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Mechanical Properties of Bamboo fibre Concrete with Waste Foundry Sand

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Abstract - *Concrete can be identified by the type of aggregate or cement used, by the special qualities it possesses, or by the methods of manufacture utilised. a significant lack of river sand, which was good for a fresh area of research. study on the loss of river sand and the need for scientific resource use and management. Foundry sand can be substituted for fine aggregates in concrete at percentages of 5%, 10%, 15%, 20%, and 25%, or added as an extra ingredient to alter the material's properties. Banana fibres significantly improved the concrete's split tensile and compressive strengths, among other technical attributes. The resistance of the flexibility to cracking and spalling was also enhanced. As such, it serves as a natural supplement*, providing consistent for 28,56 and 90 days.

KEYWORDS: Banana fibres, Waste foundry sand, Compressive strength and Split tensile strength.

I. INTRODUCTION

Concrete is a composite material that dries over time and is made of cement paste mixed with fine and coarse aggregate. The majority of the concert is either built on hydraulic cement or uses concrete with a lime base. Waste products like peanut shell ash are produced by the peanut industry. Usually, it is disposed of outside without considering the advantages for the economy or the environment.

Using trash and byproducts has become an appealing alternative to disposal as land filling becomes more and more costly. Waste foundry sand, or WFS, is one kind of industrial residue. Millions of tonnes of trash are produced worldwide by the ferrous and non-ferrous metal casting industries. India produces more than 2 million tonnes of waste foundry sand annually. WFS is a valuable byproduct of the metal casting sector that has been successfully used for a long time as a space filler. However, using waste foundry sand for land infill is becoming more and more difficult due to the fast rising costs of disposal.

The ingredients of fibre reinforced concrete (FRC) are aggregate, Portland cement, and discrete discontinuous fibres. Traditional unreinforced concrete has variable strain and tensile strength capacities and is fragile. The addition of banana fibres causes the composition of concrete to change from brittle to more ductile, while also making the material more homogenised and isotropic. Under applied loads, several kinds of microcracks in typical concrete quickly become more noticeable.

2. OBJECTIVES

1. To investigate the possible advantages of using leftover foundry sand in place of some of the fine aggregate.
2. The purpose of fibre is to prevent cracks.
3. To assess the compressive and split tensile strengths of the concrete.

3. MATERIALS

3.1 Cement: Cement is mostly utilised as a binder agent in concrete, which is used in building, to bind and harden other components together. Ordinary Portland cement, or OPC, is used in construction. Grade 53.

3.2 Fine Aggregate: In the current investigation, river sand that was easily accessible was used as fine aggregate.

3.3 Coarse Aggregate: Aggregate that remains above the IS Sieve 4.75 mm is referred to as coarse aggregate. A gradual increase in size of 10–20 mm is the typical maximum, per IS383:1970.

3.4 Water : Aggregates were cleaned and pure tap water was used for the mixing and curing of the concrete.

3.5 Waste Foundry Sand: The locally sourced waste foundry sand was given by Mak's Casting Uppal located in Hyderabad. WFS was used as a partial replacement for fine aggregate, or natural river sand.

3.6 Banana Fibre: The banana trunk fibres used in this project originate from a local Tamilnadu community. The fibres are available as consumable and processed forms. An apparatus for cutting was used to create fibres with a consistent length.

4. EXPERIMENTAL RESULTS

4.1 Compressive strength

Compressive strength is a key component of concrete that must be evaluated because it serves as a benchmark for material quality.

Table1: Compressive strength of concrete with Waste Foundry Sand as partial replacement of fine aggregate.

Sl.no	% Of WFS	Compressive strength Results (N/mm²)		
		28 days	56 days	90 days
1	0%	39.28	42.56	45.62
2	5%	42.08	45.71	49.18
3	10%	43.62	47.54	51.03
4	15%	45.66	49.79	53.44
5	20%	44.18	48.15	51.68
6	25%	41.84	45.61	48.97

Table 2: Compressive strength of concrete by addition of banana fibres.

Sl.no	% of BF	Compressive strength Results (N/mm²)		
		28 days	56 days	90 days
1	0%	39.28	42.56	45.62
2	0.25%	43.26	47.07	50.56
3	0.5%	46.73	50.95	54.88
4	1%	43.93	47.87	51.39

Table 3: Combined compressive strength result with 15% Waste foundry sand replace with fine aggregate and by adding 0.5% Banana fibre in concrete.

Sl.no	% Of WFS+BF	Compressive strength Results (N/mm²)		
		28 days	56 days	90 days
1	0%	39.28	42.56	45.62
2	15% WSF+0.5%BF	49.92	54.45	58.46

4.2 Split tensile strength results

Results of the split tensile strength test for the cast and cured specimens, performed in a compressive strength machine, are shown in a table.

Table 4 : Split tensile strength of concrete with Waste Foundry Sand as partial replacement of fine aggregate.

Sl.no	% Of WFS	Split tensile strength Results (N/mm²)		
		28 days	56 days	90 days
1	0%	3.88	4.22	4.53
2	5%	4.11	4.46	4.79
3	10%	4.24	4.61	4.94
4	15%	4.46	4.85	5.21
5	20%	4.22	4.59	4.98
6	25%	3.99	4.34	4.67

Table 5 : Split tensile strength of concrete by addition of banana fibres.

Sl.no	% of BF	Split tensile strength Results (N/mm²)		
		28 days	56 days	90 days
1	0%	3.88	4.22	4.53
2	0.25%	4.16	4.53	4.86
3	0.5%	4.23	4.61	4.98
4	1%	4.08	4.36	4.78

Table 6: Combined Split tensile result with 15% Waste foundry sand replace with fine aggregate and by adding 0.5% Banana fibre in concrete.

Sl.no	% Of WFS+BF	Split tensile strength Results (N/mm²)		
		28 days	56 days	90 days
1	0%	3.88	4.22	4.53
2	15% WSF+0.5%BF	4.65	5.06	5.44

5. CONCLUSION:

1. The Normal Concrete Compressive strength result for 28,56 and 90 days is 39.28, 42.56 and 45.62 N/mm^2.

2. At 15% replacement of fine aggregate by waste foundry sand the compressive strength of concrete for 28,56 and 90 days is 45.66, 49.79 and 53.44 N/mm^2.

3. By addition of 0.5% banana fibre in concrete the compressive strength of concrete for 28,56 and 90 days is 46.73, 50.95 and 54.88 N/mm^2.

4. Combined replacement of with 15% of waste foundry sand and 0.5% of banana fibre adding on concrete the compressive strength of concrete for 28,56 and 90 days is 49.92, 54.45 and 58.46 N/mm^2.

5. The Normal Concrete Split tensile strength result for 28,56 and 90 days is 3.88, 4.22 and 4.53 N/mm^2.

6. At 15% replacement of fine aggregate by waste foundry sand the Split tensile strength of concrete for 28,56 and 90 days is 4.46, 4.85 and 5.21 N/mm^2.

7. By addition of 0.5% banana fibre in concrete the Split tensile strength of for 28,56 and 90 days is 4.23, 4.61 and 4.98 N/mm^2.

8. Combined replacement with 15% of waste foundry sand and 0.5% of banana fibre adding on concrete the Split tensile strength of concrete for 28,56 and 90 days is 4.65, 5.06 and 5.44 N/mm^2.

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