International Journal of Research in Engineering, Science and Management
Volume 7, Issue 10, October 2024
https://www.ijresm.com | ISSN (Online): 2581-5792

Utilization of Sugar Mill Waste for Manufacturing of Hollow Bricks Environmental Friendly

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***Abstract*: In India, bricks are usually made up of clay, which consumes a larger amount of clay and leads to topsoil removal and land degradation. To avoid these environmental threats, an attempt was made to study the behavior of bricks manufactured using waste materials from sugarcane industrial waste. The burned clay hollow brick is one of the most important and often-used building components in masonry construction for providing insulation against heat as the air acts as an insulator. Worldwide Burnt clay hollow brick production from waste materials would increase brick performance at cheap production costs, reduce the environmental burden brought on by waste deposition in open landfills, and promote more environment friendly building practices. The purpose of this study is to assess the impact of adding waste from important crops-like sugarcane and other material like lime & cement. In this study, sugarcane Bagasse ash (SBA) is collected from a sugar mill that is situated in Sultanpur, Uttar Pradesh. Bagasse in the proportions of 20%, 30%, and 40%, Lime in the proportions of 4%, 8%, and 12%, and Cement in the proportions of 2%, 4%, and 6% have been used to make Clay hollow bricks in this study. Hollow bricks' Compressive Strength and long-lasting qualities are also investigated.**

***Keywords*: Bagasse Ash, Lime, Cement, Clay Hollow Bricks.**

1. Introduction

Due to the increasing quantity produced by various industries or plants in India, there may be a requirement for research on environmentally sound reuse and effective disposal methods for bagasse ash. In India, landfills are typically used to dispose of bagasse, The residual bagasse ash from incineration may be disposed of by utilizing it as a building material. Repurposing it as a building material, specifically incorporating this bagasse ash into bricks, is one workable method for the control of this sludge. As a result, research on the recycling of waste materials by leveraging their incorporation into bricks has been a hot topic throughout the past century, with various degrees of success over a vast array of waste fabrics. This popularity is partly due to the variety of wastes that may be incorporated into the brick-making process, but more crucially, the high temperatures used to fire the bricks allow for the volatilization of hazardous materials as well as the fixation of wastes. study examines how sugarcane bagasse ash can be recycled by utilizing it as a partial replacement for cloth in clay bricks. There can be a shortage of traditional construction production materials due to the limited availability of natural resources and the rapid urbanization. In contrast, the energy required to produce traditional building materials pollutes the air, water, and land. An accelerated environmental challenge results from the accumulation of mismanaged agricultural waste, particularly from developing countries. As a result, modern technology that recycles and transforms trash into useable materials must be improved if the environment is to be protected and society is to continue improving sustainably.

2. Scope

1) To promote the solid waste from the sugar mills as a useful product.
2) To manage the disposal of waste product into construction raw material.
3) To dispose the waste safely in the form of brick manufacturing.
4) To encourage the waste products as eco-friendly material.
5) To make the brick which are energy efficient which is the only viable solution to the environmental concerns and natural resources conservation for future generations.
6) Light in weight and easily portable.

A. Literature Review

In India, bricks are usually made up of clay, and are generally produced in traditional, unorganized small-scale industries. Brick making consumes larger amount of clay which leads to top soil removal and land degradation. To avoid all these environmental threats an attempt was made to study the behavior of bricks manufactured using, waste materials from sugarcane industrial waste. Recycling of such waste as raw material alternatives may contribute in the exhaustion of the natural resources and reduction in waste disposal costs. In this project we choose sugarcane bagasse ash (SBA) and press mud in ordinary Portland cement (OPC) stabilized bricks. The brick was manufactured of size 25cm x 12cm x 6.5cm. The blocks were named as 4, 6 and 8 then it is added with SBA and press mud by weight of dry soil, then the bricks followed by curing f or period of 28 days. The test like compressive strength, water absorption test, shape and size test in accordance with bureau of Indian standard (BIS) specifications by also considering the cost.

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3. Materials

A. Bagasse Ash

Currently, bagasse is burned as gas in sugar mills, which is an incredible way to power their boilers. Bagasse is a waste product of the sugarcane industry. This bagasse ash is typically spread over fields and sold in ash ponds, which has an adverse effect on the environment. Additionally, studies show that occupational exposure to bagasse processing dusts might result in pulmonary fibrosis, also known as bagassosis, a chronic lung condition. Since there may be a great need for its reuse and because bagasse ash is found to be high in silica and to have pozollanic properties, it may be possible to use it as construction material.

B. Lime

Natural calcium oxide is fused with coke so one can render the highest yield in the manufacture of acetylene. The pleasant of the resultant carbide lime is an immediate end result of the first-rate excellent raw materials. Carbide lime is finer in particle length, and bodily, having a completely finely divided particle size makes carbide lime higher. A finer particle size approach quicker and more reactivity.

C. Cement (Ordinary Portland Cement)

The most widely used type of cement is Portland cement, which is a fundamental component of concrete, mortar, stucco, and the majority of non-specialty grout. Magnesium oxide (MgO) cannot contain more than 5.0% of the mass. When cement and water are combined, a complicated series of chemical reactions take place that are currently only partially understood. The strength of cement is due to the crystals of its various elements interacting and slowly crystallizing. Portlandite (Ca(OH)2) is slowly transformed into insoluble calcium carbonate by carbon dioxide absorption. Immersion in warm water after the initial setting will hasten setting. To limit flash setting and rapid setting, gypsum is added.

D. Soil

As a part of this investigation, the clay soil was acquired from the Sultanpur, Uttar Pradesh The soil thus obtained was carried to the laboratory in test. A small amount of soil was taken, sieved through 4.75 mm sieve, weighed, and air-dried before weighing again to determine the natural moisture content of the same. The various geotechnical properties of the local soil.

E. Water

Water is an important ingredient of brick as it actually used for manufacturing of brick. Since it helps to bind all the raw materials for giving proper mix, Water used for making brick should be free from impurities. The common specifications regarding quality of mixing water is water should be fit for drinking.

4. Methodology

All the material essential to sieve the clay, bagasse cement and lime in sieve of 4.75mm for the proper binding of hollow bricks. The mixture is casted in the mould of size 300mm×150mm×90mm. The casted hollow bricks are 20%, 30%, 40% bagasse ash, 4%,8%,12% lime and 2%,4%,6% cement based on the mix design, then the hollow bricks are sun dried for a period of 3 to 4 days. The cured hollow bricks are undergone various test for identifying the strength.

A. Compressive Strength test/Crushing Strength

The brick specimens are immersed in water for 24 hours. The specimen is placed in compression testing machine with 3mm plywood on top and bottom of it to get uniform load on the specimen. Then load is applied axially at a uniform rate of 10N/mm^2. The crushing load is noted for the hollow bricks % 20, 30, 40.

5. Result and Interpretation

1) These hollow bricks are economical and light weighted.
2) This hollow brick size is 300*150*90 mm which is also bigger than the size of normal brick.
3) This hollow brick manufacturing material is easily available.
4) It gives good compressive strength and will give light loaded of the building.
5) In comparison to clay bricks these hollow bricks added with bagasse and solid brick gives more strength.
6) The proportion mix of this hollow brick is 20%, 30%, 40% bagasse ash, 4%, 8%, 12% lime and cement 2%, 4%, 6% by weight of clay.
7) Hollow brick is easily portable from one place to other place.
8) These hollow bricks are also used Road lining because stop clay flowing help.
9) It is used for cooling purpose of the boundary wall and for the proper ventilation purpose also.
10) These hollow bricks can be used easily in construction work.

6. Conclusion and Recommendation

Table 2

Properties	Specific Gravity
Soil	2.64
Bagasse ash	2.0
Lime	3.2
Cement	3.0

Based on the experimental procedure and test, we conclude as,

1) Use of bagasse ash in brick can solve the disposal problem reduce cost and produce a “greener” Eco-friendly hollow brick for construction.
2) The crushing strength or compressive strength of solid bricks named as 20% is 9N/mm^2, 30% is 11.5N/mm^2 and

Table 1
Brick strength test

Compressive strength of clay brick	% of bagasse ash	Compressive strength of solid brick	Compressive strength of hollow brick
6 N/mm^2	20%	9 N/mm^2	11 N/mm^2
6.4N/mm^2	30%	11.5 N/mm^2	13 N/mm^2
6.5N/mm^2	40%	12.0 N/mm^2	15 N/mm^2

40% is 12.0N/mm^2.

3) The crushing strength or compressive strength of hollow bricks named as 20% is 11N/mm^2, 30% is 13N/mm^2 and 40% is 15N/mm^2.
4) Hence, we strongly recommended brick named 40% has a good compressive strength and suitable for construction.
5) Environmental effects of wastes and disposal problems of can be reduced through this manufacturing of hollow bricks.
6) This can be also using Honey combing pedestal.
7) Can be important of recycling for final disposal of these abundant wastes leading to conservation of fertile soil.
8) Based on limited results and observations it can be concluded that the incorporation of Bagasse in brunt clay Hollow Brick production leading to economical and sustainable conservation.
9) The compression strength of bagasse ash brick as Satisfies the strength of other bricks.

Fig. 1. Casted hollow bricks

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