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Thermal Insulation Fly Ash Brick Composite With Saw Dust And Fiber

[1]Manish Kumar, [2]Sunny Rajput, [3] Aman Nayak, [4]Amit Yadav, [5]Gargi Rana, [6]Narayan
[1]Assistant Professor, [2]Students, [3]Students, [4]Students, [5]Students, [6]Students
[1]Email-manish3393_gn@iimtindia.net,
[1]IIMT Group of Colleges , Greater Noida, India
[2,3,4,5,6]IIMT Group of Colleges, Greater Noida, India

Abstract

This study aims to characterize the clay bricks produced by the addition of the two agricultural waste materials i.e. wooden waste ash and rice husk ash. Disposing off these waste materials is a very challenging task and is a hazard to environment. The Wooden waste ash and rice husk ash were collected locally from the cities of Greater Noida & Ghaziabad respectively. These were mixed with the clay for brick manufacturing in three different proportions i.e. 5, 10 and 15% by weight of clay. Mechanical i.e. compressive strength and modulus of rupture and durability properties
i.e. water absorption; freeze-thaw and sulphate resistance of these bricks were evaluated. Test results indicated that the sulphate attack resistance and efflorescence of clay bricks incorporating Wooden waste ash and rice husk ash have been increased significantly. However, no significant effect on mechanical properties was observed. Furthermore, the additions of wastes have reduced the unit weight of bricks which decrease the overall weight of the structure leading to economical construction. Therefore, it can be concluded that the addition of waste materials in brick manufacturing can minimize the environmental burden leading towards more economical and sustainable construction.

Introduction

1.1 GENERAL

Building material industry has witnessed an increased demand from the last decade due to an increased demand of housing for the growing urban population which has caused shortage of building materials. The crisis of raw material shortfalls is faced by the relevant industry to fulfill the increased demand of building materials. This situation has levied the need for searching other substitutes of raw materials. Consequently, as a result of this search for raw materials; the conversion of the industrial wastes to useful building and construction material has evolved as a substitute over conventional raw materials. By doing this not only the

industrial waste will be recycled and used as building materials but there will be economic design of buildings.

The ultimate disposal of incinerated Bio mass ash can be accomplished by using it an engineering construction material. One possible solution for the management of this sludge is to re-use it as a building material, namely, to incorporate this Bio mass ash into bricks. The fired clay brick is one of the most common and abundant masonry building materials and remain popular for its many characteristic properties. As such, the recycling of waste materials by incorporating them into bricks has been a popular topic of investigation over the last century, with varying degrees of success across a wide range of waste material.

Fly ash is pozzolonic material which can be used in construction industry. The fly ash can be divided in two groups:

Low calcium fly ash is produced from combustion of bituminous coals or anthracite coals. It has low calcium (CaO) percentage about 3% and silica + alumina + iron oxide more than 70%.

High calcium fly ash is produced from combustion of sub-bituminous of lignite coals and it has about 20% of calcium (CaO) content and percentage of Sio_2+Al_20_3 +Fe_20_3 in this fly is less than 70%.

To have better utilization of this fly ash as per Nation's policy on fly ash, trial have been made for making of bricks using fly ash, lime, gypsum and sand.

The bricks used are only machine-made. The mortars used only one 1:6.Types of mortar used: (a) 1:6 [FLY ASH: sand], (b) 1:6 [Cement: sand]. Five samples are prepared with 1:6 Fly ash mortar and five samples are prepared with 1:6 cement mortar with 10 mm joint. Testing carried out at 14 days curing.

The bricks were cured for 21 days. After curing the bricks were tested for water absorption test and compression test.

We got water absorption = 15 %and compressive strength = 22.68 N/mm^2

Then we casted prisms with use of bricks and 1:6 mortars with 10 mm bed joints. The mortars were of two types:

- Cement: sand mortar and
- FLY ASH : sand mortar

Such five samples were made and cured for 14 days andcompression test were done. The table –I shows the stress at first crack and stress at failure in N/mm^2 after 14 days curing of masonry.

2.1 LITERATURE REVIEW

First of all, various books and journals were collected for reference and were studied before starting the project work for having an idea about how the project should be. In this project an alternative building bricks are introduced. So, first the basic and essential characteristics of bricks were studied. Making construction

bricks by using the hematite tailings , additives of clay and fly ash were added to the raw materials to improve the brick quality, Effect of raw materials formulation on the properties of fired specimens, effect of firing temperature, forming pressure and forming water content on the properties of fired specimens Comparative study of the use of different biomass bottom ash in the manufacture of ceramic bricks. Hematite tailings as main raw material to prepare high strength autoclaved bricks, optimum formulation was the mixtures of 70% hematite tailings, 15% lime and 15% sand, The compressive strength, flexural strength, compressive strength of hematite tailings autoclaved bricks after 15 freezing–thawing cycles and the mass loss of it with optimum process condition were 21.2 MPa, 4.21 MPa, 18.36 MPa and 0.72%,

The load-bearing brick is made from low-silicon tailings by pressing and autoclaving process, in the presence of alkali-activated slag/ fly ash cementing material (AAFSC). Tailings accounts for 83% of the total mass of the brick. The compressive strength of the brick is up to 16.1 MPa, bending strength 3.8 MPa, and with low drying shrinkage and good freeze–thaw resistance. Some factors influencing the mechanical strength of the brick including forming pressure, forming water content and curing regime, are investigated. The hydration products, freeze–thaw durability and anti-carbonation characteristics of the products are discussed.

The large demand has been placed on building material industry especially in the last decade owing to the increasing population which causes a chronic shortage of building materials, the civil engineers have been challenged to convert waste to useful building and construction material. Recycling of such waste as raw material alternatives may contribute in the exhaustion of the natural resources; the conservation of not renewable resources; improvement of the population health and security preoccupation with environmental matters and reduction in waste disposal costs.

In the review of utilization of those waste, this paper reviewed recycling various waste material in bricks production. The effects of those wastes on the bricks properties as physical, mechanical properties will be reviewed and recommendations for future research as out comings of this review will be given. This reviewed approach on bricks making from waste is useful to provide potential and sustainable solution. Bricks are a widely-used construction and building material around the world. Bricks are prepared from natural waste material which comprises of orange peels and coconut waste. Clay is used as a binding material for natural waste material and paper mill waste. The main objective of the present study is to reduce the quantity of clay with natural waste material. The orange peels and coconut waste which otherwise is land filled has been utilized to make construction bricks that serves a purpose of solid waste management. These wastes are used to reduce the quantity of clay as there is a greater shortage of clay in many parts of world. Initially, characterization of paper mill waste has been carried out by XRF, XRD and SEM. The SEM monographs shows that the waste has porous and fibrous structure. The bricks of prepared by orange peels and coconut waste with varying compositions of clay reduced the quantity of clay by (10% - 40% wt).

Experimental Work

4.1 MATERIAL USED:

Fly ash is the finely divided residue that results from the combustion of pulverizedcoal and is transported from the combustion chamber by exhaust gases. Over 61 million metric tons (68 million tons) of fly ash were produced in 2001.

4.2 WOODEN WASTE ASH:

Wooden waste ash is the powdery residue remaining after the combustion of wood,such as burning wood in a fireplace, bonfire, or an industrial power plant.

4.1.2 Fly Ash

4.1.3 Waste Fly Ash

FIBER: Fiber-reinforced polymer (FRP), also Fibers-reinforced plastic, is a composite material made of a polymer matrix reinforced with fibers. The fibers are usually glass, carbon, , although other fibers such as paper or wood or asbestos have been sometimes used. The polymer is usually an epoxy, or polyester thermosetting plastic, and phenol formaldehyde resins are still in use. FRPs are commonly used in the aerospace, automotive, marine, and construction industries

CEMENT: Cement, one of the most important building materials, is a binding agent that sets and hardens to adhere to building units such as stones, bricks, tiles,

Fig.Preparation of Mixing

etc.Cement generally refers to a very fine powdery substance chiefly made up of limestone (calcium), sand or clay (silicon), bauxite (aluminum), and iron ore, and may include shells, chalk, marl, shale, clay, blast furnace slag, slate. The raw ingredients are processed in cement manufacturing plants and heated to form a rock-hard substance, which is then ground into a fine powder to be sold. Cement mixed with water causes a chemical reaction and forms a paste that sets and hardens to bind individual structures of building materials.Cement is an integral part of the urban infrastructure. It is used to make concrete as well as mortar, and to secure the infrastructure by binding the building blocks. Concrete is made of cement, water, sand, and gravel mixed in definite proportions, whereas mortar consists of cement, water, and lime aggregate. These are both used to bind rocks, stones, bricks, and other building units, fill or seal any gaps, and make decorative patterns. Cement mixed with water silicates and aluminates makes a water-repellant hardened mass that is used for water-proofing.

Results And Discussion

There are four different tests are undergone inBricks; They are,

1. Visual Test,
2. Compressive Strength Test,
3. Water Absorption Test,
4. Efflorescence Test.

VISUAL TEST

Table:1

Sl. No	TESTS	Y/N
1)	The bricks should be well finished, smooth and are free from cracks.	Yes
2)	They should possess sharp and square edges.	Yes
3)	They are of uniform color, shape and size as per standard.	Yes
4)	When the bricks are struck with each other, they should produce clear ringing sound.	Yes
5)	Fracture of good bricks showed uniform and bright compact structure without any voids.	Yes
6)	Bricks should not be broken down when dropped from 1m height.	Yes

Conclusion

- Agriculture waste (RHA and WA) utilization in burnt clay bricks is an effective wayof disposal of waste materials leading to sustainable construction. Lighter bricks can be produced after addition of RHA and WA in burnt clay bricks.
- Lighter bricks are helpful in achieving economy during construction. Brickspecimens after incorporating RHA and WA showed less compressive and flexural strength.
- Furthermore, porosity, water absorption and initial rate of absorption was increased with the addition of waste in burnt clay bricks. High porosity is usuallyrelated with good insulation properties.
- Burnt clay bricks with 15% waste addition can be used in moderate weather according to water absorption results.
- Efflorescence results were also encouraging. Based on the study, it can be concluded that bricks incorporating RHA and WA up to 15% can be effectively used for construction purposes leading to sustainable construction.

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