

Development of Eco-Friendly Bricks Using Sugarcane Bagasse Ash

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ABSTRACT

The construction industry is under increasing pressure to adopt sustainable and eco-friendly materials due to depletion of natural resources and rising environmental concerns. Sugarcane Bagasse Ash (SCBA), an agricultural by-product generated in large quantities by sugar industries, has emerged as a promising sustainable material for brick manufacturing. This review paper presents a comprehensive overview of the utilization of SCBA in eco-friendly brick production. Properties of SCBA, manufacturing methods, mechanical performance, durability aspects, and environmental benefits reported in previous studies are discussed. The review highlights the potential of SCBA-based bricks as a viable alternative to conventional burnt clay bricks, contributing to sustainable and low-carbon construction practices.

Keywords:- SCBA, Eco-friendly bricks, Sustainable construction, Agricultural waste, Green materials

1. INTRODUCTION

Bricks are one of the most widely used building materials in construction. Conventional burnt clay bricks require large quantities of clay and energy-intensive firing processes, leading to environmental degradation and greenhouse gas emissions. To address these challenges, researchers have focused on developing alternative brick materials using industrial and agricultural wastes.

Sugarcane bagasse ash (SCBA) is produced after burning bagasse in sugar mills for energy generation. India, being one of the largest producers of sugarcane, generates millions of tonnes of SCBA annually. Improper disposal of this ash causes air, water, and soil pollution. Therefore, utilizing SCBA in brick manufacturing offers an environmentally sustainable solution while improving resource efficiency.

2. SUGARCANE BAGASSE ASH: SOURCE AND CHARACTERISTICS

2.1 Source of SCBA

SCBA is obtained from sugar industries where bagasse is used as fuel in boilers. The ash is collected from furnace and boiler units.



Fig 2.1. Sugarcane Bagasse Ash

2.2 Physical and Chemical Properties

- High silica (SiO₂) content
- Fine particle size after grinding
- Pozzolanic nature
- Low specific gravity

These properties make SCBA suitable for use as a partial replacement of cement or fine aggregates in brick production

3. MANUFACTURING OF SCBA-BASED BRICKS

Several studies have reported different methods of brick manufacturing using SCBA:

- Replacement of cement by SCBA (5–25%)
- Partial replacement of sand or quarry dust
- Use of lime or cement as binding material
- Non-fired (sun-dried or cured) brick production

The elimination of kiln firing significantly reduces energy consumption and carbon emissions.

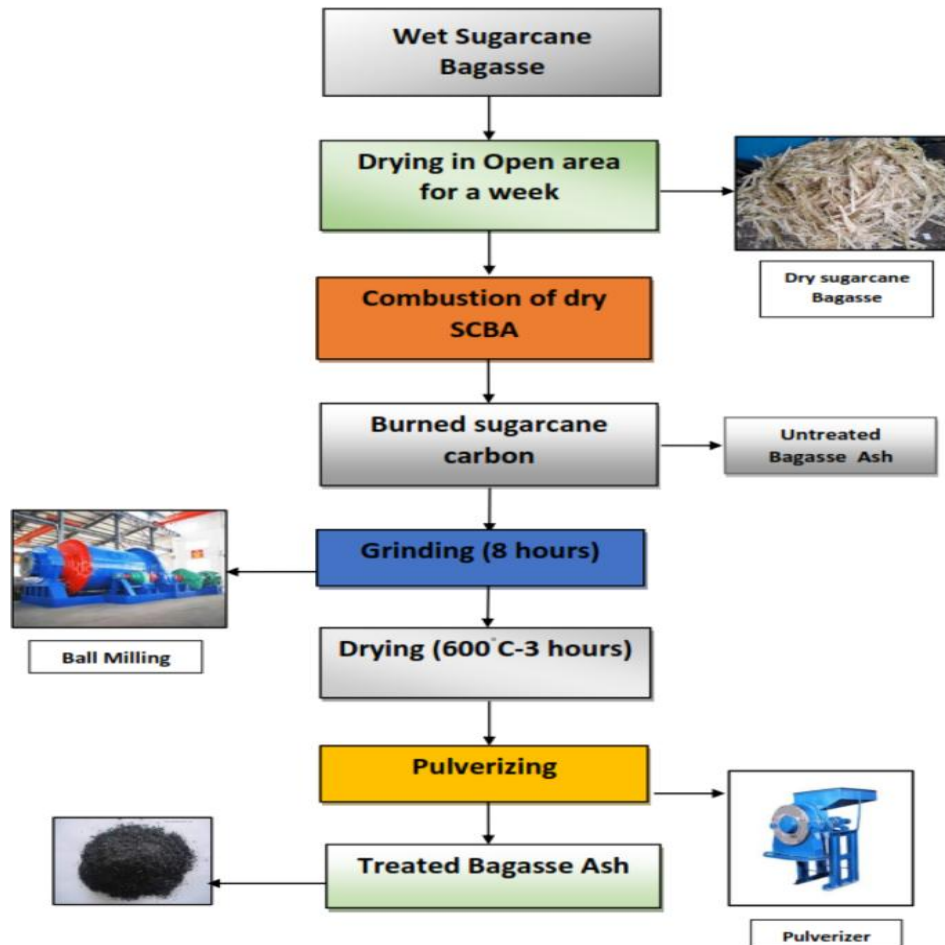


Fig 3.1: flowchart Manufacturing of SCBA

4. MECHANICAL PROPERTIES OF SCBA BRICKS

4.1 Compressive Strength

Literature indicates that SCBA bricks achieve compressive strength values ranging from **8 MPa to 15 MPa**, depending on mix proportions and curing conditions. Optimum SCBA content is generally reported between **10% and 20%**.

4.2 Water Absorption

Most studies report water absorption values below **20%**, meeting IS code requirements. Excess SCBA content may increase porosity.

5. DURABILITY AND THERMAL PERFORMANCE

SCBA bricks show:

- Improved resistance to weathering
- Lower density and better thermal insulation
- Reduced efflorescence

These properties make them suitable for low-cost housing and energy-efficient buildings.

6. ENVIRONMENTAL AND ECONOMIC BENEFITS

- Utilization of agricultural waste
- Reduction in clay excavation
- Lower cement consumption
- Reduced landfill disposal
- Cost-effective production
- Contribution to SDGs (SDG-9, SDG-11, SDG-12)

7. COMPARISON WITH CONVENTIONAL BRICKS

Property	Clay Bricks	SCBA Bricks
Energy Consumption	High (firing)	Low (no firing)
Environmental Impact	High	Low
Strength	Moderate	Moderate to High
Sustainability	Low	High

8. CHALLENGES AND LIMITATIONS

- Variability in SCBA quality
- Need for proper grinding and processing
- Limited awareness among practitioners
- Lack of standardized guidelines

9. FUTURE RESEARCH SCOPE

- Standardization of SCBA brick mix designs
- Long-term durability studies
- Fire resistance and thermal conductivity evaluation
- Field-level implementation and life-cycle assessment

10. CONCLUSIONS

1. Based on the reviewed literature, sugarcane bagasse ash is a promising sustainable material for eco-friendly brick manufacturing.
2. SCBA-based bricks demonstrate satisfactory mechanical performance, reduced environmental impact, and economic advantages.
3. With proper processing and standardization, SCBA bricks can serve as a viable alternative to conventional burnt clay bricks, supporting sustainable construction practices.

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