

EXPERIMENTAL STUDY ON STRENGTH PROPERTIES OF GLASS FIBER WITH PARTIAL REPLACEMENT OF CEMENT BY RICE HUSK ASH

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Abstract - The main objective of this study is to determine the strength characteristic of concrete by using glass fiber and replacing the cement by rice husk ash. It is used as pozzolanic material for long time because it contains silica. Fiber reinforced concrete is defined as concrete having fibers in random distribution. Concrete is brittle in nature, its elasticity is low when contrasted with its compressive quality so different types of fibers are there but we are used the glass fiber as FRC material. In this study an attempt is made to know the behaviour of glass fiber reinforced concrete with partial replacement of cement by rice husk ash. Here cement is replaced by rice husk as in the order of 2.5%, 5%, 7.5%, 10%, 12.5%, 15% and fiber of 0.5% by volume is added. It is observed that the substitution of cement by rice husk ash is going to reduce the strength in the entire test. Glass fiber reinforced concrete with 7.5% of rice husk ash replacement to cement can be considered as good concrete.

Key Words: Rice husk ash, Glass fiber, Strength, FRC, pozzolanic.

1. INTRODUCTION

Concrete has years of history since from then it is the most important thing for the construction works like buildings dams roads, concrete is also used in under water construction. Concrete is a composite materials like binding material, fine aggregate, coarse aggregate, admixtures and water. It has been developing step by step on account of its adaptability of utilization numerous explores are assisting with updating the solid such a significant number of materials are utilizing as supplanting materials.

1.1 Pozzolanic Material

Pozzolanic materials are the silica based material they do not contain cementitious properties. But when the pozzolanic material respond with calcium hydroxide which is delivered during hydration process at conventional temperature to structures mixes which are having cementitious property.

1.2 Fiber Reinforced Concrete

Concrete is brittle in nature, it's elasticity is low when contrasted with its compressive quality along these lines the solid fortified with steel bars. Presently the filaments or fibers are utilizing the solid motivation behind utilizing fiber is to expand the rigidity, studiness, flexural quality, toughness. Fibers are randomly dispersed in fiber-

reinforced concrete but in normal rebars are placed as per designation

2. LITERATURE REVIEW

Pirth and Mehta (2000) The examination paper the impact of rice husk debris in regards to with the temperature of cement. Based on perception utilization of RHA in solid assists with decreasing the temperature of mass of cement the paper shows that it lessens the temperature when contrasted with OPC.

Gaurav Tuli and ishan Garg (2000) The gernal paper An Overview of glass fiber reinforced concrete shows that The fiber reinforced concrete has better quality and solidness contrasted with plain concrete. The normal concrete contains micro porous cracks this condition is inhibited by using glass fiber here for research the anti crack CEM-FILL alkali resistance fiber were used in varying percentages.

Surabha P. Bawankule (2015) In this Experimental work shows the investigation of rice husk ash as a replacement material for ordinary Portland cement. For that rice husk ash proportion is varied gradually by 2.5% in cement mortar paste from 0% to 15% and concluded that the compressive strength of hardened concrete is diminishes with increment in the percentage of rice husk ash.

Durga chaitanya kumar jagarapu (2016) In this journal paper that is Experimental Studies on Glass Fiber. The attempt was made to know physiological behavior. Here glass fiber are used in the order of 0.5%, 1%, 2%, and 3% of cement. The glass fiber in solid expands the rigidity and furthermore helps in solidness and durability.

Gupta et al (2017) The journal paper shows The effect of alkali resistant glass fiber are studied and strength are calculated and contrasted with normal concrete for M25 grade concrete.

Savita chaudhary and aditya pratap singh (2018) This experimental study Rice husk ash as pozzolanic material many exploration has been done to study the utilization of RHA in concrete and furthermore demonstrated that it has the nature benefit. So this is the priniple intension of this work.

Ashish Kumar singh (2018) In this experimental study A review on partial substitution of cement by rice husk ash.

Here it shows substitution of cement by RHA at 0% to 20% and the strength testes are done and contrasted with no substitution according to the results substitution is recommended only up to 15%.

The main objective of the present study was to know the strength behavior of glass fiber reinforced concrete by replacing cement by rice husk ash.

3. MATERIALS USED AND METHODOLOGY

MATERIALS

CEMENT: The cement used in this experimental study is ACC ordinary Portland cement of 43 grade. Test results are as shown below.

Table 3.1 Test results cement

no	Test	Result
1	specific gravity of cement	3.1
2	Initial setting time	30 minutes

M- SAND: locally available M- sand was used as fine aggregate the specific gravity test was conducted and the value was found to be 2.46 and water absorption is 1.8%.

COARSE AGGREGATE: The 20mm size down of coarse aggregates was utilized in this project. The test results are as shown below.

Table 3.2 test results of coarse aggregate.

No.s	Test	Result
1	Specific gravity	2.64
2	Water absorption	0.16%

GLASS FIBER: Glass fibers of specification CEM fill anti crack HD-12mm is used in the present study.

Rice Husk Ash: rice husk ash was procured from local rice mil and tested for its specific gravity and found to be 2.3.

METHODOLOGY

Mix design for M-30 concrete was carried out as per IS 10262 2009 and the proportion obtained was 1:2:2.5 with water cement ratio 0.5.

4. Casting and testing

The cement concrete of the designed proportion was mixed. During the mixing process cement is replaced by rice husk ash with proportion like 2.5%, 5%, 7.5%, 10%,12.5%, 15%. Mixing is done until homogeneous mix is obtained, specimens were casted for compression strength test, split tensile

strength, and flexure strength. After 24 hours the specimens were de moulded and kept for curing for 28 days the specimens were removed from tank and tested.

The testing on concrete is done in two states that is

5. RESULTS & DISCUSSIONS

TABLE 5.1: COMPRESSIVE STRENGTH TEST

% of replacement	No of cubes	28 days strength	Percentage Decrease in strength (%)
		Average Strength N/mm2	
0%	3	37.33	0
2.5%	3	36.4	2.4
5%	3	35.1	5.6
7.5%	3	33.3	10.7
10%	3	32.4	13
12.5%	3	30.6	17.8
15%	3	30.2	19

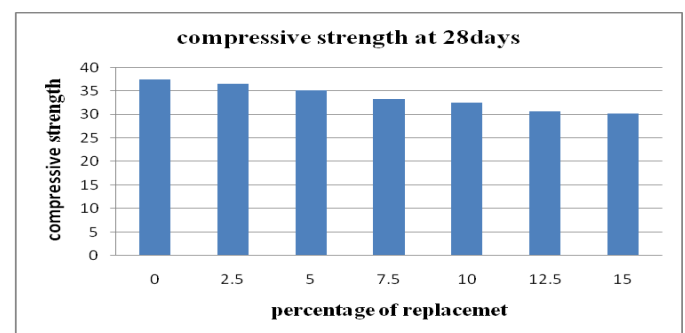


Fig 5.1: Compressive strength at 28days

TABLE 5.2: SPLIT TENSILE STRENGTH TEST

% of replacement	No of cylinders	28 days strength	Percentage Decrease in strength (%)
		Average Strength N/mm2	
0%	3	3.1	0
2.5%	3	2.9	6.45
5%	3	2.68	13.5
7.5%	3	2.55	17.1
10%	3	2.4	22.5
12.5%	3	2.26	27
15%	3	2.12	31.6

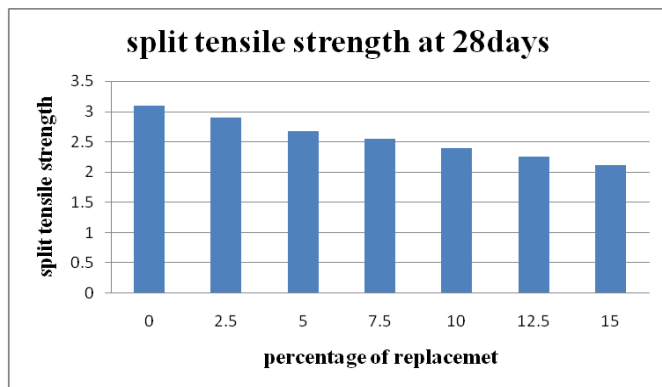


Fig 5.2: Split tensile strength at 28days

TABLE 5.3: FLEXURAL STRENGTH TEST

% of replacement	No of beams	28 days strength	Percentage decrease in strength (%)
		Average Strength N/mm2	
0%	3	5.24	0
2.5%	3	5.16	1.5
5%	3	5.08	3.05
7.5%	3	4.86	7.25
10%	3	4.74	9.5
12.5%	3	4.4	16
15%	3	4.28	18.3

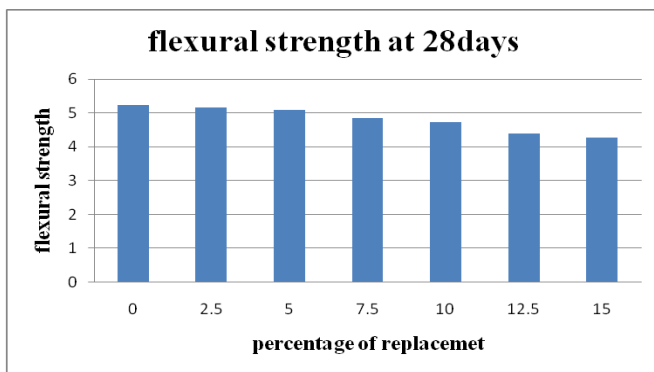


Fig 5.3: Flexure strength at 28days

6. CONCLUSIONS

The test result was tabulated and percentage increase or decrease in strength is calculated.

1. It is observed that the substitution of cement by rice husk ash is going to reduce the strength in the entire test.
2. The reduction in compressive strength is 19% when percentage replacement is about 15% however the strength is 30.2MPa whereas at 7.5% replacement the

strength is 33.3MPa and corresponding reduction is 10.7%.

3. The same observation is made in all of strength test.

Thus glass fiber reinforced concrete with 7.5% of rice husk ash replacement to cement can be considered as good concrete.

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