Utilization of Bagasse Ash as a Brick Material

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***Abstract*- Depending on incinerating conditions, sugarcane bagasse ash (SCBA) may contain high levels of SiO_2 and Al_2O_3. Uses of sugarcane bagasse ash waste in brick can save the sugarcane industry disposal costs and produce "Greener" bricks for construction. In this research the bagasse ash, stone dust, cement and lime can be used as the replacement of clay and sand in burnt clay bricks. The different proportions of 0%, 10%, 20%, 30%, 40%, 50% and 60% of these materials are taken and bricks can be manufactured. After a full manufacturing process the bricks were tested in laboratory and results were analyzed regarding the compressive strength.**

Index Terms: sugarcane bagasse ash, greener bricks, compressive strength

I. INTRODUCTION

In recent years, there has been a growing interest in sustainable building materials that can reduce the environmental footprint of the construction industry. One such material that has gained attention is bagasse ash, a byproduct of sugarcane processing. Bagasse ash is rich in silica and alumina, making it a suitable substitute for clay in brick production. By incorporating bagasse ash into brick manufacturing, the construction industry can reduce its reliance on natural resources, minimize waste disposal issues, and promote sustainable building practices. The use of bagasse ash in brick production can also help to reduce the environmental impacts associated with traditional brick manufacturing, such as greenhouse gas emissions and air pollution. Furthermore, the utilization of bagasse ash can provide a new revenue stream for sugarcane industries and brick manufacturers, promoting economic development and sustainability. Overall, the utilization of bagasse ash as a brick material is a promising area of research that can contribute to a more sustainable and environmentally friendly construction industry.

This study explores the potential of utilizing bagasse ash as a sustainable material in brick production, reducing waste disposal issues and promoting eco-friendly construction practices. By incorporating bagasse ash into bricks, the construction industry can reduce its environmental footprint while creating a valuable product from waste material.

II. OBJECTIVES

- Effectively utilize sugarcane bagasse ash (SCBA) as a primary raw material in brick production
- To significantly lower the embodied carbon dioxide (CO_2) emissions
- To minimize the extraction and consumption of raw materials such as clay, sand, and natural aggregates.
- To mitigate environmental pollution caused by the improper disposal or burning of bagasse ash.
- Entities or lower production costs compared to traditional bricks, enhancing market appeal.
- To create a new revenue stream for the sugarcane industry

III. LITERATURE REVIEW

Vignesh Kumar & B. Jai Vignesh (2017): 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 and environmentally friendly brick in order to have a balanced environment and avoid the waste problem.

D. Kishore & S. Kotteswaran (2018): This paper deals with use of bagasse ash as material. Bagasse is waste formed by burning of sugarcane. Recycling of sugarcane bagasse ash waste for brick bodies, through replacement of natural clay by up 20% weight. In this

paper, bagasse ash as an effective replacement in fly ash bricks with different proportions of 10% to 80% with replacement of fly ash.

Bangar Sayali S, Shubhangi, N Gawade Anjali Y (2018): Reviewed the replacement of cement with bagasse ash, discussing its benefits and challenges in building construction.

Rohit Kumar B R, Tarun G, Sankethkumar L R, Rakshitha R, Tarunya V Chawan (2023): Investigated the use of sugarcane bagasse ash as a building material, exploring its potential as a partial replacement for cement in bricks.

IV. MATERIAL AND METHODOLOGY

Sugarcane Bagasse Ash (SBGA) –

Bagasse ash is produced by the burning of bagasse, a sugarcane waste product. Currently, bagasse is burned as fuel in sugar plants to power their boilers. Environmental issues result from this bagasse ash, which is typically scattered over farmland and dumped in ash ponds. Its physical characteristics include fineness, expansion, setting time, and compressive strength. It has a good chemical composition that includes silica and aluminum.

Fig. No. 1 Sugarcane Bagasse Ash (SBGA)

Stone Dust –

Stone dust, a byproduct of the crushing process, is a concentrated material that can be utilized as aggregates, particularly as fine aggregates, in concrete. The rock is crushed into various sizes during quarrying operations; the dust that results from this process is known as quarry dust and it is produced as trash. It becomes useless as a result and adds to air pollution. As a result, it is advised that quarry dust be used in building projects to reduce construction costs, preserve building materials, and guarantee the efficient use of natural resources.

Cement –

Concrete's primary ingredient is cement. It is a low-cost, high-quality building material that is employed in construction projects. Ordinary Portland cement will be the type of cement utilized.

Lime stone powder-

To produce acetylene with the maximum yield possible, pure calcium oxide is fused with coke. The superior grade raw ingredients are directly responsible for the quality of the final carbide lime. Physically, having highly finely divided particles makes carbide lime better since it has smaller, finer particles. Greater speed and reactivity result from smaller particle sizes.

V. RESULT

Table No. 1 Effective replacement of fly ash by bagasse ash

Sample	F. A (Kg)	B.A (Kg)	Lime (Kg)	Q.D (Kg)
Std	60.00	0.00	20.00	20.00
S1	50.00	10.00	20.00	20.00
S2	40.00	20.00	20.00	20.00
S3	30.00	30.00	20.00	20.00
S4	20.00	40.00	20.00	20.00
S5	10.00	50.00	20.00	20.00
S6	0.00	60.00	20.00	20.00

F.A=Fly ash, B.A= Bagasse ash, Q.D= Quarry Dust

Compressive Strength Test

The brick specimens are immersed in water for 24 hours. The frog of the brick is filled flush with 1:3 cement mortars and the specimen are stored in damp jute bag for 24 hours and then immersed in clean water for 24 hours. The crushing strength is then checked. The crushing strength is the ratio of crushing load to the area of brick loaded. Average of five specimens is taken as the crushing strength.

Table No. 2 Compression strength of bricks (230x115x75) at 7, 14 and 21 days for bagasse ash fly bricks

Sample	7 Days	14 Days	21 Days
STD	4.40	4.68	7.52
S1	3.35	4.30	7.40
S2	3.10	4.15	6.05
S3	3.00	4.05	5.55
S4	2.90	3.90	5.06

S5	2.75	3.75	4.00
S6	NA	NA	NA

V. CONCLUSION

Table No. 3 Comparison between bagasse ash flyash bricks and ordinary clay bricks

SN	Description	Clay Bricks	Bagasse Ash Fly ash Bricks
1	Size, mm	215x100x70	230x115x75
2	Volume, cm^3	1505	1725
3	Bricks in 1 Cum Masonry	664	500
4	Density, Kg /m^3	1600	1668
5	Cost in Rupees	4000/1000	2420/1000
6	Compressive Strength, Kg/cm^2	30-50	30-50
7	Water Absorption,%	20-25	8-12

From the above table, following conclusions can be drawn-

(a) Compressive strength decreases on increase in percentage of Bagasse ash as compare to fly ash.

(b) Use of bagasse ash in brick can solve the disposal problem; reduce cost and produce a 'greener' Eco-friendly bricks for construction.

Environmental effects of wastes and disposal problems of waste can be reduced through this research.

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