bricks thermal conductivity is play important role for thermal comfort of building.fly ash bricks are commonly used for construction building. We are focus on local area agriculture waste (Corn Husk) aggregate mixing with fly ash bricks composition. Corn husk is waste material and its conductivity is low and its work as insulating material**.** The main aim of the work is to manufacture fly ash bricks with mixing corn husk aggregate. The composition of fly ash bricks are fly ash, sand, and cement. In this work CHA mix with portion 0%, 15%, 25%, 35%. Experimental result present in graph with comparison of normal fly ash bricks to corn husk mix fly ash bricks.

Keywords - Corn Husk, Fly Ash Bricks, Compressive Test, Thermal Conductivity, KD2 pro

I. INTRODUCTION

Bricks are most important component of building manufacturing**.** Now a day various type of bricks available in the market .but its scope to thermal comfort and economical bricks using for better building.

Bricks composition is important for best bricks manufacturing proper mix portion of material is give high grade bricks. Eco-friendly bricks are manufacturing from waste material from industry agriculture.

The main components of fly ash bricks are Calcium oxide (60-70%), Silica (15-20%), Alumina (5-10%), and Iron oxide (3-5%).Corn husk aggregate mix in this composition to manufacture new bricks composition. And investigation the effect on bricks properties.[6]

Mixing of corn husk in fly ash composition its change the properties of the brick some mechanical properties and thermal properties change.
Corn husk is the agriculture waste product gating from corn plant .it is the most important crop in the Chhattisgarh, shown in Fig. 1. The composition of the corn husk organic compounds Table1.[7]

The main aim of the work is to made fly ash bricks, with mixing of corn husk fine aggregate. The objective is to reduce the thermal conductivity of bricks and find optimal composition of fly ash bricks so that the cooling and heating of the building can reduce and as well as the waste product (corn husk) can also be utilized. The composition of fly ash bricks is fly ash, sand, and cement. In this work Corn husk mix in the total composition by 0, 15, 25, and35%.

The sizes of bricks are 190 ×90× 90 mm standard size[6].

Content, % wt.			
C	**H**	**O**	**N**
36.8-41.1	5.7-6.1	0.5-0.6	34.5-36.6

Table 1. The composition of the corn husk compounds

Fig.1.Corn husk

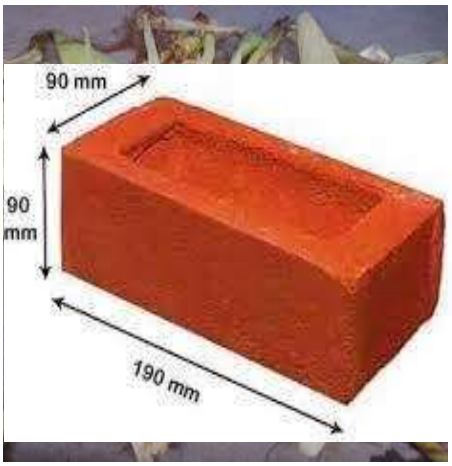

Fig.2.Bricks standard size

S. No.	Waste material	Cementing material	Test conducted	Reference
1.	Rice Husk	Ordinary Portland cement	Compressive test , Water absorption test	[1]
2.	Rice Strew	Ordinary Portland cement	Physical and Chemical Properties of Rice Straw Ash and Its Effect on the Cement Paste Produced cement type	[2]
3.	Limestone dust and wood sawdust	Ordinary Portland cement	Compressive strength, Flexural strength, Water absorption	[3]
4.	Granite Saw Dust	Ordinary Portland cement	Compressive test , Water absorption test	[4]
5.	Fly Ash Brick and Finding the Optimal Mix of Materials	Ordinary Portland cement	Compressive test , Water absorption test	[5]

Table 3 Literature review on production of bricks from waste materials.

II. EXPERIMENTAL INVESTIGATION

The Corn husk aggregate used for this study is obtained from the Indian state of Chhattisgarh. Corn husk is got after corn cub and seeds are separated and sun dried for remove the moisture content after that grinded and got corn husk fine aggregate. The aggregate of corn husk will be used to substitute ordinary Portland cement by 0%, 10%, 20%, and 25%, of the weight of cement.

Compressive Strength Test

This test is actually carried out after the curing period of 7,14 & 28 days, the formula for calculating it as follows:- Compressive strength= Applied Maximum Load X 1000(N)/ Cross Sectional Area190 ×90× 90 mm standard size The Compressive Strength of fly ash Brick is measure by Compression testing machine(CTM)fig 3. [2]

Fig 3. Compressive testing

Water Absorption Test

CHA should not absorb more 10% of water by its total weight. The bricks which are being taken for testing in CTM that should be dried up in an oven at a temperature of 105 C to 115 C until it can attain its constant weight for being cooler at a room temperature and that weight is taken as W1. Then the brick is kept in clean water for 24 hours at a and that weight is taken as W2. Fig 3.

Water Absorption in % =. (W2- W1/W1)X100.[1]

Thermal Conductivity Test

The KD2 Pro is a fully portable field and lab thermal properties analyzer. It uses the transient line heat source method to measure thermal conductivity, thermal resistivity, thermal diffusivity, and specific heat. Fig 7.[6]

Fig 4. Water Absorption test

Fig 5. CHA mix bricks

III. RESULTS AND DISCUSSION

(A) Compressive Strength:

Compressive/Crushing strength of bricks (Indian Made) are very variable, and may vary from 3MPa to 16MPa for hand-made burnt bricks, while Crushing strength of heavy duty bricks machine pressed (also called engineering bricks) may have compressive strength as high as 45MPa, The effect of percentage RSA mixing with fly ash composition on the compressive strength of fly ash bricks is shown in Fig. According to IS12894: 2002 the compressive strength of the fly ash bricks should be greater than 3.5MPa. The compressive strength of Rice Sheath mix ash bricks is a range of 4-6MPa that value much suitable for building construction.

AT 15% mixing of CHA compressive strength increase and increasing % of CHA reducing Compressive strength. Fig .8. Show the variation of compressive strength in graph

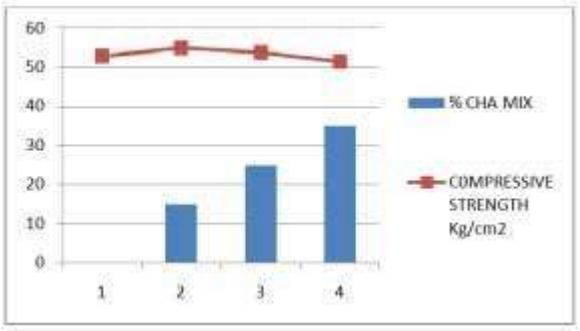

Fig 6. Compressive strength testing graph

(B) Water absorption test:

The effect of rice sheath content on water absorption of brick samples is presented in Fig...The water absorption value is often related to the compactness and density of the brick sample, so it is also related to the compressive strength value. According to Fig.9 , the water absorption of bricks slightly increased since the rice sheath content increased from 0% to 35%.

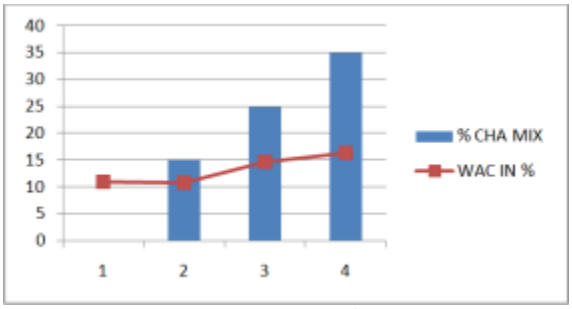

Fig7. Water absorption test graph for CHA mix bricks

(C) Thermal Conductivity:

The thermal conductivity of the % RSA mix fly ash bricks with is shown in Fig.10. The thermal conductivity of the rice sheath mix fly ash bricks composition continuous decreases by increasing the RSA %, because rice sheath contains a bonding properties and it's not good thermal conductor material. Thermal conductivity decreases due to decreasing the density of bricks.

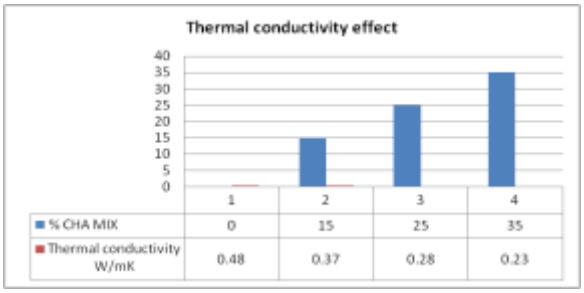

Fig 8. Thermal conductivity graph with CHA mix bricks

Fig 9. KD2 PRO analyzer using for thermal conductivity analysis

Fig 10. CHA mix bricks sample

IV. CONCLUSION

Corn husk mixing in fly ash bricks composition experimental investigation of thermal conductivity test shows that 15%-25% Corn husk mix with fly ash bricks composition give best result for building construction with respect to compressive strength. Corn husk is agriculture waste its best use in construction material.

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