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UTILIZATION OF RICE HUSK ASH AS PARTIAL REPLACEMENT FOR CEMENT IN CONCRETE

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ABSTRACT–

Strong Material is a key factor in measuring strength of a Structure. The fact that India is a developing nation having Mega structure and line up in the strongest nations of the world. For strong structure strength of material used should be high enough. What if the concrete used is having a high strength and we are also able to save the material and make it Eco Friendly? That's the better idea to make the structure Eco-friendly and also the use of material is less. The main objective of the project is to expedite the improvement of infrastructure with the help of High- Performance Concrete. The project has one of the major advantages that we can use the waste material produced during farming and use that thing in the improvement of strength of material and use it in the construction part of mega structures.

This Project addresses the potential use of Rice Husk Ash (RHA) as a cementitious material in concrete mixes. RHA is produced from the burning of rice husk which is a by- product of rice milling. The ash content is about 18-22% by weight of the rice husks. Research has shown that concrete made with RHA as a partial cement substitute to levels of 5%, 10%, 15% and 20% by weight of cement has superior performance characteristics compared to normal concrete. Also, the use of RHA would result in a reduction of the cost of concrete construction, and the reduction of the environmental greenhouse effects.

Concerns and the requirement to conserve energy and resources, efforts have been made to burn the husk at a controlled temperature and atmosphere, and to utilize the ash so produced as a supplementary cementing material

2. MATERIALS USED

2.1 Rice Husk Ash (RHA)

The ash collected was sieved through BS standard sieve size 75µm and its color was grey.

2.2 Cement

Ordinary Portland cement (OPC) of 53 grade was used in which the composition and properties is in compliance with the Indian standard organization.

2.3 Water

Water plays an important role in concrete production (mix) in that it starts the reaction between the cement, pozzolan and the aggregates. It helps in the hydration of the mix. In this research, the water used was distilled water.

2.4 Aggregates

The research work is restricted to sand collected from the river. The sand was collected to ensure that there was no allowance for deleterious materials contained in the sand. In this research, granite of 20mm maximum size was used.

FIG 2.1 RICE HUSK ASH

3. METHODOLOGY

The main objective of this work is to study the suitability of the rice husk ash as a pozzolanic material for cement replacement in concrete. However, it is expected that the use of rice husk ash in concrete improves the strength properties of concrete.

Also, it is an attempt made to develop the concrete using rice husk ash as a source material for partial replacement of cement, which satisfies the various structural properties of concrete like compressive strength and Flexural strength.

It is also expected that the final outcome of the project will have an overall beneficial effect on the utility of rice husk ash Concrete in the field of civil engineering construction work.

Following parameters influences behavior of the rice husk ash concrete, so the separameters are kept constant for the experimental work:

a) Percentage replacement of cement by rice husk ash

b) Fineness of rice husk ash

c) Chemical composition of rice husk ash

d) Water to cementitious material ratio (w/b ratio)

3.1 PROCEDURE

- **COLLECTION OF MATERIALS**
- **MIXING PROCESS**
- **MOLDING PROCESS**
- **REMOVING OF MOULD**
- **CURING**
- **TESTING.**

1. Physical Property of Material:

Physical property as color, specific gravity, initial setting time, moisture content etc., is to be determined by experiments.

2. Mixing Process:

For this experimental study, concrete is to be prepared by nominal mix method. For present study concrete should be mixed in specific proportions and w/c ratio, Rice hush ash added as 5 % 25% of cement weight by increments.

3. Moulding Process:

Concrete mixer moulded in cube sized 150*150*150 mm^3. Totally, 72 cubes should be moulded, in which 18 cubes were tested of each interval that is for 7 ,14 ,21 and 28 days.

4. Removing Of Mould:

After 24 hours moulds are removed.

5. Curing Process:

Concrete cubes are cured normally in fresh water for 7 to 28 days at room temperature.

6. Testing Process:

For finding physical property of material, specific gravity of cement, initial setting time, moisture content and standard consistency should be determined, compressive strength was to be conducted by compressive strength testing machine.

4. TESTING OF SPECIMENS

After casting, specimens were tested after 7 and 28 days of curing. Under this article, the procedure followed for testing of specimens is mentioned for evaluating various properties like compressive strength, splitting tensile strength, young's modulus of elasticity and rapid chloride permeability of concrete.

4.1 RESULTS OF SLUMP TEST

MIX	RHA Replacement	Slump Value (mm)
M1	0%	77
M2	5%	72
M3	10%	66
M4	15%	60
M5	20%	50

Table 4.1: Result of Slumps

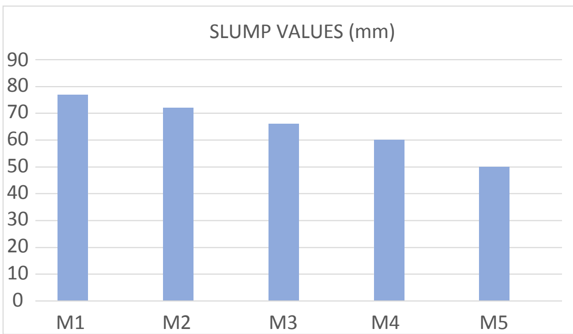

Fig 4.1 - Results of Slump Value

4.2 COMPRESSIVE STRENGTH

Six cubes sized 150mmx150mmx150mm were casted to be tested at 7 days and 28 days of curing for each mix except for concrete mix containing carbon nano tubes. Nine numbers of cubes for concrete were casted and tested after 28days of curing. Details the values of compressive strength for different batches.

MIX	RHA Replacement	Compressive Strength (N/mm^2)	
		7 Days	28 Days
M1	0%	33.5	47.6
M2	5%	36.7	49.1
M3	10%	34.6	46.2
M4	15%	31.9	40.1
M5	20%	27.4	35.3
M6	25%	21.1	27.4

Table 4.2 - Compressive strength and flexure strength

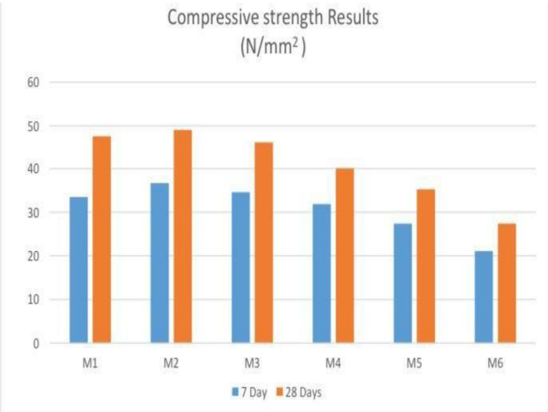

Fig 4.2 – Result of Compressive strength

4.3 SPLITTING TENSILE STRENGTH

Six cubes sized 150mmx150mmx150mm were casted to be tested at 7 days and 28 days of curing for each mix except for concrete mix containing carbon nanotubes. Nine numbers of cubes for concrete were casted and tested after 28 days.

SPLIT TENSILE STRENGTH (Nmm^2)		
Sample	7 Days	28 Days
M1	2.163	3.021
M2	2.360	3.178
M3	1.921	2.643
M4	1.814	2.517
M5	1.586	2.118
M6	1.443	2.041

Table 4.3 - Split Tensile Strength of Concrete

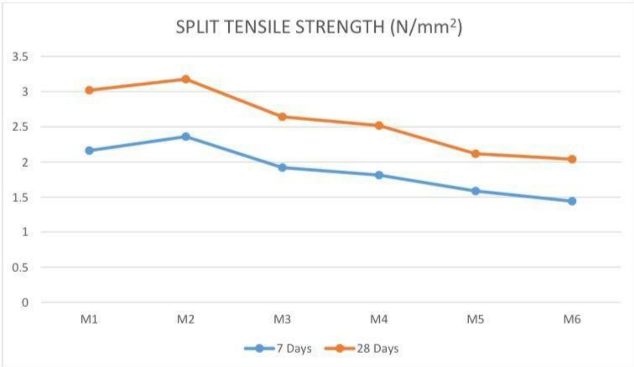

Fig 4.3 – Split tensile strength

4.4 COMPARING RESULTS

As the project done is with RHA and without RHA so we need to compare theresults of the two.

Now below are the comparison of results of the project in form of Table and thegraphical representation.

MIX	RHA REPLACEMENT	COMPRESSIVE STRENGTH		FLEXURE STRENGT H
		7 DAYS	28 DAYS	28 DAYS (N/mm^2)
M1	0%	33.5	47.6	3.037
M2	5%	36.7	49.1	3.350
M3	10%	34.6	46.2	3.151
M4	15%	31.9	40.1	2.516
M5	20%	27.4	35.3	2.185
M6	25%	21.1	27.4	1.975

Table 4.4- Compressive strength and flexure strength

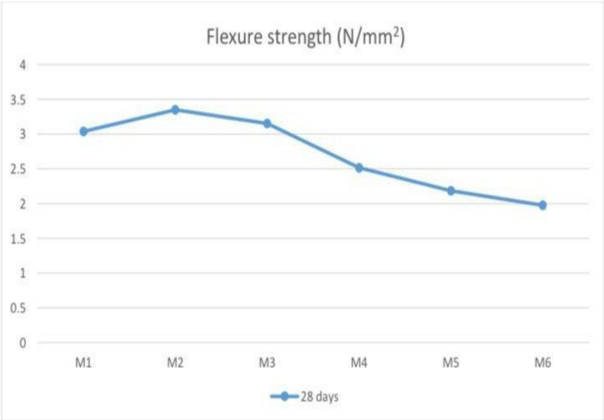

Fig 4.3- Flexure Strength of concrete

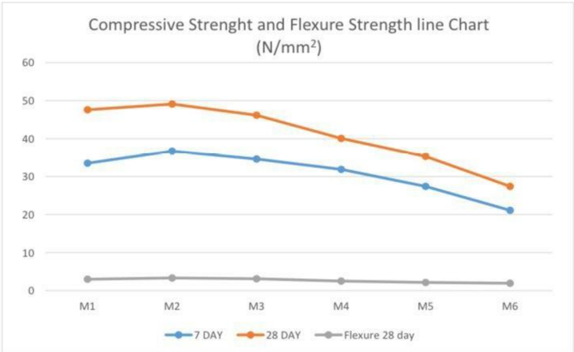

Fig 4.4 – Comparison of compressive and flexure strength

From the above results we can demonstrate that the Compressive Strength of concrete can be increased if a correct Proportion of RHA is to be mixed properly.

Flexure strength came out to be good at M2 grade in our testing and after further increase in RHA we notice a sudden decrease in flexure strength.

From the above results we come to a conclusion that for M2 (5% RHA Replacement) we get maximum compressive, flexural and split tensile strength for the concrete.

5.CONCLUSION

After doing this project following conclusions are made:

➢ Rice Husk Ash is a highly reactive pozzolanic material and can be used as a supplementary cementing material to produce high-performance concrete.

➢ The compressive strength of the concrete containing up to 15 percent of the RHA was higher than that of the control Portland cement concrete. The strength of the concrete increased with decreasing w/ (c + RHA).

➢ Due to the high specific surface of the RHA, the concrete incorporating RHA required higher dosages of the super- plasticize and the air-entraining admixture than the control Portland cement and silica fume concretes to achieve the same slump and air content.

➢ The RHA concrete had slightly longer set times than those of the control and the silica fume concretes. The bleeding of the concrete incorporating RHA was negligible.

➢ The RHA concrete had higher compressive strengths at ages up to 180 days compared with that of the control concrete, but lower values than those of the silica-fume concrete.

➢ The flexural and splitting tensile strengths, modulus of elasticity, and dryingshrinkage of the control concrete and the concrete incorporating RHA or silica fumewere comparable.

6. REFERENCES

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