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Replacement of Wood Waste ash and Sugarcane Bagasse ash with cement

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ABSTRACT: The idea of sustainability is widely acknowledged in the context of contemporary building. The expense of building has escalated along with the deteriorating impact on the environment, despite the fact that the construction industry is undergoing a tremendous revolution in terms of both technology and materials utilised. This led to the adoption of a more balanced strategy with the environment serving as its central theme in order to improve the quality of life. The substitution of conventional cement substitutes such as wood waste ash and sugarcane bagasse ash algorithm

KEYWORDS: Wood Waste ash, Sugarcane bagasse ash, Sustainability.

I. INTRODUCTION

Construction has employed cementations materials. In order to meet the increasing functional requirements of the structures and their resistance to abrasive elements, new cementations materials and concrete composites must be created. Recent advancements in concrete technology have been motivated by concern for the environment and a desire to use industrial waste materials. Cement and water are combined to create concrete, a synthetic substance that contains coarse and tiny particles.

II. RELATED WORK

The purpose of this study was to determine whether adding wood waste ash or sugarcane ash to concrete improved its strength-related properties. The study examines the effects of adding wood waste ash, and sugarcane ash to concrete while using Plain Cement Concrete (PCC) as a reference to examine drying shrinkage and flexural, compressive, and tensile strength properties. According to Majid Ali et al. (2011), advantages include low cost, low density, reasonable specific strength, good thermal insulation, reduced wear, and the capacity to be recycled with no negative environmental impact. As a result, it not only improves the physical characteristics of concrete but also proves to be a sustainable waste management method.

III. METHODOLOGY

The sources utilized are disclosed by the projects approach. Using the subsequent supplies:

- 1) Cement
- 2) Fine aggregate
- 3) Water
- 4) Coarse Aggregate
- 5) Wood waste ash,
- 6) Sugarcane bagasse ash

A test on several materials is also shown. And offers the methodology's following schematic representation: Gathering of information

- 1) Material testing
- 2) Mix Design
- 3) Mixing at Predetermined Ratio
- 4) Moulding,
- 5) Remoulding after 24 hours
- 6) Curing for 7, 14, and 28 days are the next steps.
- 7) Testing of the sample

8) Analysis of the data and conclusion

Test on fresh concrete.

- 1) Slump test
- 2) Test for Compaction Factor

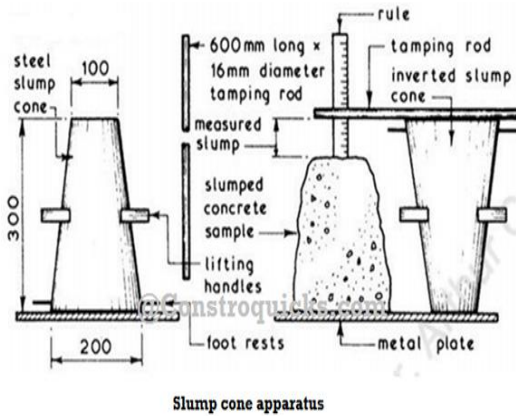
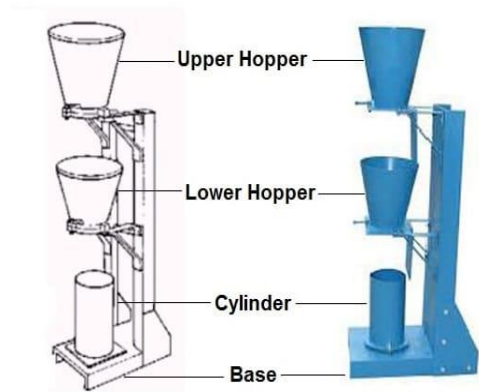


Figure No. 1 Slump Cone Apparatus



Compaction Factor Test

Figure No. 2 Compaction Factor Test Apparatus

Test on Hardened Concrete.

- 1) Compressive Strength test
- 2) Split Tensile Strength test

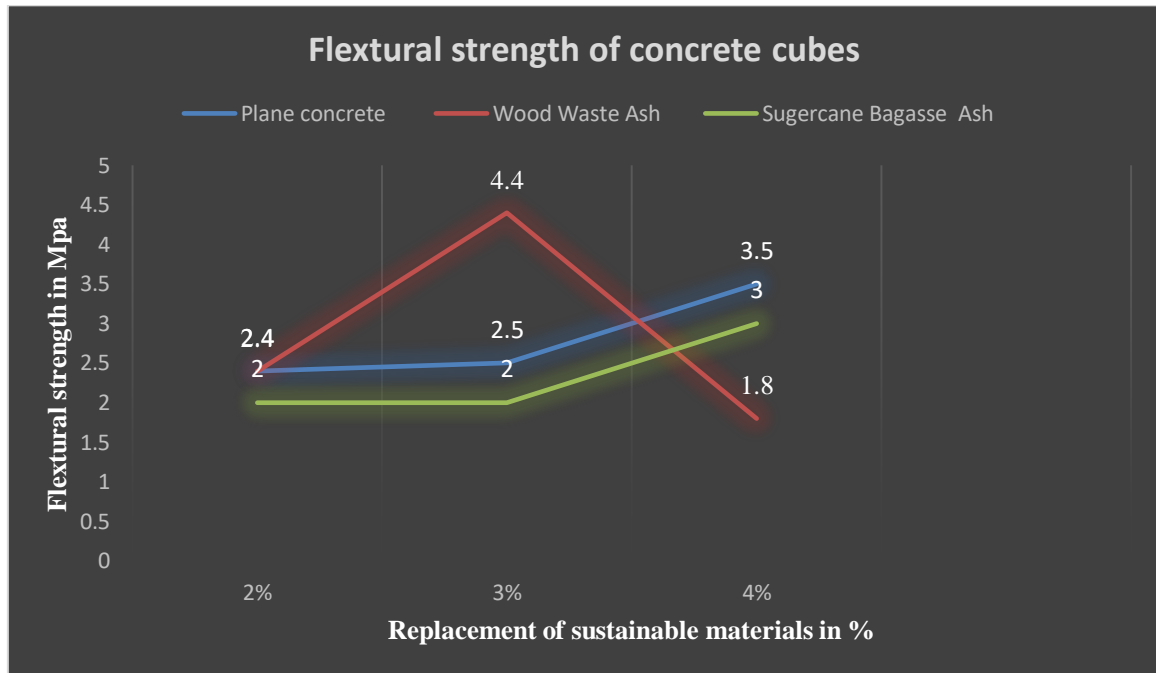


(a)



(b)

Figure No. 3 (a) & (b) Compression Test on Concrete Block



Graph No.1.Flextural strength of Concrete Cube

IV. EXPERIMENTAL RESULTS

A systematic approach to using and recycling materials more efficiently throughout the course of their whole life cycles is known as sustainable materials management. As a result, our society today views the utilization of natural resources and environmental protection from a new angle. The cubes are cast using the materials listed below.



Figure No. 4 (a),(b),(c),(d) &(e) Ingredients use in concrete

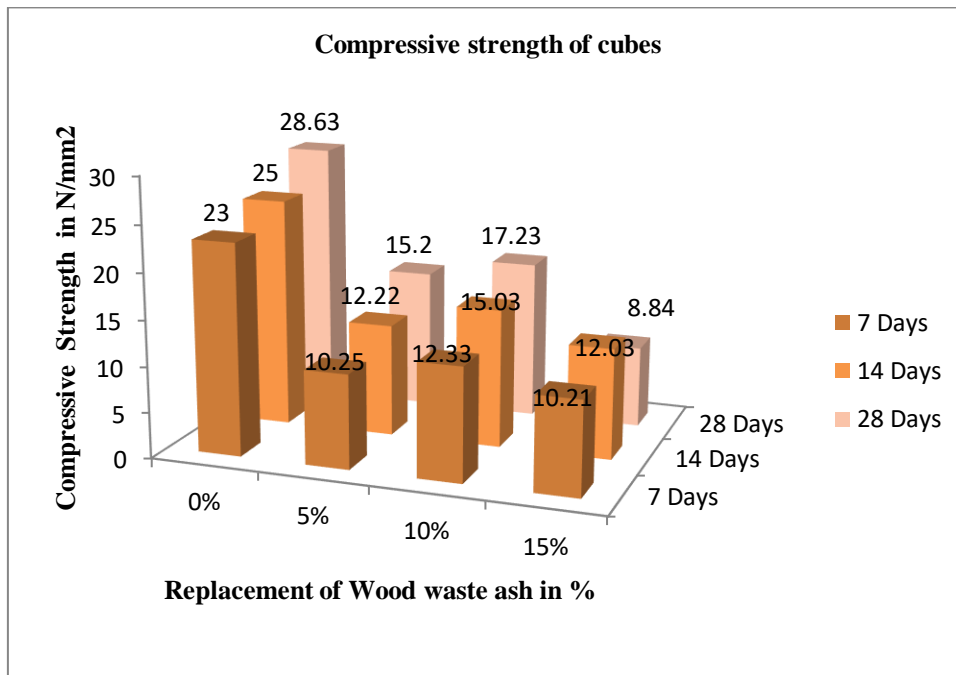
Result for Wood Waste Ash-

Wood ash was substituted for 5%, 10%, and 15% of the cement in the samples that were cast. The cubes were cast in accordance with the procedure described in IS 516:1959 and IS 456:2000. At 7, 14, and 28 days, three samples were



tested for strength using a compression testing apparatus. Compressive strength values were contrasted with those of a standard M20 concrete mix. Graph No. 2 presents the results that were found.

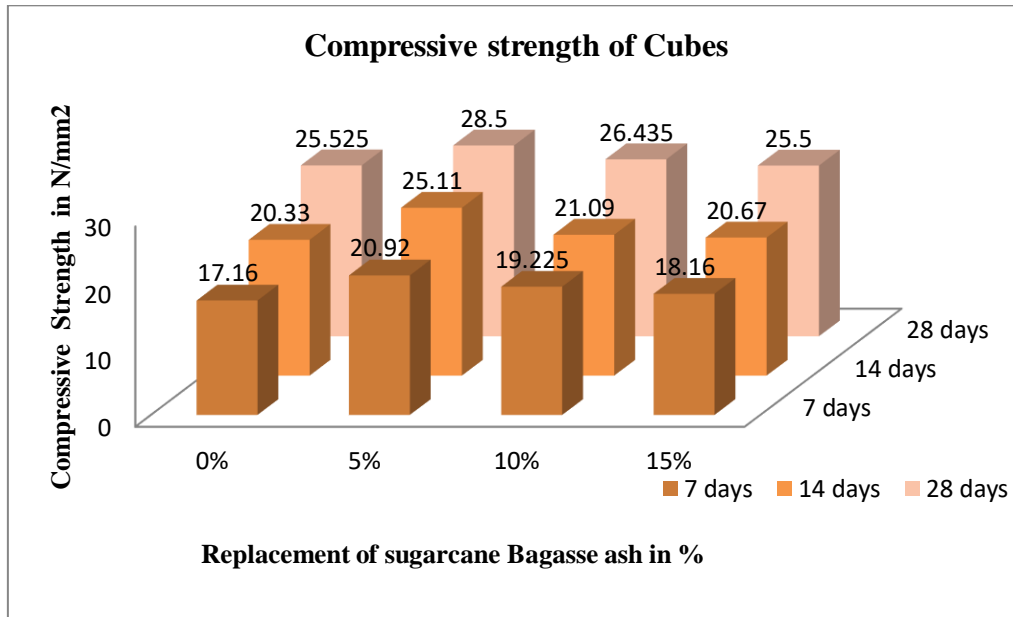
The 7 day compressive strength of a standard M20 concrete for 5% was obtained as 10.25 N/mm² and 14 days strength was obtained 12.22 N/mm² the 28 day compressive strength was obtained as 15.20 N/mm². The 7 day compressive strength of a standard M20 concrete for 10% was obtained as 12.33 N/mm² and 14 days strength was obtained 15.03 N/mm² the 28 day compressive strength was obtained as 17.23 N/mm². The 7 day compressive strength of a standard M20 concrete for 15% was obtained as 10.21 N/mm² and 14 days strength was obtained 12.03 N/mm² the 28 day compressive strength was obtained as 8.84 N/mm². From the above results, it is observed that compressive strength for 10% is highest. Therefore, it is observed that the cement can be safely replaced with wood waste ash up to 10%.



Graph No. 2. “Compressive strength of Concrete cubes for wood waste ash”

Result for Sugarcane Bagasse Ash

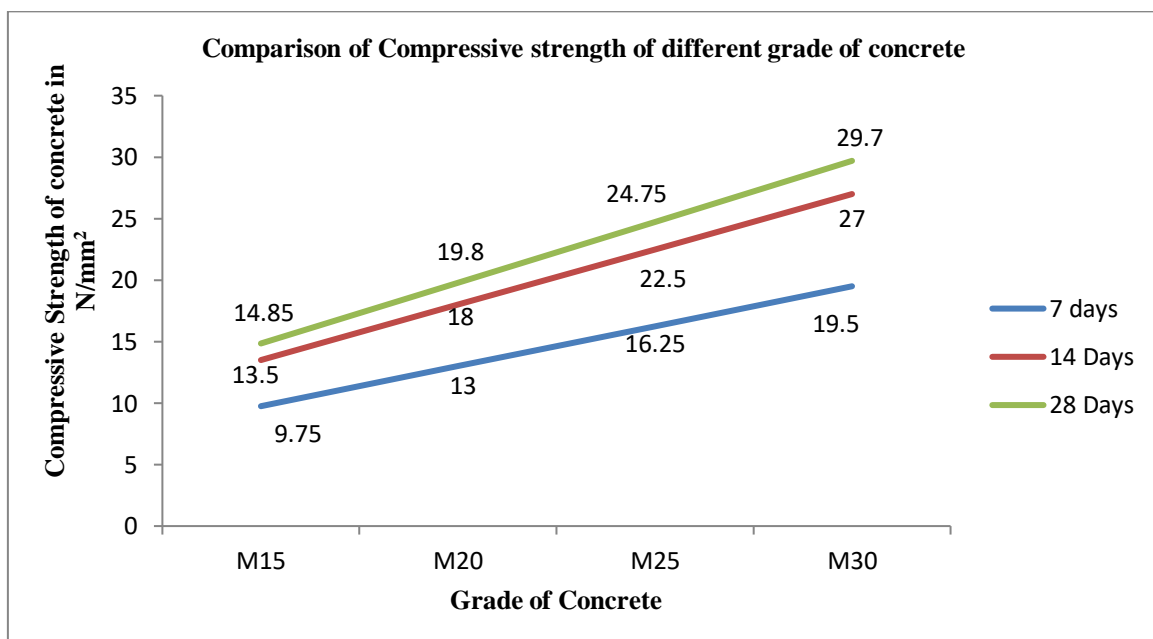
Samples with 5%, 10% and 15% replacement of cement with sugarcane bagasse ash were casted. The cubes were casted as per the procedure specified in IS 516:1959 and IS 456:2000. The strength of 3 samples was tested at 7, 14 and 28 days using compression testing machine. The compressive strength values were compared with that of conventional concrete mix of M20.



Graph No 3. “Compressive strength of concrete cubes for Sugarcane bagasse ash”

The 7 day’s compressive strength of a standard M20 grade of concrete for 5% was obtained as 20.92 N/mm² and 14 days strength was obtained 25.11 N/mm² the 28 day compressive strength was obtained as 28.50 N/mm². The 7 day compressive strength of a standard M20 concrete for 10% was obtained as 19.225 N/mm² and 14 days strength was obtained 21.09 N/mm² the 28 day compressive strength was obtained as 26.435 N/mm². The 7 day compressive strength of a standard M20 concrete for 15% was obtained as 18.16 N/mm² and 14 days strength was obtained 20.67 N/mm² the 28 day compressive strength was obtained as 25.50 N/mm². From the above results, it is observed that compressive strength for 5% is highest. Therefore, it is observed that the cement can be safely replaced with wood waste ash up to 5%.

Comparison of Compressive strength of different grade of concrete



Graph No.4. “Comparison of Compressive strength of different grade of concrete”

Comparison between conventional concrete and wood waste ash and sugarcane baggase ash concrete.

For standard concrete of M20 grade, the 28-day strength is 19.8 N/mm². 28.5 N/mm² is found as the 28-day strength of M20 grade concrete when 5% of the cement is replaced by sugarcane bagasse ash. 17.23 N/mm² is the obtained 28-day strength for M20 grade concrete when 10% of the cement is replaced with wood waste ash. According to this, sugarcane bagasse ash concrete is stronger than both regular concrete and wood waste ash concrete..

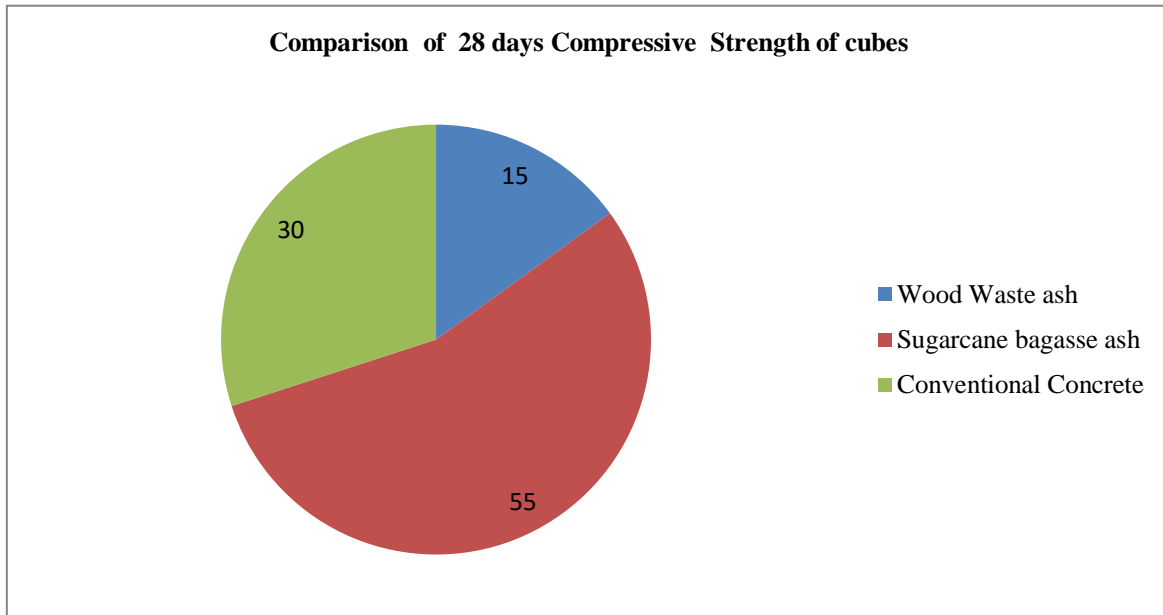


Chart 1. “Comparison of Compressive strength of cubes for sustainable material”

V. CONCLUSION

1. Wood ash particles are coarser than cement particles and have a larger specific surface area due to their porous structure and asymmetrical morphology.
2. The slump of concrete is negatively impacted by the partial substitution of cement with wood ash.
3. As the proportion of wood ash increased, water absorption increased as well.
4. When compared to the control specimen, the strength parameters slightly decrease as the amount of wood ash and sugarcane bagasse ash in the concrete increases. The strength achieved, however, remains higher than the desired strength.
5. Furthermore, pozzolanic reactions cause the strength to grow stronger with age. As a result, the use of wood ash and sugarcane bagasse in concrete aids in the transformation of the material from a potential environmental risk to a valuable resource for the creation of a highly effective substitute cementing material.
6. Thermal combustion significantly reduces the mass and volume of the waste, making it possible to manage it in an economical and environmentally responsible manner. Land filling is the most widely used method of ash disposal. Particulate matter found in wood ash and sugarcane bagasse ash has been linked to respiratory illnesses and groundwater contamination. In the upcoming year, a sustainable ash management strategy that incorporates the ash into the natural cycle must be used.
7. The cube with 10 percentages of wood waste ash replacement met the strength requirement with compressive strengths of 7, 14, and 28 days. Strength will start to decline after 10%. Up to 10% of wood waste ash can be replaced safely.
8. The cube with 5 percentages of sugarcane bagasse ash replacement met the strength requirement with compressive strengths of 7, 14, and 28 days. Strength will start to decline after 5%. Up to 5% of wood waste ash can be replaced safely.
9. According to this report, sugarcane bagasse ash concrete is stronger than both regular concrete and wood waste ash concrete.



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