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GREEN REBUILD: EXPLORING ECO-FRIENDLY BRICKS AND FURNITURE FROM PLASTIC WASTE

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ABSTRACT
Plastic waste has emerged as a pressing global environmental challenge, with millions of tons discarded annually. Its non-biodegradable nature exacerbates long-term pollution, threatening ecosystems and human health. Traditional waste management strategies such as landfilling and incineration have proven inadequate, often contributing to additional environmental harm. This crisis has driven innovative approaches like recycling plastic waste into eco-friendly construction materials, including bricks. These plastic-based bricks offer dual advantages: mitigating plastic pollution and reducing reliance on traditional resources like clay and cement, which deplete natural reserves and produce high carbon emissions. Studies reveal that these bricks demonstrate superior strength, durability, and water resistance compared to conventional options.

The integration of recycled plastic into construction aligns with circular economy principles by transforming waste into valuable, sustainable resources. Organizations like Keshav Srushti in India exemplify the potential of such innovations, converting plastic waste into durable bricks, furniture, and benches. These efforts address both urban waste management challenges and the rising demand for affordable, sustainable materials. By promoting awareness, partnerships, and scalable solutions, this approach not only reduces environmental harm but also fosters economic opportunities and community engagement. Embracing recycled plastic products can significantly contribute to a cleaner, greener future.

Keywords: Plastic waste, recycling, eco-friendly bricks, sustainability.

INTRODUCTION
The world today faces a plastic waste management crisis as millions of tons of plastic is discarded annually, most of which ends up in landfills, oceans and waterways. Common plastic products like bottles, covers and food packaging have become indispensable. Due to its non-biodegradable nature because its synthetic polymers resist natural decomposition, lacking the enzymes or microbes needed to break them down, plastic contributes to long-term environmental pollution, ultimately threatening ecosystems and human health. The urgent need for innovative solutions to mitigate plastic waste has sparked interest in integrating this material into sustainable practices, particularly in construction. Recycling, the process of transforming waste materials into reusable products is one such approach that addresses this growing problem. In particular, the innovative idea of using plastic waste to create eco-friendly bricks offers a dual benefit: mitigating plastic waste while meeting the demand for affordable, lightweight and durable construction materials.

The construction industry is increasingly exploring eco-friendly solutions and the incorporation of recycled plastics into sand bricks is a promising method. Conventional brick production relies on clay and kiln-fired processes, requiring many resources and contributing to carbon emissions. These plastic based bricks are not only an eco-friendly alternative but also exhibits properties such as durability, insulation and lightweight, which are highly desirable in modern construction.

This approach not only minimizes waste but also promotes sustainable alternatives to traditional materials, preventing a potential environmental crisis.

India generates 10.2 million tonnes of plastic waste annually (Budryk, 2024) and is a leading country in plastic waste production. It is thus eminent to have a better collection system as well as sustainable solutions to curb the environmental harm caused by plastic pollution.

OBJECTIVES

1. To understand the importance of Plastic Waste Management.
2. To investigate the process of transforming plastic waste into bricks and furniture.
3. To promote the adoption of plastic waste recycling innovations in the building sector.

REVIEW OF LITERATURE

Rao, Mohammad and Bhushaiah state that plastics are crucial in a circular economy where recycling and repurposing them after use can create economic value and minimize environmental damage. Adding plastic waste into concrete bricks offers multiple benefits like improving material properties and sustainability. The researchers studied bricks with 20% non-recyclable thermoplastic waste, fly ash, cement and sand. Bricks containing plastic elements have reduced water absorption, efflorescence and match the strength of standard bricks. Unlike traditional methods involving incineration, this low-temperature process minimizes carbon emissions by melting the plastic into the brick matrix (Bhushaiah, Mohammad, & Rao, 2019).

Kognole, Shipkule, Patil and Survase found that the use of waste plastic in brick manufacturing is a sustainable and practical solution for addressing pollution as it promotes a cleaner environment. It helps reduce the reliance on clay for brick making, conserving the natural resources which are traditionally used as these are not required for plastic sand bricks. These bricks also offer an economical option for the consumers as it combines affordability with functionality. Plastic sand bricks also exhibit zero water absorption, enhancing their durability and resistance to environmental conditions. When compared to Fly Ash bricks and third-class clay bricks, plastic sand bricks demonstrate superior utility, making them a valuable innovation for the construction industry. (Kognole, Shipkule, Patil, Patil, & Survase, 2019)

Kumar and Srivastava state that the increasing urbanization and widespread use of plastics in daily life have led to a surge in plastic consumption, primarily due to its versatility and popularity. By leveraging the recyclable properties of plastic, researchers have proposed mixing plastic waste with sand to create bricks that can serve as alternatives to traditional bricks. Comparative analyses such as scratch tests, water absorption, porosity tests, soundness tests, and efflorescence tests demonstrated the potential of these bricks offering strength, quality, and durability. Notably, these plastic-based bricks exhibit significantly lower water absorption rates than conventional bricks, contributing to their environmental sustainability and highlighting their promise as eco-friendly construction materials. (Kumar & Srivastava)

Sreekumar, Mohan, Kurian, Mathew and Moolayli found that the efforts to repurpose waste plastic into functional materials have gained traction, with studies exploring innovative applications to

mitigate its impact. One such approach involves mixing plastic waste with sand to create composite bricks. To facilitate this process, a brick manufacturing machine was specifically designed and fabricated in a local engineering workshop to produce bricks in small quantities. Waste plastic, including leftover bottles and cans, was chopped into small pieces, melted, and combined with M-sand and thermocol in precise proportions. The resulting paste was poured into a standard brick mould, setting and hardening within 20 minutes. Local tests, including free fall and scratch tests, confirmed its durability. Further assessments, such as compressive strength, water absorption, and efflorescence tests, demonstrated that the plastic composite brick outperformed traditional bricks, highlighting its potential as a sustainable alternative for construction materials. (Mohan, Kurian, Mathew, Moolayil, & Sreekumar)

STATEMENT OF PROBLEM

Plastic waste poses a significant environmental challenge globally, with millions of tons discarded each year. This growing issue has resulted in severe pollution, negatively affecting ecosystems, public health, and urban landscapes. Traditional waste management practices, such as landfilling and incineration, increase these problems by contributing to greenhouse gas emissions and soil contamination. Meanwhile, the demand for affordable and sustainable construction materials and furniture continues to rise. However, the construction industry heavily relies on non-renewable resources, further depleting natural reserves. This study seeks to address these dual challenges by exploring the feasibility of converting plastic waste into durable, eco-friendly bricks and furniture. By highlighting innovative methods to repurpose waste plastics, the research aims to offer sustainable alternatives that reduce environmental impact and meet growing construction and furnishing needs.

SIGNIFICANCE OF THE STUDY

This study holds immense significance in addressing environmental and societal challenges. By repurposing plastic waste into eco-friendly bricks and furniture, the research contributes to reducing plastic pollution, a critical global concern. The innovative approach promotes sustainable waste management practices and offers an alternative to traditional construction materials that deplete natural resources. Moreover, the development of cost-effective solutions aligns with the rising demand for affordable housing and sustainable urban infrastructure. For industries, this study provides a model for integrating circular economy principles, fostering environmental responsibility, and reducing carbon footprints. Communities and policymakers can benefit from the findings by implementing scalable solutions to tackle waste management and housing shortages. Ultimately, the study underscores the transformative potential of combining environmental sustainability with economic viability, paving the way for a cleaner, greener future.

RESEARCH METHODOLOGY

The research methodology includes both primary and secondary data. Primary data includes physical inspection of the manufacturing plant, observation of the manufacturing process and review of the documentation and interviewing the key persons. Secondary data include books, journals and research papers.

PRIMARY DATA

Primary data was collected through direct observation and interaction with manufacturing plants involved in converting plastic waste into bricks and furniture. The researcher conducted physical inspections of the plants to gain a comprehensive understanding of the upcycling process and its practical applications. Key personnel, including plant managers and process engineers, were interviewed to gather insights into the techniques and materials used. Since each manufacturing unit utilized distinct methods and raw materials, detailed records of these variations were maintained to provide a comprehensive analysis of the processes.

SECONDARY DATA

Secondary data was gathered from a thorough review of relevant research papers, journals, and online sources. Books and academic studies were also consulted to gain in-depth knowledge of plastic waste upcycling and its environmental and economic implications. This provided a theoretical foundation to complement the findings from primary data.

DATA ANALYSIS

1. Products made of a single type of polymer (e.g. PET bottles) are easier to recycle because sorting and processing require less effort. They don't need to be separated into different materials. Items made with multiple polymers (e.g. laminated food packages) are difficult to separate because each polymer has different melting points and processing requirements. Food packages use multiple polymer layers so as to sustain the shelf life of the product. But such existence of multiple layers makes it difficult to recycle it.

2. This is where the organisation uses the SAFEReCYCLER machine which is one of its kind as it manages the melting procedure of various polymer layers. The SAFEReCYCLER machine processes 15 kilograms of plastic waste per hour into plastic granules. The melting point of this waste plastic is between 110-140 Degrees Celsius.

Source: Actual Photograph taken by researcher

This machine thus converts the multiple polymer wrappers into granules. These granules are then further processed to be converted into plastic planks using a simple plastic extrusion and molding machine which gives shape to this melted polymer.

- The water absorption percentage of such planks/bricks is 0.2% whereas a conventional brick has 12% absorption rate and in the
- A Compressive Strength Test done showed results of 10.12 N/mm^2, comparing to regular 1st class clay brick with compressive strength of 10.3 N/mm$^{2.}$
- A load carry test showed load capacity of 197.5 kN, while a conventional brick wall of the same dimensions carries 153.95 kN
- Plastic bricks burned under continuous heat exposure, developing surface cracks, while the rear side remained relatively cool at 32°C. In contrast, conventional bricks maintained structural integrity but transferred more heat, with the rear side reaching 113°C.

Source: Actual Photograph taken by researcher

3. The organization “Keshav Srushti” has established partnerships with cement factories and milk dairies to enhance plastic recycling efforts. Cement factories, where waste collectors typically dispose of plastic by burning, and milk dairies, which generate a high volume of plastic milk pouches, now collaborate with the organization by sending their plastic waste for recycling. This waste is transformed into durable plastic planks and bricks. The organization aims to address "legacy waste"—a type of waste that persists for years due to its inability to degrade.

4. The plastic planks produced from this waste are transformed into easily assembled furniture, such as benches, stools, and study tables, inspired by the design principles of IKEA and plastic bricks. This also promotes an easy employment opportunity as semi-skilled and low-skilled workers can also learn how to assemble these products.

Source: Actual Photograph taken by researcher

5. The organization aims to teach 10 villages in Maharashtra how to collect and recycle plastic waste, believing that untreated plastic dumps mar the natural beauty of these villages.

Additionally, the organization plans to donate 150 recycled plastic benches to schools and parks, advocating for the use of recycled plastic over wood to promote sustainability.

Keshav Srushti encourages individuals to contribute to plastic recycling by collecting used wrappers and milk pouches from their homes and storing them in PET bottles. Each filled bottle weighs approximately 200 grams. By collecting 500 such bottles, a total of 1 ton of plastic waste can be accumulated. This plastic waste is then repurposed to create 30 benches, demonstrating how regular recycling efforts can transform waste into valuable and useful products.

SUGGESTIONS AND RECOMMENDATIONS

1. Develop a Revenue Model

Begin selling eco-friendly plastic bricks to local builders, NGOs, and government projects focused on sustainable construction. This can provide a steady revenue stream and reduce reliance on donations.

2. Partner with Corporations for CSR Initiatives
Collaborate with companies looking to meet Corporate Social Responsibility (CSR) goals. Many corporations are eager to support eco-friendly and waste management projects.

3. Launch a Community Awareness Campaign
Organize workshops, social media drives, and events to educate communities on the importance of recycling and how their contributions can lead to impactful outcomes like building bricks and benches.

4. Create Visibility Through Marketing
Invest in low-cost but high-impact marketing strategies, such as social media, storytelling videos, and press releases, to share success stories and attract attention to your mission.

5. Introduce a "Plastic for Bricks/Furniture" Exchange Program
Encourage the public to donate plastic waste by offering incentives such as discounts on bricks, recognition in community events, or small eco-friendly gifts.

6. Expand Donation Channels
Set up online donation portals and crowdfunding campaigns to make it easier for individuals and organizations to contribute financially.

7. Build a Network of Distribution and Sales
Identify and partner with construction material suppliers to distribute the bricks. Create a small sales team to promote products to construction firms and eco-conscious builders.

CONCLUSION

Plastic waste recycling is essential to combat the growing environmental crisis caused by non-biodegradable plastic pollution. Every year, millions of tons of plastic waste end up in landfills and oceans, harming ecosystems and contributing to climate change. Recycling this waste not only reduces environmental damage but also transforms it into valuable resources. Products like recycled plastic bricks, benches, and stools demonstrate innovative ways to reuse plastic while addressing pressing challenges like urban waste management and the demand for sustainable materials. These products are durable, cost-effective, and eco-friendly, making them ideal for construction and public use. The future of sustainable development lies in embracing recycled plastic products, as they contribute to a circular economy by reducing waste, conserving natural resources, and lowering carbon footprints. By supporting recycling initiatives, we can pave the way for a cleaner, greener planet while promoting innovative solutions to tackle plastic pollution.

REFERENCES

6. Rajarapu Bhushaiah, S. M. (2019). Study of Plastic Bricks Made From Waste Plastic. *International Research Journal of Engineering and Technology* .
7. Bhushaiah, R., Mohammad, S., & Rao, D. S. (2019). Study of Plastic Bricks Made From Waste Plastic. *International Research Journal of Engineering and Technology*.
8. Kognole, R. S., Shipkule, K., Patil, M., Patil, L., & Survase, U. (2019). Utilization of Plastic waste for Making Plastic Bricks. *Published in International Journal of Trend in Scientific Research and Development*.

9. Mohan, G., Kurian, J. N., Mathew, J., Moolayil, J. T., & Sreekumar. (n.d.). Fabrication of Plastic Brick Manufacturing Machine and Brick Analysis .
10. Budryk, Z. (2024). *The Hill*. Retrieved from https://thehill.com/policy/energy-environment/4861923-india-plastic-waste-study/?utm_source=chatgpt.com
11. Kumar, R., & Srivastava, D. (n.d.). A review on utilization of plastic waste materials in bricks manufacturing process.