Archives available at journals.mriindia.com

International Journal of Recent Advances in Engineering and Technology

ISSN: 2347-2812
Volume 14 Issue 1s, 2025

Ecofriendly Brick Using Bone-Meal, Cowdung Ash and Wood Ash

Adsare Ankit Jitendra[1], Matele Pratik Bhaskar[2], Rakshe Kartik Ajay[3], Mahale Sanat Ramesh[4]

[1,2,3,4]*Department of Civil Engineering Jaihind College of Engineering, Kuran Pune, India*
adsareankit@gmail.com[1], pratikmatele1234@gmail.com[2], rakshe.kartik2002@gmail.com[3], sanatmahale3@gmail.com[4]
***Guide Name:-** Prof. Supekar G. S.*

Peer Review Information

Submission: 20 Jan 2025
Revision: 24 Feb 2025
Acceptance: 27 March 2025

Keywords

RHA – Rice Husk Ash
PET – Polyethylene Terephthalate
CB's – Cigarette Butts

Abstract

The investigation focuses on the creation of sustain- able practices. Clay, cow dung ash, wood ashes, and bone were used to create the bricks. Sustainable building materials are produced using the food industry's production methods. The key target is to diminish the environmental impact of brick. Why? Utilizing agricultural and animal waste to produce products through recycling. Convex the circular economy's principles. Two methods. Kiln-firing at high temperatures is the focus of research for this method of production. Drying in a low-temperature furnace is possible at temperatures ranging from 900°C to 1100°C (and 100°C to 110°C). The materials used are selected based on their ability to be useful: improve the strength of brick, including compressive and thermal properties, insulation, and water resistance.

INTRODUCTION

A major trans-national trend is gaining momentum in the construction field as it deals with the dual challenges of environmental sustainability and resource management. With the contribution of traditional materials like clay and cement leading to significant greenhouse gas emissions and resource depletion, there is an increasing demand for alternative mate- rials that are both environmentally and economically advanta- geous. Greener bricks, manufactured from recycled and waste materials, offer a promising solution in this re-invention.

BACKGROUND ON ECO-FRIENDLY BRICKS

Greener bricks are intended to provide mechanical and thermal properties that are comparable to or superior to con- ventional bricks while being more environmentally conscious. The incorporation of organic waste materials enhances these properties in several ways:

- **Bone Meal:** In the meat and food industry, bone meal is produced and, due to its high levels of calcium and phosphorus, serves as an effective binding agent. This material enhances compressive strength and durability, making bricks suitable for structural applications.
- **Cow Dung Ash:** An increase in the quantity of silica and other minerals in cow dung ash improves the binding capacity of bricks and reduces water absorption. Further- more, cow dung ash is an easily accessible waste, thereby enhancing waste

management.

- **Wood Ash:** Containing potassium, calcium, and silica, wood ash acts as an insulation material and improves the durability of bricks. Its usage also reduces waste from forestry operations and enhances the thermal performance of buildings.

RELATED WORK

Studies on eco-friendly building materials provide addi- tional insights. Researchers have evaluated the potential of var- ious waste-based additives—such as Rice Husk Ash (RHA), fly ash, PET waste, and cigarette butts (CB's)—in improving the properties of bricks and concrete. RHA, despite its high silica content (91.3%), benefits from pozzolanic properties that enhance insulation and mechanical strength while reducing costs. Studies on cow dung ash indicate that its use in earth bricks can increase compressive strength, although water resistance remains a challenge. Furthermore, bricks produced from stubble, PET, and recycled aggregates have been found to be 15–25% cheaper and 20–30% more energy efficient than conventional bricks. However, further research is needed to optimize durability, water resistance, and overall strength for large-scale practical applications.

LITERATURE BASED FINDINGS

The table below summarizes key related work on eco- friendly bricks and the utilization of waste materials

Sr.No.	Related Work (Author and Title)	Findings	Remarks
1	Characterization and Utilization of Rice Husk Ash (RHA) from Rice Mill of Bangladesh (K. N. Farooque et al, 2009)	RHA (91.3% silica) enhances cement strength, insulation, and cost-efficiency, requiring grinding for pozzolanic use.	RHA enhances thermal insulation, convenience, and affordability in construc- tion. It is a sustainable alternative, reducing waste disposal issues and im- proving eco-friendly con- struction materials.
2	Development of Eco-Friendly Bricks for Sustainable Construction (Dr. Vishal Puri et al, 2022)	Waste-based bricks, including stubble, PET, polythene, and recycled aggregates, are 15–25% less costly while maintaining good aesthet- ics and performance. Constructed edges offer both sound and thermal insulation.	PET-based bricks improve energy efficiency by 20–30%. These eco-friendly bricks promote sustainable construction, though further research on durability, fire resistance, and strength optimization is necessary for practical ap- plications.
3	Critical Review on Studies of Properties of Brick with Ad- dition of Rice Husk Ash and Cow Dung Ash (P. Narwal et al, 2019)	Testing on bricks with RHA and cow dung ash additives at varying percentages (5–25%) re- vealed improvements in compres- sive strength and water absorption characteristics after air drying and furnace firing at 900°C.	Provides insights into optimizing additive content for enhanced performance and sustainability, though further research is needed for long-term viability and structural applications.

Table I. Literature Based Findings

GRAPHICAL REPRESENTATION OF RESULTS

Effect of Additive Percentage on Compressive Strength

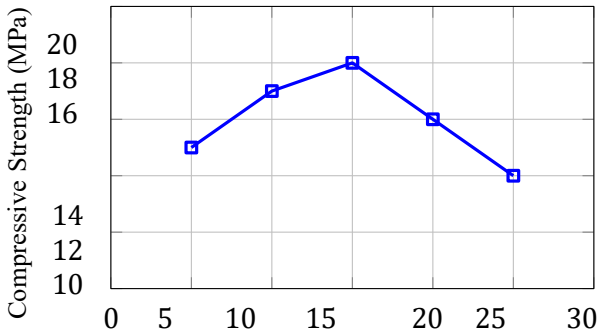

Fig. 1. Variation of compressive strength with increasing percentage of composite additive. The data (dummy values) reflect trends similar to those reported in studies utilizing waste ash in brick production.

DISCUSSION

The investigation demonstrates that sustainable brick pro- duction—using a composite mix of bone meal, cow dung ash, and wood ashes—can significantly reduce the environmental impact associated with traditional brick manufacturing. The experimental methods include two production processes: kiln- firing at high temperatures (900°C to 1100°C) and low-temperature furnace drying (100°C to 110°C). Graphical analysis (Fig. 1) indicates that there is an optimal additive percentage (around 15%) at which compressive strength is maximized. Beyond this point, further addition may lead to diminished bonding within the brick matrix. These findings align with earlier studies involving RHA and cow dung ash, emphasizing the importance of fine-tuning the additive composition to achieve a balance between strength, thermal insulation, and water resistance.

CONCLUSION

This study highlights the potential of ecofriendly bricks made from bone meal, cow dung ash, and wood ashes in promoting sustainable construction practices. These bricks not only help reduce greenhouse gas emissions and resource depletion but also provide a viable alternative to conventional brick manufacturing. In addition to the benefits discussed, further investigations will focus on refining the mix propor- tions and exploring additional performance metrics such as long-term durability, fire resistance, and improved thermal properties. Such optimizations will be crucial for large-scale practical applications and further advancements in sustainable construction technology.

ACKNOWLEDGMENTS

The investigation focuses on the creation of sustainable practices. We acknowledge the support of Jaihind College of Engineering, Kuran, and extend our gratitude to all who con-tributed to this project. Special thanks are due to Prof. Konde M.M. for his invaluable guidance throughout the project.

References

K. N. Farooque, M. Zaman, E. Halim, S. Islam, M. Hossain, Y. A. Mollah, and A. J. Mahmood, “Characterization and Utilization of Rice Husk Ash (RHA) from Rice Mill of Bangladesh,” 2009.

D. Vishal Puri, S. Kumar, K. Grover, and M. Sharma, “Development of Eco-Friendly Bricks for Sustainable Construction,” 2022.

P. Narwal, A. P. Gupta, and S. K. Sharma, “Critical Review on Studies of Properties of Brick with Addition of Rice Husk Ash and Cow Dung Ash,” *JETIR*, vol. 6, no. 6, June 2019.