Industrial Engineering Journal
ISSN: 0970-2555
Volume : 52, Issue 12, No. 3, December : 2023

THERMAL INSULATION OF PLASTIC WASTE BRICK COMPOSITE WITH RICE HUSK, SAW DUST AND GLAZED POWDER

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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 Viralimalai and Rajagiri, respectively. These were mixed with the clay for brick manufacturing in three different proportions i.e.5,10 and 15% by weight of clay. Mechanically. 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 weigh to f 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.

Keywords: Plastic waste, Thermal insulation, Composite material, Rice husk, Sawdust, Glazed powder, sustainable construction.

Introduction

The improper disposal of plastic waste poses a significant environmental challenge. One promising avenue to address this issue is the incorporation of plastic waste into construction materials, providing a sustainable and cost-effective solution. This study focuses on developing a composite material that combines plastic waste with natural and waste-derived components for enhanced thermal insulation. 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 substitute so fraw 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. different proportion (5%, 10%, 15% by weight of clay). Burnt clay bricks were prepared in brick kiln on a massive scale. The utilization of these waste will be helpful in saving the natural resources along with economical and sustainable construction.

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Fig. industrial waste power

Fig. wooden waste ash

Literature

The 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.

2.1 Preparation of eco-friendly construction bricks from hematite tailings Youngling Chen, Yimin Zhang, Tiejun Chen, Yeanling Zhao, ShenxuBao (2011)

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

2.2 Yongliang Chen,Yimin Zhang, Tiejum Chen,Yunliang Zhao, Shenxu Bao 29, Dec 2017

The present study evaluates the suitability of several types of biomass bottom ashes[wood bottom ash(WBA), pine-olive pruning bottom ash(POPBA), olive stone bottom ash (OSBA), and olive pomade bottom ash (OPBA)] as an alternative source to replace ceramic raw material in the production of clay bricks. Preparation of high strength autoclaved bricks from hematite tailings

2.3 Yunliang Zhao,Yimin Zhang, Tiejun Chen,Yongliang Chen,(2011)

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 21.2MPa,4.21MPa,18.36 MPa and 0.72%.

Objectives

- To use biomass combustion ash waste (rice husk and wood ash) as secondary raw materials in the manufacture of clay bricks.
- To determine the physical and chemical properties of the wooden waste ash and rice husk ash.
- To determine the strength of the bricks by using the waste materials.
- To minimize the environmental pollution.

Material Testing

1.1 Material Used

Clay**: Clay is defined as a stiff, sticky fine-grained earth that can be molded when wet, and is**

dried and backed to make bricks, pottery, and ceramics. For this research work, clay is procured from places Viralimalai. The collected soil samples are dried and then used for the preparation for bricks in Kalkuthampatti, Viralimalai.

Wooden waste ash: **Wooden waste ash is the powdery residue remaining after the combustion of wood, such as burning wood in a fire place, bon fire, or an industrial power plant.**

Rice husk ash: **Rice husks are the hard protective coverings of rice grains which are separated from the grains during million process. In the course of a typical milling process, the husks are removed from the raw grain to reveal whole brown rice which upon further milling to remove the bran layer will yield white rice.**

V. Result And Discussion

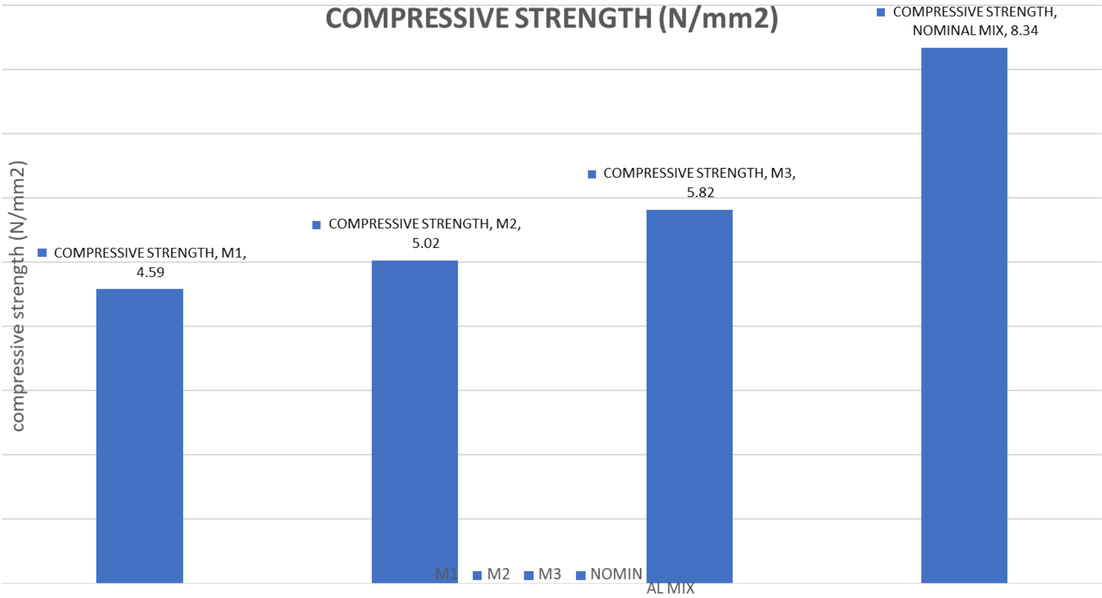
5.1 Compressive Strength Test: **A compression testing machine, the compression plate of which shall have a ball seating in the form of portion of a sphere the Centre of which coincides with the Centre of the plate, shall be used.**

Fig. Sample preparation

Preconditioning: Remove unevenness observed in the bed faces to provide two smooth and parallel faces by grinding. Immerse in water at room temperature for 21 hours. Remove the specimen and drain out any surplus moisture at room temperature. Fill the frog (where provided) and all voids in the bed face flush with cement mortar (1 cement, clean coarse sand of grade 3 mm and down). Store under the damp jute bags for 24 hours followed by immersion in clean water for 3 days. Remove, and wipe out any traces of moisture.

Table : Compressive Strength Test Results

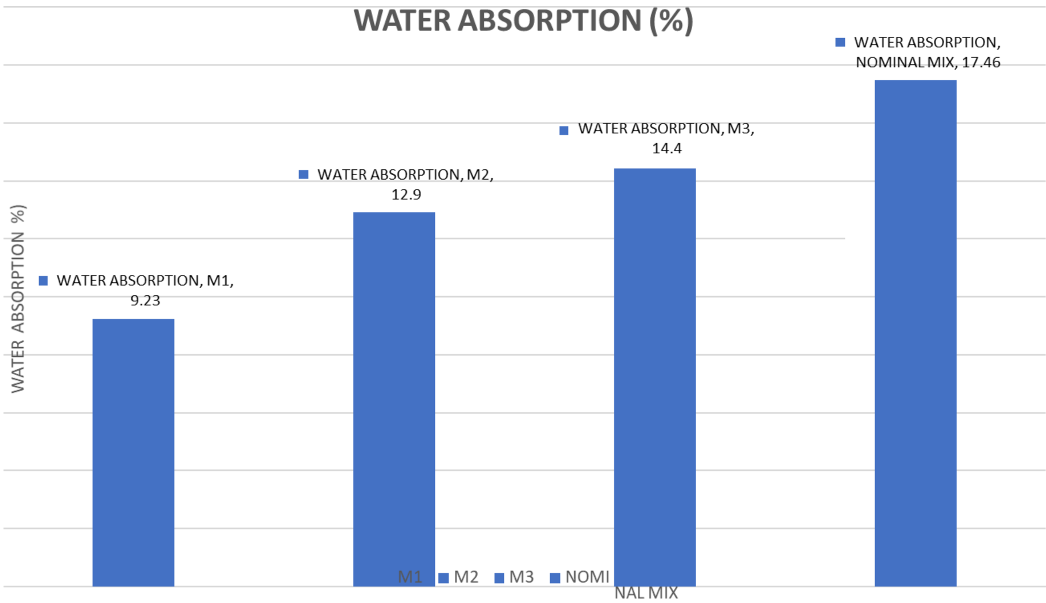
Mix	**Sample 1 (kN)**	**Sample 2(kN)**	**Sample 3(kN)**	**Average Compressive Strength(N/mm2)**
M1	**81**	**78**	**77**	**4.59**
M2	**82**	**91**	**85**	**5.02**
M3	**98**	**102**	**99**	**5.82**
Conventional Mix	**150**	**115**	**163**	**8.34**



Water Absorption Test: Dry the specimen in a ventilated oven at a temperature of 105 to 115°C till it attains substantially constant mass. Cool the specimen to room temperature and obtain its weight (MI). Specimen warm to touch shall not be used for the purpose.

Table: Water Absorption Test Results

Mix	**y Weight (Kg) M1**	**et Weight (Kg) M2**	**/ater Absorption(%)**
W1	2.913	3.182	9.23
W2	2.805	3.167	90
W3	2.790	3.192	40
Conventional Mix	2.885	3.389	46



Conclusion

Agriculture waste (RHA and WA) utilization in burnt clay bricks is an effective way of disposal of waste materials leading to sustainable construction. Lighter bricks can be produced after addition of RHA and WA in burnt clay bricks.

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.

Further more, porosity, water absorption and initial rate of absorption was increased with the addition of waste in burnt clay bricks. High porosity is usually related with good insulation properties.

Burnt clay bricks with 15% waste addition can be used in moderate weather according to water absorption results.

Fig. final product

Lighter bricks are helpful in achieving economy during construction. Brick specimens after incorporating RHA and WA showed less compressive and flexural strength.

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