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MAKING ECO- FRIENDLY CONCRETE BY USING WASTE OR RESIDUAL MATERIALS FROM DIFFERENT INDUSTRIES

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Abstract
Concrete is a mixture of cement, fine aggregate, coarse aggregate & water. With about 10 billion tons of concrete produced every time, it's the most consumed substance in the world, second only to water. It's also the world's most extensively used material for construction – from islands to large structures, concrete forms the veritably foundation of our structure. Over 70 of the world's population lives in a concrete structure. Due to the continuity and strength of concrete, it's used to make colorful types of structures like structures, pavements, pipes, bottom crossbeams, shafts and pillars. still, despite the massive product and consumption of concrete around the globe, there has been a lot of enterprise about the fact that it might be an active contributor to hothouse gas emigrations. Keeping in mind the current climate condition and the marvels of global warming, there's a pressing need for the construction and other diligence to go through a green revolution- in other words, diligence need to borrow and introduce environmental friendly accoutrements. Recycled concrete is tested for resistance to factors such as freeze-thaw cycles, abrasion, and chemical exposure. Studies indicate that with proper mix design, it can perform on par with conventional concrete. The versatility of recycled concrete extends to a wide range of construction applications Recycled concrete can be used in load-bearing components such as beams and columns, contributing to the structural integrity of buildings. Pavements and Foundations The material's durability makes it an excellent choice for road pavements, sidewalks, and foundations, where it can withstand heavy loads.

Keywords: Concrete, waste material, Recycled concrete, Environmental friendly.

I. INTRODUCTION

1.1 General : Recycling concrete involves the breaking down of demolished or unused concrete structures into aggregates, which can be reused in new construction. This process typically includes crushing, screening, and sometimes, additional processing to remove contaminants. The resulting recycled aggregates replace traditional virgin aggregates in concrete production, reducing the demand for natural resources. Traditional concrete production is energy-intensive and contributes significantly to carbon emissions. Recycling concrete conserves energy and reduces the overall carbon footprint, making it a more environmentally friendly option. The use of recycled aggregates helps preserve natural resources, as it minimizes the need for extracting new materials from quarries. Recycling concrete diverts construction and demolition waste from landfills, addressing the growing concern of waste management in urban areas. Recycled concrete exhibits properties comparable to traditional concrete, and advancements in recycling technologies have addressed earlier concerns about its performance. Key considerations include. Extensive research has shown that recycled concrete can achieve suitable compressive strength, making it suitable for various applications. Recycled concrete is tested for resistance to factors such as freeze-thaw cycles, abrasion, and chemical exposure. Studies indicate that with proper mix design, it can perform on par with conventional concrete. The versatility of recycled concrete extends to a wide range of construction. Recycled concrete can be used in load-bearing components such as beams and columns, contributing to the structural integrity of buildings. The material's durability makes it an excellent choice for road pavements, sidewalks, and foundations, where it can withstand heavy loads. Crushed recycled concrete can be used in landscaping projects, providing a sustainable alternative for pathways and decorative features. While the adoption of recycled concrete is growing, challenges remain. Ensuring the quality of recycled concrete relies on effective quality control measures during the production process. The establishment and adherence to industry standards for recycled concrete are crucial for widespread acceptance and use. Overcoming any skepticism about the performance and safety of recycled concrete is vital for its broader adoption in construction projects. Recycled concrete represents a significant stride towards sustainability in the construction industry. Its use not only conserves resources and reduces waste but also demonstrates a commitment to environmentally responsible building practices. As research and technology continue to advance, recycled concrete is poised to play an increasingly pivotal role in shaping the future of construction. Embracing this eco-friendly alternative can lead to more resilient and sustainable structures, benefitting both the industry and the environment.

II. LITRATURE REVIEW:

The literature on making eco-friendly concrete with waste materials highlights a growing interest in sustainable construction practices, with a focus on reducing the environmental impact of traditional concrete production. Researchers and scholars have explored various waste materials from different industries to create innovative and environmentally friendly concrete mixes.

Research has extensively investigated the incorporation of fly ash, a byproduct of coal combustion in power plants, into concrete. Studies suggest that the addition of fly ash improves the workability, durability, and strength of concrete, while simultaneously reducing the carbon footprint associated with cement production (Mehta, 2008).

The use of GGBFS, a byproduct of the steel industry, has gained attention in the literature. Researchers emphasize the positive effects of GGBFS on concrete properties, including increased compressive strength, reduced permeability, and enhanced resistance to aggressive environments (Nehdi & Duquette, 2010). The recycling of construction and demolition waste for use as aggregates in concrete has been extensively studied. Literature suggests that incorporating recycled aggregates not only reduces the environmental impact of waste disposal but also enhances the sustainability of concrete structures (Poon et al., 2002).

The literature on incorporating RHA in concrete reveals its potential as a supplementary material. Researchers have found that RHA contributes to increased strength and durability while mitigating the environmental impact associated with rice milling waste (Mannan et al., 2016).

The exploration of plastic waste as an additive in concrete has generated significant interest. Studies suggest that incorporating shredded plastic in concrete mixes not only addresses plastic pollution but also improves certain properties of concrete, such as its ductility and impact resistance (Siddique et al., 2018).

Several studies focus on conducting life cycle assessments (LCA) to evaluate the overall environmental impact of eco-friendly concrete. These assessments consider factors such as energy consumption, carbon emissions, and resource depletion, providing a comprehensive understanding of the sustainability of alternative concrete formulations (Tam et al., 2012).

The literature acknowledges challenges associated with the widespread adoption of eco-friendly concrete, including issues related to standardization, cost-effectiveness, and societal acceptance. However, researchers also highlight the significant opportunities for mitigating environmental degradation through the development and implementation of sustainable concrete practices (Tam & Tam, 2019).

III. MATERIAL USED:

Utilizing Fly Ash from Power Plants

One of the key components in eco-friendly concrete is fly ash, a byproduct of coal combustion in power plants. Instead of allowing this waste material to accumulate in landfills, incorporating it into concrete mixtures enhances the material's strength and durability. By using fly ash as a supplementary cementitious material, the demand for traditional cement is reduced, resulting in lower carbon dioxide emissions during production.

Ground Granulated Blast Furnace Slag (GGBFS) from the Steel Industry

GGBFS, a byproduct from the steel manufacturing process, is another valuable waste material that can be used in concrete production. By replacing a portion of cement with GGBFS, not only is the environmental impact reduced, but the resulting concrete also exhibits improved resistance to corrosion and enhanced durability. This approach not only minimizes waste but also contributes to the circular economy by repurposing industrial byproducts.

Recycled Aggregates from Construction and Demolition Waste

Construction and demolition waste often end up in landfills, contributing to environmental degradation. However, by recycling concrete debris and using it as aggregates in new concrete mixes, a sustainable solution is achieved. This approach conserves natural resources, reduces the need for quarrying, and minimizes the environmental impact associated with the extraction of raw materials.

Incorporating Rice Husk Ash (RHA) from Agriculture

Rice husk ash, a byproduct of rice milling, is rich in silica and possesses pozzolanic properties. When added to concrete mixtures, RHA enhances the material's strength and durability while reducing the overall cement content. This not only provides a beneficial use for agricultural waste but also contributes to lowering the carbon footprint of concrete production.

Plastic Waste in Concrete

The global issue of plastic pollution has prompted researchers to explore ways to incorporate plastic waste into concrete. By replacing a portion of traditional aggregates with shredded plastic, the resulting eco-friendly concrete not only reduces the consumption of natural resources but also addresses the challenge of plastic waste disposal. This innovative approach is gaining traction as a sustainable solution for both the construction and waste management industries.

IV. EXPERIMENTAL WORK & RESULT :

There are four different tests are undergone in bricks they are,

1. Visual Test,
2. Compressive Strength Test,
3. Water Absorption Test,
4. Efflorescence Test.

VISUAL TEST

Table 1 Visual Test

Sl.No	TESTS	Y/N
1)	The bricks should be well finished, smooth and are free from cracks.	Yes
2)	They should possess sharp and square edges.	Yes
3)	They are of uniform color, shape and size as per standard.	Yes
4)	When the bricks are struck with each other, they should produce clear ringing sound.	Yes
5)	Fracture of good bricks showed uniform and bright compact structure without any voids.	Yes
6)	Bricks should not be broken down when dropped from 1m height.	Yes

Fig: final product from waste materials

COMPRESSIVE STRENGTH TEST: A compression testing machine, the compression plate of which shall have a ball seating in the form of portion of a sphere the Centre of which coincides with the Centre of the plate, shall be used.

Table 2: Compressive Strength Test Result

Mix	**Sample 1 (kN)**	**Sample 2 (kN)**	**Sample 3(kN)**	**Average Compressive Strength (N/mm2)**
M1	81	78	77	4.59
M2	82	91	85	5.02
M3	98	102	99	5.82
Conventional Mix	150	115	163	8.34

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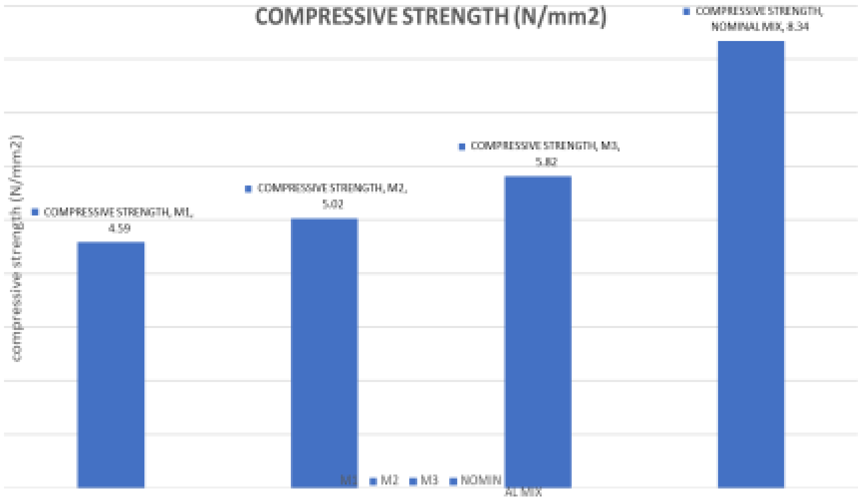
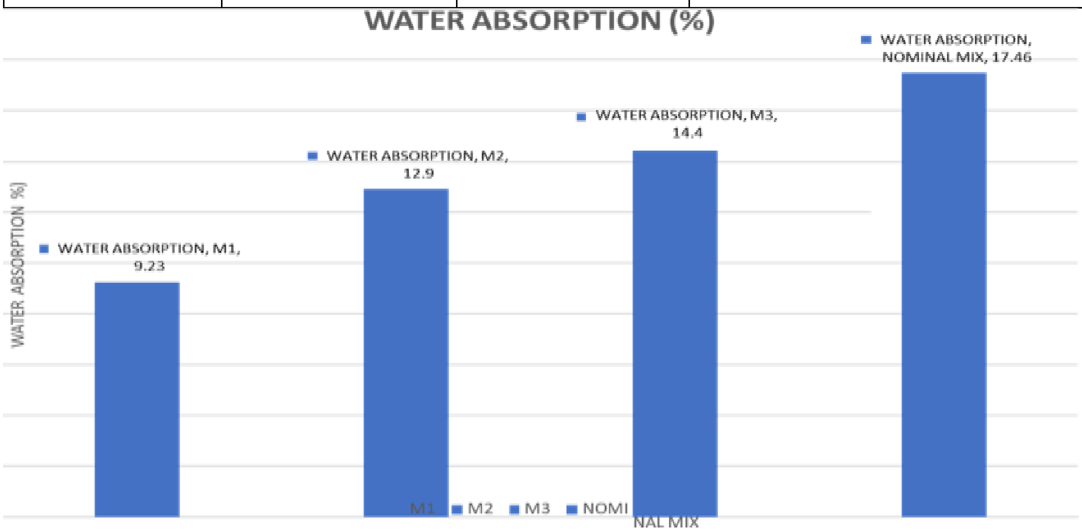


Bar chart: comparison of compressive strength

WATER ABSORPTION TEST: A sensitive balance capable of weighing within 01 percent of the mass of the specimen; and a ventilated oven.

Table 3: Water Absorption Test Results

Mix	**Dry Weight (Kg) M1**	**Wet Weight (Kg) M2**	**Water Absorption(%)**
W1	2.913	3.182	9.23
W2	2.805	3.167	12.90
W3	2.790	3.192	14.40
Conventional Mix	2.885	3.389	17.46



Bar chart: comparison of water absorption

V. CONCLUSION :

In conclusion, the transformation of construction practices through the utilization of waste materials in the production of eco-friendly concrete represents a pivotal step towards sustainable and responsible infrastructure development. The incorporation of waste materials such as fly ash, GGBFS, recycled aggregates, rice husk ash, and plastic waste in concrete formulations has demonstrated significant potential to reduce the environmental impact of traditional concrete production. This reduction is primarily attributed to the decreased reliance on conventional cement and the repurposing of industrial and agricultural byproducts. While the literature acknowledges challenges such as standardization, cost-effectiveness, and societal acceptance, these challenges are seen as opportunities for further research and innovation. Overcoming these obstacles will be crucial for the widespread adoption of eco-friendly concrete practices in the construction industry. The transformative approach of making eco-friendly concrete with waste materials is not merely a trend but represents a fundamental shift in the construction industry towards a greener and more sustainable future. This shift is driven by a collective understanding of the urgent need to address environmental concerns and adopt practices that align with long-term ecological balance.

In conclusion, the ongoing efforts to make eco-friendly concrete with waste materials contribute significantly to the evolution of construction practices. The research and advancements in this field provide a roadmap for a construction industry that is both environmentally responsible and capable of meeting the growing global demand for infrastructure in a sustainable manner. As this transformation continues, it holds the promise of reshaping the very foundation of how we build, ensuring a more resilient and harmonious coexistence with the environment.

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