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Review Paper On Production Of Green Bricks For Recycles Waste

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Abstract:- This study investigates Eco Lite Bricks, a novel construction material composed of cement, glass powder, waste plastic powder, and a foaming agent. These bricks offer better insulation, lower density, and a sustainable waste management solution [1].Previous studies have shown the advantages of using a variety of waste materials in the production of bricks, including their mechanical and physical qualities as well as their environmental impact. In order to offer a viable and long-term solution for the environment, this study reviews the use of waste materials in the production of bricks [3].The problems with waste management and the environment are driving up demand for sustainable building materials.The brick business, which is notorious for producing a lot of waste and having a high carbon footprint, is looking at more environmentally friendly options. A study created "green bricks" by adding plastic trash from post-consumer waste as an extra component. Compared to conventional clay bricks, the green bricks were stronger and more durable, and their manufacture produced less waste[4].In order to combat environmental pollution, preserve resources, and advance sustainability, recycling plastic waste is essential. It is feasible to lessen the negative consequences of plastic trash while generating new chances for innovation and economic expansion with the development of recycling technologies and raised awareness [7].The study assesses several manufacturing processes, material compositions, and performance attributes and finds that waste valorization significantly lowers resource consumption and carbon emissions [8]. An inventive method of waste management and resource conservation is the use of agro-industrial waste as a substitute raw material in the production of bricks. The feasibility of producing bricks from agro-industrial wastes such fly ash, bagasse, rice husk ash, and other byproducts is examined in this study [9].The current work's primary goal is to investigate ways to reduce pollution. The strength

fluctuation in brick was noticed in the current investigation when waste materials were substituted for clay [10].

Keyword:- Eco friendly; Foaming agent; Waste plastic powder.Bricks, Fly ash, Marble sludge, granite sludge, stone sludge, Ceramic sludge, RiceHusk ash.

1. Introduction

Plastic trash has become a major challenge to global sustainability, impacting economies, human health, and ecosystems. Its environmental persistence and unsustainable disposal methods provide serious problems. Plastics accumulate in landfills and natural ecosystems because they take hundreds of years to break down. Additionally, deteriorated plastics fragment into microscopic particles called microplastics, which contaminate soil, water, and air and enter food systems. Hazardous chemicals like dioxins, furans, and carbon monoxide are released when plastic is burned, which exacerbates respiratory ailments and air pollution[1].The earliest recorded use of burnt clay bricks dates back more than 5,000 years, to ancient Mesopotamia circa 3500 BC. Around 3000 BC, the ancient Egyptians invented the process of firing bricks in kilns, which produced bricks that were more consistent and long-lasting. Bricks have been utilized for thousands of years in many cultures, and because of their adaptability, strength, and beauty, they are frequently used in construction [2].Carbon dioxide (CO2), carbon monoxide (CO), and other chemical pollutants are among the greenhouse gases (GHG) released during the production of clay bricks due to the substantial usage of non-renewable resources [4].Sustainable development should be centered on protecting the environment and conserving the quickly depleting natural resources. Globally,the disposal of this trash has grown to be a serious social and environmental issue. Therefore, it is becoming more and more important to recycle the trash from the building industry [6].A danger to global sustainability, plastic trash has an impact on economies, human health, and ecosystems. Its environmental persistence and unsustainable disposal methods provide serious problems. Plastics accumulate in landfills and natural ecosystems because they take hundreds of years to break down [7]. This has prompted a great deal of research into the creation and application of environmentally friendly bricks as a practical and sustainable substitute. This report summarizes the main conclusions from numerous studies examining various strategies for producing eco-bricks using a variety of materials and production methods [8].Since brick is primarily used to make the exterior and interior walls of structures, it is a member of a broad family of building materials. Because the brick business uses a lot of raw materials and produces a lot of finished goods, it is the most suggested technological activity sector to absorb solid waste [10].

i . To ascertain the ideal proportion of plastic to mix with sand in concrete bricks in order to maximize compression strength. This entails carrying out a number of tests using different ratios of sand to plastic in order to determine which combination gives the bricks their highest compressive strength [4].

ii . To determine the ideal proportion of plastic to add to the sand in concrete bricks in order to maximize flexural strength. This goal entails testing the bricks' resistance to bending or flexing forces and determining the mix that produces the greatest flexural strength [4].

iii . The main objective of the present work is to study is to control the pollution. In the present study the strength variation in brick of various properties replacing clay with waste materials such as Granite waste, Ceramic waste, Rice husk, Sugarcane bagasse ash was observed. In the present thesis the analysis of brick has been carried out by application of various waste materials such as Granite waste, Ceramic waste, Rice husk, Sugarcane bagasse ash in brick by conducting concerned tests [10].

2.Literature Review

[1] Geena George et al focus on “Development of Eco-Friendly Eco Lite Bricks using Waste Plastic Powder and Waste Glass Powder” 21-02-2025.

As more waste glass powder is added and less waste plastic powder is used, bricks' compressive strength increases. This is because the pozzolanic qualities of the glass powder improve binding and produce a denser, more robust substance. Mix 2 is favored since it balances the utilization of waste plastic and glass, even though Mix 5 has the maximum compressive strength.Thewater absorption values, which range from 4.129% to 5.459%, show differences in the mixtures' hydrophilicity and porosity.

[2]Medhat Sobhy El-Mahllawy et al focus on“Characterization and utilization capabilitiesof industrial wastes for green bricks production”9 January 2024.

Particle size analysis, differential thermal analysis, X-ray fluorescence, and X-ray diffraction were used to examine the raw materials and lab-made specimens. Standard standards were also used to determine and assess the cured specimens' mechanical and physical characteristics. Additionally, the cured specimens' durability was assessed in relation to their water-collapsibility.

[3]S.V. GiriBabuet al focus on "Manufacturing of Eco-Friendly Brick: A Critical Review” International Journalof Computational Engineering Research (IJCER),February – 2018.

The use of fly ash and quarry dust as an efficient substitute for cement in the production of bricks was covered by Venkatesh et al. (2017). Three experimental mix proportions, including cement (50%, 60%, and 70%), fly ash (40%, 30%, and 20%), and 10% quarry dust, were evaluated by the author. The author came to the conclusion that up to 25% of the cement content could be substituted with quarry dust without significantly affecting compressive strength or other characteristics.In 2017, Ramkumar and Rubini conducted research on the production of bricks using cement, quarry dust, and brick debris. By substituting 5%, 10%, 15%, and 20% of the debris with quarry dust, the common mix is optimized to achieve the desired strength. According to the IS code, these bricks meet the standards and specifications of a typical brick. Their project work only made an effort to repurpose building sector waste.

[4]Mohamad Syazwan Bin Shaharudinet al focus on"Development of Green Brick Incorporating PlasticWaste as Sand Replacement”Volume 04, Issue 02, 2024.

Bricks are the most often utilized material in the construction industry, particularly in residential constructions. However, there has been an increase in interest recently in investigating the use of various plastic mixtures to create bricks with special qualities. Researchers examine these novel bricks in a variety of ways to evaluate their qualities.The water absorption and compression tests are two of the most popular ones.
By determining the bricks' strength and durability, these assessments assist make sure they adhere to industry requirements.

[5] Frank Ikechukwu Aneke andet al focus on"College of Agriculture, Engineering and Science Howard College Campus, University of KwaZulu-Natal, Durban, 4041, South Africa”24 November 2020.

In conclusion, it has been demonstrated that using waste materials like scrap plastic and foundry sand to make bricks is both economical and environmentally beneficial. When converted into a practical greenfield construction material, it is both economical and environmentally beneficial. Because the production of burnt clay bricks necessitates the use of high temperatures, which are expensive and energy-intensive, it may also be a source of carbon credit revenue.

[6] Neeraj Jainet al focus on "Fabrication of Green Bricks Utilizing Sustainable Recycled FineAggregates"Sep. - Oct. 2016).

Approximately 25% of the 14.5 MT of solid waste produced by India's construction sector each year is recycled and used to make building materials [26]. A few studies have been conducted to investigate the possibility of using the leftover C&D waste to create value-added products. The feasibility of producing non-modular bricks utilizing fine recycled concrete aggregates in place of natural fine aggregate (river sand) and stone dust is the subject of the current laboratory investigations.

[7] Mohamad Syazwan Bin Shaharudinet al focus on "Development of Green Brick Incorporating PlasticWaste as Sand Replacement"21 February2025.

As more waste glass powder is added and less waste plastic powder is used, bricks' compressive strength increases. This is because the pozzolanic qualities of glass powder improve binding and produce a denser, stronger substance. Mix 2 is favored because it balances the use of waste glass and waste plastic, even though Mix 5 has the maximum compressive strength.The water absorption values, which range from 4.129% to 5.459%, show differences in the mixtures' hydrophilicity and porosity. The greater water absorption in Mix I, which contains more waste plastic, emphasizes how porosity affects a material's capacity to absorb water. Because waste plastic is more porous, it forms a more open structure that may absorb more water.

[8]JimuelErenoet al focus on "Eco Bricks and Sustainability: A ScientificPerspective on Waste-Based Materials" 13 May 2025.

Research continuously shows that eco-friendly bricks have the potential to be an affordable and sustainable substitute for conventional bricks. Even if there are still certain obstacles to overcome, like maximizing material qualities and guaranteeing long-term durability, research indicates that substantial strides have been made in creating practical and ecologically friendly building materials by utilizing waste materials and cutting-edge methods. To solve lingering issues and encourage broader eco-brick usage, more study is required.

[9] Naveen Arasu Anbarasuet al focus on "Review of Sustainable Construction and Waste Management:Brick Manufacturing Using Agro-industrial Wastes" 28.01.2025.

Incorporating agro-industrial wastes into brick production offers numerous economic and environmental advantages in addition to a sustainable waste management solution.These advantages include resource conservation, waste management, and a decrease in carbon emissions.

[10] Dr.Thippeswamy H.N.et al focus on "Eco-friendly Brick Construction Using Waste Materials"OCT 2019 | IRE Journals | Volume 3 Issue 4 | ISSN: 2456-8880.

According to the findings, the pure clay brick's compressive strength is 8.94 N/mm2. As the amount of rice husk and sugarcane bagasse ash, ceramic powder, and granite powder increased, the bricks' compressive strength declined. While the compressive strength decreased by 12.19% and 7.15% for rice husk, it decreased by 24% and 28% for sugarcane bagasse ash. It was discovered that all of the bricks met IS 1077:1957's maximum compressive strength criterion using ceramic powder and granite powder, respectively.

3. Methodology

XRD, XRF, and particle size distribution methods were employed to characterize the materials utilized and the stabilized green specimens. Additionally, the thermal analyzer DT 50 (Schi-madzu Co., Kyoto, Japan) was used to monitor the mineralogical and hydration products of the examined mixes at various curing ages using differential thermal analysis. The pH value at 20ºC was measured using a digital pH meter in compliance with ASTM D4972-19 [2].

Tap water from Syarikat Bekalan Air Selangor (SYABAS) was used to create the brick specimen. Cement acquires its cohesive properties during the hydration process. Several crucial phases are involved in the mechanical processing of plastic waste plastic bottles to turn them into sand particles.The initial stage involves gathering and classifying plastic bottles according to their type and color.Sorting is a crucial stage to guarantee the efficiency of the process because different types of plastic have varying melting points and may need different processing techniques. After being sorted, the plastic bottles are sent into a shredder, which cuts them into uniformly small pieces. A granulator or pulverizer next grinds the bottles into smaller pieces. Depending on the required particle size and the characteristics of the plastic bottle being processed, this procedure can be performed multiple times [4].

To assess how acidic surroundings affected the bricks, the reaction of the bricks immersed in three different acidic concentrations was closely observed. Tensile and compressive strength tests were conducted after the submerged bricks were allowed to dry for a full day [5].

Material-Based Approaches: Using waste materials was the subject of numerous research, such as:
1) Rice husk ash, sawdust, straw, hemp fibers, cow manure, and coffee stem are examples of agricultural waste. These were mixed with cement, sand, or other binders, then molded, cured, and tested for water absorption, compressive strength, and other characteristics.
2) Fly ash, crumb rubber, plastic trash (PET, HDPE, LDPE), foundry sand, and wastepaper are examples of industrial waste. These investigations used a range of mixture ratios, molding processes, and curing techniques, with testing concentrated on durability and mechanical qualities.
3) Recycled materials include recycled concrete and clay. Crushing, mixing, and remolding were the methods used, and the performance of recycled and virgin materials was frequently compared [8].

This initial step involves excavating the soil, laying it on a flat surface, and cleaning it of various contaminants (such as stones, pebbles, and vegetation). Weathering is the process of leaving a material exposed to the elements for several months after it has been cleared of all contaminants. To make decent brick earth, the soil is then combined with agricultural and industrial waste [10].

4. Conclusion

The study's main goals were effectively achieved, highlighting the vital significance that recycling waste materials for construction applications plays. The trials showed that adding waste plastic and glass powder to building blocks not only increases their energy efficiency but also advances sustainable building practices. This strategy demonstrates how waste materials can be used to produce high-performing, environmentally friendly building solutions [1].

There is need for more research into the production of reinforced bricks from waste materials, however the application of eco-friendly bricks created from waste materials is currently quite limited. In the lack of pertinent criteria that are partially accepted by the public and industry, more research and development is required to provide a wide range of low-cost, environmentally friendly bricks made from waste materials [3].

It is clear that adding more plastic to the concrete mix has a detrimental effect on the bricks' compressive strength and bending resistance. Further research is necessary to find the ideal percentage of plastic material that ensures a sustained decrease of waste without affecting brick strength in order to fully realize the potential benefits of using plastic waste in concrete bricks.Furthermore, developing plastic recycling methods and investigating the creation of composite materials may be promising for raising the general qualities of environmentally friendly bricks [4].

Additionally, more water was absorbed by the burnt clay bricks, and water is needed throughout production to achieve the required uniformity. However, the test results showed that foundry sand and scrap plastic waste could be used to create SPW bricks without the requirement for water. Since burned clay bricks demand a high energy of 1100 ℃, whereas SPW bricks require 220 ℃ to achieve two to three times the strength of fired clay bricks, the use of plastic waste and foundry sand would also serve as an additional green-efficient building material [5].

In summary, eco-bricks are a viable option for environmentally friendly building that adheres to circular economy principles and may provide social advantages like reasonably priced housing in underdeveloped areas. Researchers, legislators, and industry stakeholders must work together to spur innovation, set standards, and encourage adoption if they are to reach their full potential. The switch to eco-bricks may be crucial to building a more robust and sustainable built environment in the future [8].

Research and development are essential to improving the efficacy of waste-based bricks and making them suitable substitutes for traditional materials. To increase the strength, longevity, and effectiveness of these bricks, improvements in additives and processing methods are crucial.Governmental frameworks that provide clear guidelines and incentives may also encourage producers to use waste-based bricks, ensuring their safety and quality.International cooperation encourages the sharing of technology and information, which leads to a wider adoption of sustainable practices in different places [9].

This research can lessen the impact of garbage on the environment and waste disposal issues [10].

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