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INVESTIGATION ON JUTE FIBRE CONCRETE WITH WASTE FOUNDRY SAND

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ABSTRACT
In an effort to reduce its impact on the environment, the construction sector is always looking for sustainable substitutes for traditional building materials. The combined impacts of incorporating jute fibre into concrete and using waste foundry sand (WFS) as a partial substitute for fine aggregate are examined in this study. WFS is a byproduct of metal casting operations that presents environmental issues and disposal obstacles. But adding it to concrete as an additive can have positive effects on the environment and the economy. To asses the compressive strength and split tensile strength for 28,56 and 90 days.

Keywords:
Jute fibre, Waste foundry sand, Environmental issues, Compressive Strength and Split Tensile Strength.

1.INTRODUCTION

Concerns over the effects of development on the environment and the depletion of natural resources have grown in recent years. Consequently, in an effort to increase the sustainability of concrete manufacturing, scientists and engineers have been investigating substitute materials and techniques. One such method is adding jute fibres to concrete to improve its qualities and using waste foundry sand (WFS) in part as a substitute for fine aggregate

Waste foundry sand is produced during the metal casting process and is widely accessible. However, because of its disposal difficulties, it is frequently seen as a troublesome waste material. Recent research, however, indicates that WFS may be used in place of fine aggregate in concrete production without degrading the material's mechanical qualities. Not only may the environmental impact of disposing of concrete be mitigated, but it is also possible to minimise the use of natural resources like river sand by adding WFS into concrete mixtures.

Additionally, because of its advantageous qualities—such as their high tensile strength, low cost, and biodegradability—the addition of natural fibres, including jute fibres, to concrete has drawn attention. Jute fibres can increase the composite material's ductility, toughness, and impact resistance when they are added to concrete mixtures. Furthermore, by offering a sustainable substitute for synthetic fibres, jute fibres support sustainability.

2.OBJECTIVES

(a) Examine the durability performance of concrete reinforced with jute fibre and WFS, paying particular attention to elements such sulphate attack resistance, resistance to abrasion, penetration by chloride ions, and freeze-thaw cycles.

(b) Ascertain the ideal ratio of WFS and jute fibre in the concrete mix to meet performance objectives while reducing material costs and consumption.

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3.MATERIALS

1. Cement:- Cement serves as a common binding agent in construction and is the primary ingredient in mortar, grout, and concrete. To create clinker, a mixture of limestone, clay, shale, iron ore, and other materials is frequently burnt at high temperatures in a kiln. Clinker is then reduced to a fine powder.

2. Fine aggregate:- The average diameter of the particles that make up sand is between 0.075 and 4.75 millimetres (mm). Sometimes, people refer to it as fine aggregate. When combined with cement and coarse aggregate (such as crushed stone or gravel), it forms the foundation of mortar and concrete compositions.

3. Coarse aggregate:- Granular materials with an average diameter of 4.75 mm to 75 mm are referred to as coarse aggregate; however, the upper limit may change based on regional requirements and laws. Like sand and cement as well as fine aggregate, it is one of the primary ingredients of concrete.

4. Waste foundry sand:- Waste foundry sand needs to be handled carefully to reduce negative impacts on the environment and public health because of its makeup and possible environmental impact. A range of techniques, including recycling, constructive reuse, and appropriate disposal, are utilized to appropriately handle leftover foundry sand.

5.Jute Fibre:- Additionally, jute fibers can help reduce shrinkage and cracking in concrete, leading to improved overall performance and longevity of concrete structures.

6. Water:- Water is frequently added to concrete mixtures, which affects the hardened material's strength, durability, and workability. Enduring concrete projects that are high-quality and long-lasting need careful control of the water-cement ratio, proper mix design, and application of curing procedures.

4. TEST RESULTS

(a) Compressive Strength: The highest load or force that a material can bear when compressed (pressed or squeezed) before failing or breaking is known as its compressive strength. To determine for 28,56 and 90 days.

Table 1:- Compressive Strength Results on Concrete With Partial Replacement of Fine Aggregate With Waste Foundry Sand.

S.No.	% of WFS	Compressive Strength Results,(N/mm^2)		
		28 days	56 days	90 days
1	WF0	39.43	42.96	46.12
2	WF5	42.13	45.92	49.24
3	WF10	43.44	47.36	50.83
4	WF15	45.73	49.86	53.54
5	WF20	44.06	48.02	51.57
6	WF25	42.22	45.89	49.08

Table 2: Compressive Strength Results on Addition of Jute Fibre by Weight of Concrete.

S.No	% of JF	Compressive Strength Results,(N/mm^2)		
		28 days	56 days	90 days
1	0%	39.43	42.96	46.12
2	0.5%	45.41	49.42	53.04
3	1.0%	47.75	52.02	55.85
4	1.5%	45.86	49.98	53.67

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Table 3: Combined Replacements of Compressive Strength Results on Concrete With Waste Foundry Sand and Jute Fibre

Sl.no	% of WFS + % of JF	Compressive Strength Results,(N/mm^2)		
		28 days	56 days	90 days
1	0%	39.43	42.96	46.12
2	15 % WFS+1.0% JF	50.91	55.56	59.89

Split Tensile Strength: The split tensile strength of concrete is an important property that shows how resilient the material is to tensile strains and breaking. It is particularly significant in situations where tensile forces are expected to be applied to the concrete. To determine for 28,56 and 90 days.

Table 4 : Split Tensile Strength Results on Concrete With Partial Replacement of Fine Aggregate With Waste Foundry Sand.

S.No	% of WFS	Split Tensile Strength Results,(N/mm^2)		
		28 days	56 days	90 days
1	WF0	3.78	4.11	4.43
2	WF5	4.06	4.49	4.75
3	WF10	4.19	4.55	4.89
4	WF15	4.41	4.83	5.18
5	WF20	4.25	4.66	4.92
6	WF25	3.99	4.34	4.67

Table 5: Split Tensile Strength Results on Addition of Jute Fibre by Weight of Concrete.

S.No	% of JF	Split Tensile Strength Results,(N/mm^2)		
		28 days	56 days	90 days
1	0%	3.78	4.11	4.43
2	0.5%	4.39	4.78	5.14
3	1.0%	4.71	5.16	5.57
4	1.5%	4.44	4.83	5.19

Table 6: Combined Replacements of Split Tensile Strength Results on Concrete with Waste Foundry Sand and Jute Fibre

S.No	% of WFS + % of JF	Split Tensile Strength Results,(N/mm^2)		
		28 days	56 days	90 days
1	0%	3.78	4.11	4.43
2	15 % WFS+1.0% JF	5.31	5.79	6.22

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5.CONCLUSIONS

1. The Normal Concrete of compressive strength results for 28, 56 and 90 days is 39.43, 42.96 and 46.12 N/mm^2.
2. The Normal Concrete of split tensile Strength results for 28, 56 and 90 days is 3.78, 4.11 and 4.43 N/mm^2.
3. At 15% waste foundry sand replacement of fine aggregate, the compressive strength results are optimum for 28, 56 and 90 days is 45.73, 49.86 and 53.54N/mm^2.
4. At 15% waste foundry sand replacement of fine aggregate, the Split tensile strength results are optimum for 28, 56 and 90 days is 4.41, 4.83 and 5.18 N/mm^2.
5. At 1.0% jute fiber to concrete by weight, the compressive strength results are optimum for 28, 56 and 90 days is 47.75, 52.02 and 55.85 N/mm^2
6. At 1.0% jute fiber to concrete by weight, the compressive strength results are optimum for 28, 56 and 90 days is 4.71, 5.16 and 5.57 N/mm^2
7. By combining 15% waste foundry sand as a replacement for fine aggregate and adding 1.0% jute fiber to concrete, the compressive strength results at 28, 56 and 90 days is 50.91,55.56 and 59.89N/mm^2.
8. By combining 15% waste foundry sand as a replacement for fine aggregate and adding 1.0% jute fiber to concrete, the split tensile strength results at 28, 56 and 90 days is 5.31, 5.79 and 6.22 N/mm^2.

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