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Experimental Study on Traditional Clay Bricks byadding Bagasse Ash and Fly Ash

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ABSTRACT: Bagasse is the fibrous matter that remains after sugarcane or sorghum stalks are crushed to extract their juice. The dry pulpy residue left after the extraction of juice from sugarcane. It is used as a bio fuel and in the manufacture of pulp and building materials. For each 10 tons of sugarcane crushed, a sugar factory produces nearly 3 tones of wet bagasse. Bagasse is an extremely inhomogeneous material comprising around 30-40% of "pith" fiber, which is derived from the core of the plant and is mainly parenchyma material, and "bast", "rind", or "stem" fiber, which comprises the balance and is largely derived from sclerenchyma material. Nowadays, it is commonplace to reutilize sugarcane bagasse as a biomass fuel in boilers for vapor and power generation in sugar factories. Depending on the incinerating conditions, the resulting sugarcane bagasse ash (SCBA) may contain high levels of SiO2 and Al203, enabling its use as a supplementary cementious material (SCM) in blended cement systems. Uses of Sugarcane bagasse waste in brick can save the sugarcane industry disposal costs and produce a 'greener' bricks for construction.

KEYWORDS: Bagasse ash, Fly ash, clay bricks, compressive strength, water absorption

I. INTRODUCTION

Nowadays, alternative raw materials are being experimented with in concrete due to their potential advantages in reducing pollution and construction costs. Concrete, which typically consists of water, coarse aggregate, and fine aggregate, can be partially or completely replaced with supplementary cementitious materials to improve its characteristics. By reusing ashes from industries, factories, and fields rather than dumping them into nearby water bodies or land, pollution can be reduced. Fly ash, silica fume,

metakaolin, rice husk ash, bagasse ash, and palm oil ash are among the most commonly used admixtures. These materials can provide additional strength to concrete due to their similar characteristics with cement after respective treatments. India is the second-largest producer of sugarcane after Brazil, and it produces 44,000 tonnes of Bagasse ash per day. This waste material is used in co-generation plants due to its high calorific value, in paper and pulp making due to its fibrous nature, and in electricity production. Extensive research has been conducted to use it as a filler

material in concrete, where it has demonstrated additional strength, reduced heat of hydration, good workability, and high durability characteristics.

The use of Sugarcane Bagasse Ash (SCBA) in concrete has been extended to self-compacting, self-consolidating, foaming, high-strength, and ultra-high-strength concrete. Research has proven the efficacy of SCBA as a good pozzolanic admixture in concrete.

II. LITERATURE REVIEW

[1] An Experimental Investigation of Rice Hask Ash and Sugercane Bagasse ash Clay Bricks (2017)

Rice husk ash and bagasse ash bricks can be extensively used in all building constructional activities similar to that of common burnt clay bricks. The rice husk ash and bagasse ash bricks are comparatively lighter in weight and stronger than common clay bricks. The object of this investigation regarding rice husk ash and bagasse ash bricks, properties. Laboratory experiments were carried out on clay bricks with replacement of rice husk ash and bagasse ash. Rice husk and bagasse ash bricks are lighter in weight and more compressive strength at 10 % replacement. An agreement diagram is plotted wherethe variation of actual vs. predicted values of compressive strength lies between + 5 % error.

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[2] An Experimental Investigation on the Combine Effectof Bagasse Ash and Rubber Tyre in Production of Bricks (2018)

This work carried out partial replacement of fly ash by bagasse ash with waste rubber tyre in order to reduce industrial waste. The effective use of these waste products is challenging task for researcher through environmental impact. Bagasse is often used as a primary fuel source for sugar mills. When burned in quantity, it produces sufficient heat energy to supply all the needs of a typical sugar mill, with energy to spare. This sugar manufacturing industries produces a lot of sugarcane bagasse ash which is disposed of in an open land. Huge quantity of ash which is a waste product, available at very negligible rate. This sugarcane bagasse ash is a fibrous waste product and has pozzolanic properties which can be made use in construction industry. Pozzolanic materials can be used as a partial replacement in the production of low cost fly ash bricks. Bagasse ash is utilized by replacing it with fly ash in bricks. Trial bricks were tested with different proportions of 10%, 20%, 30%, 40% and 50% with replacement of BA. These bricks were tested in Compression test and Water absorption test as per Indian Standards. The aim of this research was to make economical and green bricks to maintain environmental balance, and avoid problem of ash disposal.

[3] Experimental Investigation of Bricks Using Bagasse Ash Replacement By Fly Ash (2023)

Many researchers have focused on utilizing industrial and agricultural waste residue for environmental and technical reasons. One such waste product is sugarcane bagasse ash, which is generated from burning sugarcane bagasse. This waste material is available at a minimal rate and in enormous quantities. Its productive utilization can help resolve land pollution problems. In this project, we aim to use sugarcane bagasse ash as a replacement for fly-ash in brick production. The bricks will be tested with varying proportions of sugarcanebagasse ash, namely 30%, 40%, and 100% as a replacement for fly ash. The bricks will undergo various tests, including Indian standards and ASTM, to ensure their quality. The use of sugarcane bagasse ash in the brick production process will not only help in reducing environmental pollution but also promote sustainable development.

[4] Experimental Investigation on Replacement of Bagasse Ash in Bricks (2017)

This document partially replaces fly ash with pulp to reduce waste. Effective use of this waste is a challenge for scientists due to its impact on the environment. Pulp is often used as an essential oil for confectionery. The aim of this study is to create a commercial andenvironmentally friendly brick in order to have a balanced environment and avoid the waste problem. It isimportant that these wastes are disposed of safely without affecting human and environmental health. Therefore, reuse is highly desirable and bagasse has also been found to have high silica and pozzolanic properties.Therefore, it can be used instead of household appliances.

[5] Recycling of bagasse and rice husk ash in brick making (2016)

Today, international research has focused on the use of commercial or agricultural waste. materials for the construction industry. The use of this waste will not onlybe economical, but also safe and non-toxic. The main purpose of this article is to develop an environmentally friendly and energy efficient brick using pulp ash (SCBA) and rice husk ash (RHA) as raw materials. SCBA and RHA are the main products of the sugar refining industry and rice mills, respectively. The chemical composition and particle size of these waste samples were analyzed by scanning electron microscopy(SEM).In this study, SCBA and RHA were mixed in certain proportions (2.5%, 5%, 10%, 15%, 20%) to modifythe clay and produce bricks. Experimental results show that the use of SCBA-RHACLAY composite bricks is lighter, more durable, less hazardous, energy saving, more energy due to pozzolanic material, and reduces impermeability due to pore thinning.

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III. PROPOSED METHODOLOGY

1.1 MATERIALS USED

1.1.1 Sugarcane bagasse ash

The burning of bagasse which is a waste of sugarcane produces bagasse ash. Presently in sugar factories bagasse is burnt as a fuel so as to run their boilers. This bagasse ash is generally spread over farms and dump in ash pond which causes environmental problems also research states that Workplace exposure to dusts from the processing of bagasse can cause the chronic lung condition pulmonary fibrosis, more specifically referred to as bagassosis. In this experimental work SCBA was collected from the Manas Agro Industries and Infrastructure Ltd., Umred, Nagpur, Maharashtra, India.

[Fig.3.1: Sugarcane bagasse & sugarcane bagasse ash]

Sugar cane bagasse ash (SCBA) is an abundant by product of the sugar and ethanol industry. SCBA is generally used as a fertilizer or is disposed of in landfills,which has led to intensified environmental concerns.

Table 3.1: Physical properties of Sugar bagasse ash

Material	Density (Kg/cum)	Specific Gravity	Fineness Passing 45 µm	Specific Surface area (cum/Kg)	Mean grain size (µm)
Bagasse ash	0.4	1.8	95	900	5.1

Table 3.2: Chemical properties of sugarcane bagasseash

Component	Mass %
Silica (SiO2)	66.79
Alumina (Al2O3) Ferric oxide (Fe2O3)	29.20
Calcium oxide (CaO)	1.96
Magnesium oxide (MgO)	0.84
Sulphur tri oxide (SO3)	0.57
Loss of Ignition	0.72
Chloride	-

1.1.1 Water

Locally available water has been used in brick manufacturing. The bricks, when tested in accordance with the procedure laid down in IS 3495 (Part 2), after immersion in cold water for 24 hour, shall have average water absorption not more than 20 percent by mass up to class 12.5 and 15 percent by mass for higher classes. Water is important ingredient of brick as it actually usedfor manufacturing of brick. Since it helps to bind all the raw materials for giving

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proper mix. Water used formaking brick should be free from impurities.

The common specifications regarding quality of mixing water is water should be fit for drinking. Such water should have inorganic solid less than 1000 ppm. This content lead to a solid quantity 0.05% of mass of cement when w/c ratio is provided 0.5 resulting small effect on strength. But some water which are not potable may be used in making concrete with any significant effect. Dark color or bad smell water may be used if they do not posses deleterious substances. PH of water to even 9 is allowed if it not tastes brackish. In coastal areas where local water is saline and have no alternate sources, the chloride concentration up to 1000 ppm is even allowed for drinking. But this excessive amount of alkali carbonates and bicarbonates, in some natural mineral water, may cause alkali-silica reaction. A simple way of determining the suitability of such water is to compare the setting time of cement and the strength of mortar cubes using the water in question with the corresponding results obtained using known suitable or distilled water. About 10% tolerance is generally allowed. Such tests are recommended when water for
which no service record is available containing dissolvedsolids in excess of 2000 ppm or, in excess of 1000 ppm. When unusual solids are present a test is also advisable.

1.1.1 Clay

Clay is a type of fine-grained natural soil material containing clay minerals Gay Head Cliffs in Martha's Vineyard consist almost entirely of clay. Clay collect from Ghorad village, kalmeshwar, Nagpur, Maharashtra, India. Clay soil is soil that is comprised of very fine mineral particles and not much organic material. The resulting soil is quite sticky since there is not much space between the mineral particles, and it does not drain well at all.

[Fig.3.3: Clay]

1.2 MAKING OF BRICK

In the present study brick contains clay, fly ash andSCBA. Certain amount of the fly ash is substituted with Bagasse ash, this data from the Bagasse ash fly ash brick is than compared with that from a standard fly ash brick without bagasse ash. Four bricks samples of size 19 cm ×9 cm × 8 cm were cast. The industrialized manufacturingprocedure of bricks generally involves of three steps:

- Mixing the ingredients
- Placing the mix in the mould

1.3 TEST CONDUCTED ON BRICKS

Following tests shall have conduct on brick sample.

1. Compressibility test
2. Water absorption test
3. Soundness test
4. Hardness Test

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1.3.1 Compressibility test

Compressive strength test was carried out for bricks with different mix proportion of carbon buster. The specimen is placed between two plywood sheets of each having 3mm thick and carefully centred in compression testing machine. The ultimate load is noted. The compressive strength is the ratio of ultimate load to the resisting area of brick loaded. The compressive strength of the brick is obtained by using the formula,

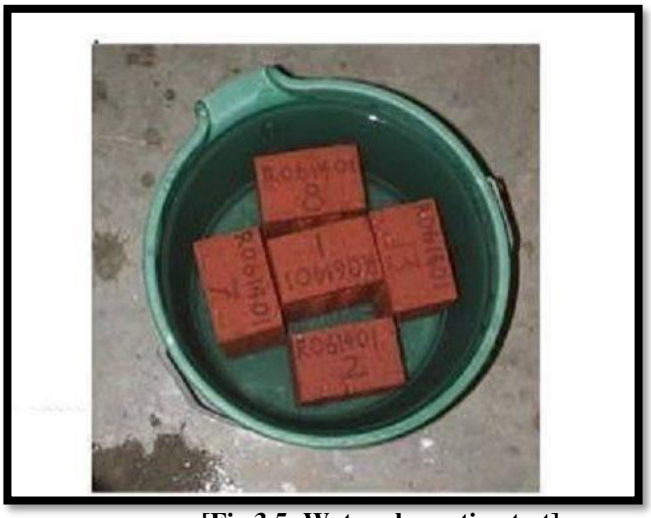
Compressive strength = Ultimate load/ Resisting Area

[Fig.3.4: Compressibility test]

1.3.2 Water absorption test

In water absorption test, the dry weight of brick was noted as weight (M1). Then the dry brick was completelyimmersed in water at room temperature for 24 hours. After 24 hours bricks were removed from the water and allowed to drain for 3 minutes and wipe out any traces ofwater with damp cloth. Now the weight was noted as (M2). The water absorption was calculated in percentageand tabulated in table and shown in next table.

Water absorption % = (wet weight – dry weight)/ dryweight



[Fig.3.5: Water absorption test]

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IV. RESULTS & DISCUSSION

4.1 COMPRESSIVE STRENGTH

Table 4.1: Compressive strength of differentproportion of bagasse ash in clay bricks

S.No.	Sample	Amount of Bagasse ash (%)	Compressive Strength (MPa)
1.	Std.	0	2.50
2.	SBA 1	5	1.30
3.	SBA 2	10	1.36
4.	SBA 3	15	1.26
5.	SBA 4	20	1.44
6.	SBA 5	25	1.39
7.	SBA 6	30	1.32

4.2 WATER ABSORPTION TEST

Table 4.3: Dry weight, wet weight and water absorption ratio for various proportions of Bagasse ashin Clay Bricks

S.No.	Sample	Amount of Bagasse ash (%)	Dry Weight (W1) (Kg)	Wet Weight (W2) Kg)	Water Absorption Value %
1.	Std.	0	2.850	3.188	11.86
2.	SBA 1	5	2.505	2.813	11.82
3.	SBA 2	10	2.481	2.798	12.77
4.	SBA 3	15	2.389	2.672	11.64
5.	SBA 4	20	2.250	2.506	11.36
6.	SBA 5	25	2.044	2.398	17.31
7.	SBA 6	30	1.985	2.263	14.00

Table 4.4: Dry weight, wet weight and water absorption ratio for various proportions of Fly ash inClay Bricks

S.No.	Sample	Amount of fly ash (%)	Compressive Strength (MPa)
1.	Std.	0	2.50
2.	FA 1	5	1.66
3.	FA 2	10	1.69
4.	FA 3	15	1.58
5.	FA 4	20	1.72
6.	FA 5	25	1.56
7.	FA 6	30	1.46

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S.No.	Sample	Amount of fly ash (%)	Dry Weight (W1) (Kg)	Wet Weight (W2) Kg)	Water Absorption Value %
1.	Std.	0	2.850	3.188	11.86
2.	FA 1	5	2.660	2.926	10.00
3.	FA 2	10	2.610	2.898	11.03
4.	FA 3	15	2.590	2.872	10.88
5.	FA 4	20	2.483	2.786	12.09
6.	FA 5	25	2.348	2.688	14.18
7.	FA 6	30	2.185	2.553	16.48

VI. CONCLUSION

The project work has been carried out by adding various
% of sugarcane bagasse ash, fly ash for increasing compressive strength of bricks. The results are indicative of satisfactory performance of green bricks based on experimental investigations concerning compressive strength and the following conclusions have been made from this work.

- Compressive strength of brick increases on increasein percentage of both the material i.e. bagasse ash and fly ash (up to 20%each). But after increase in amount of material the compressive strength goes on decreases. With the further increase 30% slight cracks are occurred.
- It is noted that 20% of bagasse ash and 20% fly ash
i.e. (total 40%) is replaced sample give maximum strength amongst all the proportions.
- At 20% of replacing bagasse ash it gives 1.45MPa compressive strength and at 20% of using only fly ash it gives 1.71MPa.
- As addition of bagasse ash more than 20% causes more water absorption, reduction in compressive strength, less hardness, under burnt.
- So we recommend that up to 20 to 25% of bagasse ash can be replaced by clay bricks.
- Use of bagasse ah in brick can solve the disposal problem, reduce the cost and produce a ‘greener’ eco-friendly bricks for construction.

This sugarcane bagasse ash is a fibrous waste product and has pozzolanic properties which can be made use in construction industry. Pozzolanic materials can be used as a partial replacement in the production of low-cost flyash bricks. The aim of this research was to make economical and green bricks to maintain environmental balance, and avoid problem of ash disposal. It is very essential to dispose these wastes safely without affectinghealth of human being and environment. So, there is a great need for its reuse, also it is found that bagasse ash in high in silica and found to have pozzolanic property. So it can be used as substitute to construction material.

- promote the solid waste from the sugar mills as auseful product.
- To manage the disposal of waste product intoconstruction raw material.
- To dispose the waste safety.
- To encourage the waste products as eco-friendly material.
- To make the bricks which are energy efficient which is the only viable solution to the environmental concerns and natural resources conservation for future generations.

Conflict of interest statement
Authors declare that they do not have any conflict of interest.

REFERENCES

Ashish Kant Ahirwar, Paveen Singh Tomar (2018), AnExperimental Investigation on the Combine Effect of Bagasse Ash and Rubber Tyre in Production of Bricks, International Journal of Advance Research, Ideas and Innovations in Technology (Volume 4, Issue 4) Available online at: www.ijariit.com.
Abdul G. Liew, Azni Idris, Calvin H. K. Wong, Abdul A. Samad, Megat Johari, M.M. Noor, Aminuddin M. Bakri, 2004. Incorporation of sewage sludge in clay brick and its characterization. Journal of Waste Management and Research,
Chaitanya Bharathi Institute of Technology, Proddatur, Andhra Pradesh, India) Bagasse ash an Effective Replacement of Fly Ash Bricks.

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8.https://www.processindustryforum.com/energy/20-most-eco- friendly- buildings-on-earth
[5] https://igbc.in/igbc/redirectHtml.htm?redVal=showAboutusnosign&id=abo ut-content
[6] https://theconstructor.org/building/green-building-materials/7028/

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