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Fly Ash & Sugarcane Bagasse Bricks(Study for the Compressive Strength with Varying Material Composition & Water Absorption Test)

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Abstract -
In the present day scenario the demand for software program and utilization of fly ash is developing in many sectors and many Advantages, low hydration in preliminary stage will quit end result in low strength, fly ash is on the whole launched from electrical energy plant Quantity as a waste product and storing or stocking it on fertile land or maintain room for in addition recycling purposes. The effects confirmed that replace Cement 1.5 percent by sugarcane waste this will keep the bricks structure With regard to flexibility and excessive strengths. This will to minimize the preliminary price of constructing material.
To obtain environmental, social and monetary with Cement Brick Mixture in Sugarcane Bagasse (SCB) Stability issue with the aid of lowering darkish cloud and therefore it's have an effect on human health. Remove scent Impress visible photograph of mysterious bagasse (SCB) emerging. The great of existence of Egyptians by using the facet of the road. In addition, integrating waste into the development enterprise Improve avenue look and environmental stipulations by means of decreasing nearby local weather air pollution. Lookup used an experiment for measure SCB mix cement bricks for structural properties.
Keyword: *Sugarcane Bagasse Ash; Sugarcane Bagasse; Cement; Rice Husk and Brawn; Industry Waste; Agricultural Waste; Sand*

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I. INTRODUCTION-

For numerous times, progressive ideas for the exercise of natural waste Fiber has been developed. Different types of natural waste in Egypt Is ditched and the waste is disposed of in tips this stir puts the terrain and people's fitness at threat. numerous waste people aggregation insurance programs are set to reclaim solid waste accoutrements primarily by natural waste filaments, indicating that choice manufacturers understand that different diligence need to insulate these wastes for manufacturing. How to reclaim and combine into separate accoutrements.

The periodic consumption of extensively dispersed burnt complexion bricks is about 340 billion tons of complexion, about 5000 acres of peak subcase, which is shoveled for erecting bricks emigrations from corrosion, coal burning. Or the motive of wood deforestation are serious issues of the slipup assiduity. Use of complexion bricks and fly ash may be considered for erecting use in new structures.

In the 2019 and 2020 crop times, transnational sugar manufacturing stood at about166.18 million metric tons, of which2020/2021.80 percent of sugar product is anticipated to come from sugarcane in tropical and tropical climates. The remaining 20 from sugar beets, which are grown in the high temperate regions of the Northern Hemisphere. In total, further than one hundred and twenty nations produce sugar.

India slipped to alternate place in sugar manufacturing during 2019- 2020, reducing Brazil's top spot. India's fiscal system produced28.9 million metric stacks of sugar. About 17 percent of the sugar product from this bill is166.18 million metric tons.

Brazil surpassed India as the world's largest patron of sugar at some point in the 2019- 2020 crop time. At the rearmost, some experimenters have noted the use of sugarcane bagasse ash in colorful types of fine summations similar as the manufacture of bricks, as an indefatigable construction fabric in geo- polymer concrete, soil stabilization, structure blocks and bricks. As development. Padding, asphalt concrete. Enough exploration has been done to find out that some houses can be erected using sugarcane bagasse.

Figure.1. Sugarcane Bagasse

Figure.2. Sugarcane Bagasse As

II. USE

2.1 Bricks Uses:-

Bricks are used for structure, block paving and sidewalks. In the US, slipup pavement was set up unfit to repel heavy business, but it's coming back in use as a system of business calming or as a ornamental face on rambler demesne. For illustration, in the early 1900s, utmost thoroughfares in the megacity of Grand Rapids, Michigan, were paved with slipup. Moment, only about 20 blocks of slipup paved roads remain (lower than0.5 percent of the aggregate of all roads in the megacity limits). Bricks in the metallurgy and glass diligence are frequently used for lining furnaces, in particular refractory bricks similar as silica, magnesia, chamotte and neutral (chromomagnesite) refractory bricks. This type of slipup should have good thermal shock resistance, contrariness under cargo, high melting point and satisfactory porosity. There's a large refractory slipup assiduity, particularly in the United Kingdom, Japan, the United States, Belgium and the Netherlands. In home surroundings, cement bricks can be used for homes as well as theater structures similar as retaining walls, and for paving driveways and walkways. In addition, they're frequently used in the construction of low- cost casing for a variety of reasons.

Bricks can use cement bricks to make theater structures and houses. What is further, these bricks are the stylish option when it comes to low cost casing construction. What's this? They're available in colorful shapes, textures and sizes.

2.2The Production of SCB in India -

i. Sugarcane has been cultivated in India since the Vedic period. The foremost citation of sugarcane civilization is set up in Indian jottings in the period from 1400 to 1000 BC. It's now extensively accepted that India is the native home of the Saccharum species.

ii. Bagasse is most generally used to produce heat and electricity in sugar manufactories (co-generation), but can also be used to make paper, as cattle feed, and to manufacture disposable food holders. Presently, sugarcane assiduity substantially uses bagasse as energy to meet its energy conditions.

iii. For every 10 tons of sugarcane crushed, a sugar plant produces about three tons of wet bagasse. Using this by- product directly as energy is challenging due to the high humidity content, generally 40 – 50 percent. Rather, bagasse is generally stored before farther processing.

iv. For power generation, bagasse is stored in wettish conditions. Under these conditions, bagasse undergoes a mild exothermic process as the residual sugar is slightly reduced.

v. For paper and pulp product, bagasse is typically kept wet to grease posterior junking of any remaining sugar as well as small pith filaments. These filaments hamper the paper making process.

2.3The properties of Sugarcane bagasse (SCB) -

Khoya is miscellaneous in terms of flyspeck size and shape. With respect to the three major factors, polymers Hemicellulose, cellulose and lignin. The chemical ingredients, physical parcels and structural parcels of sugarcane bagasse are listed. SCBs parade excellent parcels similar as indefectible finish, high strength, low thermal conductivity and easy product according to the mechanical parcels.

Sugarcane is the main food crop in both tropical andsub-tropical countries. It's the main source of sugar product. Sugarcane bagasse (SCB) is the waste produced after rooting juice from sugarcane. Bagasse ash from sugarcane (SCBA) is attained by burning sugarcane bagasse.

Table: - 1 Chemical Composition of Sugarcane Bagasse

S.Number	Chemical	Percentage%
1.	Si02	73
2.	Al2o3	6.7
3.	Fe2o3	6.30
4.	Ca0	2.8
5.	Mg0	3.2
6.	Na2Co3	1.1
7.	K2o	2.4

III. METHDOLOGY -

3.1 Method:-

i. Collection of materials used in making sugarcane bagasse ash waste and cement bricks such as cement, sugarcane waste, rustic slipup moulds, sugarcane bagasse ash.
ii. Mixing components in different proportions in three different devices.
iii. The first pot will contain 30 sugarcane waste and 70 cement.
iv. The alternate vessel will contain 40 sugarcane waste and 60 cement.
v. The third vessel will contain 50 sugarcane waste and 50 cement.
vi. In this, 5 sugarcane ash is mixed in each vessel.
vii. Three bricks are made in different proportions.
viii. The mixture is also poured into the soil for the final shape of the bricks.
ix. The size of the earth is the standard of bricks. {19 cm × 9 cm × 9 cm}
x. All bricks are kept for 14 to 21 days to test the compressive strength and water immersion test.
xi. Cement- 60 cement will be used out of the total potential slipup material. Beech and chemicals will also be used to make bricks.
xii. Sugarcane Bagasse- Sugarcane waste will be used in place of items like cement, beach and other items.
xiii. Sugarcane bagasse ash- Cane bagasse ash will also be used for making bricks.
xiv. 40 bagasse of sugarcane and ash from sugarcane bagasse will be used for making cement bricks.

Figure.3.Sugarcane Bagasse & Ash Mix

Figure.4.Bricks

3.2 Test Set up-

Following 8 tests can be done to know the quality of bricks. Some of these tests are done in the laboratory and the rest are on the field.

i. Size, shape and color test color test
ii. Soundness Test
iii. Water Immersion
iv. Hardness T Test
v. Compressive Strength Test

3.3. Size, Shape and Colour Test

In this test 20 aimlessly assembled bricks are placed according to length, extent and height and also measured to find the variation of size as per standard. The bricks are almost sawn to see if its edges are sharp and straight and unchanging in shape. A good quality slipup should be condensed and irreversible throughout.

3.4 Tenacity Test

In this test two bricks are held with both the hands and hit each other. If the bricks give a clear metallic ringing sound and do not crack then they are good quality bricks

3.5 Water Immersion Test

In this test bricks are counted in dry condition and they are allowed to submerge in fresh water for 24 hours. After 24 hours of absorption, they are removed from the water and wiped with a cloth. Slipups are also counted in the wet state. The difference between the weights is the water absorbed by the slipup. The probability of water immersion is also calculated. The less water is absorbed by slipups, the improved its quality. Good quality slipup absorbs water no more than 20 of its own weight.

Acceptance Criteria for Water Immersion Testing of Bricks

The recommendation of the test result is as follows

• For bricks of the first class, 15. Not more than
• For bricks of class II, it is 20. Should not exceed
• For Class III bricks, it is 25. Should not exceed

i. Sensitive Weight Balance
ii. Voiced Roster

3.7 Hardness Test

In this test the face of the slip is scratched with a hard object. If it does not leave any impact on the slipup then it is a good quality slipup.

IV. COMPRESSIVE STRENGTH TEST

4.1. Partial Relief:-

This test is done to know the compressive strength of the slipup. It is also called the crushing power of the slipup. Usually 5 samples of bricks are taken one by one to the laboratory for testing and testing. In this test a slipped sample is placed on the crushing machine and pressure is applied till it breaks. The final pressure at which the slipup is crushed is taken into account. All the five slipup samples are tested one by one and the average result is taken as the compressive/crushing strength of the slipup.Partial relief of cement by SCBA in concrete will prolong the original and final setting time of mixed concrete. Setting time detention is largely due to the following factors due to high water rise, decreased cement content, and presence of SCBA fly spec layers around anhydrous cement patch which will reduce cement hydration.

4.2 Compressive Strength Test for Bricks (IS 3495-Part-11992)

A contraction testing machine, whose contraction plate shall have a ball seating as part of a sphere, whose center coincides with the center of the plate, shall be used.

4.3 Preconditions

Smooth out any visible unevenness in the face of the bed to give two smooth and even faces. Immerse in water for 21 hours at room temperature. Remove the sample and remove any unnecessary moisture at room temperature. Fill frogs (where available) and flush all voids in the bed with cement mortar (1 cement, grade 3 mm and clean coarse beach below). Store under damp jute bag for 24 hours and immerse in clean water for 3 days. Remove, and wipe away any traces of moisture process

Place the instance with the flat face vertical, and the mortar-filled face overhead, between two to 3 plywood wastes, each 3 mm thick and precisely centered between the plates of the test machine. Apply cargo axially at an irreversible rate of 14 N/mm (140 kg/cm) per nanosecond until failure occurs and note the maximum cargo at failure. Cargo on failure shall be the maximum cargo at which the sample fails to produce any test machine. Note- the Cataplasm of Paris can be used in place of plywood waste to insure the irreversible face for placing cargo.

4.4 Report-

Compressive strength in N/mm² = $\frac{\text{Maximum load at failure in N}}{\text{Average area of the bed faces in mm}^2}$

Table: 2 Compressive strength

Compressive Strength of Bricks	
Types of Bricks	**Strength**
First Class Bricks	105 kg/cm^2
Second class Bricks	70 kg/cm^2
Common Building Bricks	35 kg/cm^2
Sun Dry Bricks	15-25 kg/cm^2
Fly ash Bricks	90-100 kg/cm^2

Figure. **5. Compressive Strength Machine**

Figure.6**. Water absorptions**

V.WATER ABSORPTION TEST FOR BRICKS (IS 3495)

How to Calculate Water Discharge Value for Bricks (IS 3495) the water immersion value of bricks largely affects the bond between slipup and mortar. However, water from recently laid mortar is likely to be absorbed by the bricks if the bricks have high water immersion and are not soaked prior to the masonry work. This results in poor mortar strength because a sufficient amount of water will not be available for the hydration process. This work describes a detailed procedure for water immersion testing for bricks in agreement with IS 3495, p-2.

Table: - 3the types and Waste of Indian agricultural waste:-

S. No.	**Types Of Agriculture Waste**	Annual Availability **(Kt. /year)**
1.	Rice Waste Rice Straw Rice Husk	161893.00 141120.00 20773.00
2.	Sugarcane Wastes Sugarcane Bagasse Sugarcane Tops And leaves	114761.00 73775.00 40986.00
3.	Maize Waste Maize Straw Maize Cobs	33720.00 28396.00 5324.00
4.	Banana Waste Banana Fruits Peels Banana pseudo-Stem	67776.00 393.00 67383.00
5.	Mustard Waste Mustard Press Cake Mustard Seedpod Mustard Stalks	16877.00 2681.00 1355.00 12841.00
6.	Sesame(Stalks)	1207.00
7.	Soybean Husk	671.00
8.	Coconut Waste Coconut Fronds Coconut Shell Coconut Coir Pith	9060.00 7769.00 726.00 565.00
9.	Areca Nut (Fronds, Husk)	1000.80
10.	Groundnuts (Shells)	1385.00
11.	Bajra (Stalks, Cobs, Husk)	15831.00
12.	Jowar (Cobs, Stalks, Husk)	24207.00
13.	Ragi (Straw)	2630.20
14.	Cotton Waste Cotton Stalks Cotton Hull	38281.00 35397.00 2884.00
15.	Pulses (Stalks, Arhar, Gram, Masoor, Husk)	13462.00

Table 4: - Content of Sugarcane Bagasse: -

Groups	**Compounds**	**%**
Sugars	Sucrose Reducing Sugars Oligosaccharides Polysaccharides	81-87 3-6 0.06-0.6 0.2-0.8
Salts	Inorganics Salts	1.5-3.5
Organic Non Sugar	Organic Acids Amino Acids Dextran Starch Gums Colorants	0.7-1.3 0.5-2.5 0.1-0.6 0.11-0.5 0.02-0.05 0.05-0.15 0.1

5.1 The Production of SCB in India

Sugarcane has been cultivated in India since the Vedic period. The foremost citation of sugarcane civilization is set up in Indian jottings in the period from 1400 to 1000 BC. It's now extensively accepted that India is the native home of the Saccharum species.

Bagasse is most generally used to produce heat and electricity in sugar manufactories (co-generation), but can also be used to make paper, as cattle feed, and to manufacture disposable food holders. Presently, sugarcane assiduity substantially uses bagasse as energy to meet its energy conditions.

5.2 The properties of Sugarcane bagasse (SCB)

Khoya is miscellaneous in terms of flyspeck size and shape. With respect to the three heads Hemicellulose, cellulose and lignin. The parcels of sugarcane exhibits high disfigurement parcels, high strength, low envelope conductivity and product parcels.

Table: - 5:-The properties of sugarcane bagasse: -
Chemical components

Components	Composition%
Glucose	**19.5**
Xylose	**10.5**
Arabinose	**1.5**
Galactose	**0.55**
Lignin	**9.91**
Organo soluble	**2.7**
Reducing Sugar	**1.85**
Uronic Acids	**1.91**
Ash	**1.6**
Cellulose	**50**
Total Hexoses	**20.04**
Total %	**12**

Table: - 6 Physical properties

Diameter (μm)	**10-34**
Length (mm)	0.8-2.8
Aspect Ratio (1/d)	76
Moisture Content (%)	49

Table: - 7 Structural properties

Tensile Strength (Mpa)	**180-290**
Young's Modulus (Gpa)	15-19
Failure Strain(%)	1-5
Density (kg/m3)	880-270

VI. RESULT

6.1 Test Procedure for Water Absorption for Bricks

Test Procedure for Water immersion for Bricks

i. [1]. the sample is dried in a voiced roaster at a temperature of 105 to 1150C; until it attains a fairly stable mass. The sample is cooled to room temperature and weighs M1. is recorded as

ii. [2]. the dried test instance is immersed in fully clean water at room temperature of 27 ± 20C for 24 hours.

iii. [3]. Also the sample is removed and any traces of water are wiped off with a damp cloth and the sample is counted. The importing is completed 3 twinkles after the sample is removed from the water. Weight to M2.

6.2 Calculation of %of Water Absorption

Water immersion, chance by mass, after 24 hours of absorption in cold water is given by the following formula water immersion = ((M2- M1)/ M1) x 100

Table: 8: Water Absorption Test:-Table

Properties	Weight of Dry Bricks (w1 kg)	Weight of wet Bricks (w2kg)	Weight of water absorbed (w2-w1)kg	% Water absorbed(kg)	Average %
0%	2.722 2.735 2.719	3.199 3.115 3.096	0.477 0.380 0.377	15.65 13.94 13.67	14.32
10%	2.710 2.731 2.622	3.134 3.203 3.124	0.424 0.472 0.502	14.52 16.66 16.72	15.89
20%	2.568 2.662 2.665	3.167 3.133 3.122	0.599 0.471 0.457	17.27 14.66 14.32	16.02
30%	2.506 2.678 2.753	3.232 3.324 3.234	0.726 0.646 0.481	17.56 17.654 16.692	16.92

As we can see in result, as percentage of bagasse and ash increased water absorption of bricks increased. Up to 10 % bagasse ash is adequate to replace.

Table: - 9: Compressive Strength Test: -Table

Properties	Size of Bricks (mm2)	Surface area (mm2)	Load at failure (P) In KN	Compressive strength (P/A) in N/mm2	Average
0%	224*127	28448	120 150 120	4.22 5.27 4.22	4.57
10%	224*127	28448	90 110 100	3.16 3.68 3.52	3.26
20%	224*127	28448	80 80 100	2.81 2.81 3.52	3.05
30%	224*127	28448	90 80 70	3.16 2.81 2.46	2.81

As per the results of compressive strength test, up to 10% bagasse and ash strength is as per requirement. After 10 % the strength reduces. It is desirable to use only up to 10 % bagasse ash.

VII. CONCLUSIONS -

From the below discussion and literature review we will find that sugarcane bagasse, rice waste, marble waste and glass waste are used for making normal size bricks. In all reviews, sugarcane waste was used to make bricks from complexion or marble waste. In all the styles the bricks were dried for 14 days to 21 days, after which it's hatted to high temperature to gain good quality bricks. Sugarcane bagasse was cut into small pieces to mix well with the soil. The complexion/ cement rate was low in all tests, but had advanced compressive strength, plasticity than normal complexion blend bricks. The end result of reading these papers is to reduce the quantum of soil and use the waste accoutrements present in large amounts in India.

From the below conclusion I've decided to probe on slipup blend of sugarcane bagasse, sugarcane bagasse ash and cement in different proportions. Colourful proportions are mixed to make bricks by testing compressive strength, water immersion test, continuity, weight of bricks. The mixing rate with cement is 60 cement and sugarcane bagasse is 40.

From the analysis of the below results, the following conclusions can be drawn

i. The disposal problem can be answered by using bagasse ash in bricks; Reduce costs and produce' green ‘eco-friendly bricks for construction.

ii. Through this exploration the environmental impact of waste and the problems of waste disposal can be reduced.

iii. Through this exploration a better result is formed by an innovative structure material.

iv. This study helps in converting the priceless bagasse ash into bricks and makes it precious.

v. It reduces the cost of material per slipup.

vi. From the laboratory tests, it's observed in all the tests that up to 20 of bagasse ash has all the characteristics of

vii. Bricks are sufficient and desirable for use in erecting construction.

viii. Further than 20 of bagasse ash causes further water immersion, reduced compressive strength, lower hardness, lower burning.

ix. Thus we recommend that 20 to 25 of the lost ash can be replaced with complexion in bricks.

6.1 Scope of future work

To make bricks and reduce agrarian waste. A large quantum of sugarcane waste is generated every time, through this process the waste can be used in different ways. The demand for cover ash bricks is adding in India. As to the cost and environmental benefits, people more and more prefer cover ash bricks than common burnt bricks. India is dependent on coal grounded power shops. These shops produce fly ash in veritably large amounts. Therefore Sugarcane Bagasse Ash (SCBA) is the residue attained by burning bagasse in the sugar assiduity. In general, ash with high silica content contains a high proportion of quartz (Faria, Gurgel, &Holanda, 2010). It's honored as a solid waste and is generally disposed of as a tip the demand for cover ash bricks is adding in India. As to the cost and environmental benefits, people more and more prefer cover ash bricks than common burnt bricks. India is dependent on coal grounded power shops. These shops produce fly ash in veritably large amounts.

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