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BENEFITS OF USE OF RICE HUSK ASH IN CONCRETE

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ABSTRACT

In this investigation, a feasibility study is made to use Rice Husk Ash as an admixture to an already replaced Cement with fly ash (Portland Pozzolana Cement) in Concrete, and an attempt has been made to investigate the strength parameters of concrete (Compressive and Flexural). For normal concrete, Indian Standard (IS) method of mix design is adopted. Five different replacement levels namely 5%, 7.5%, 10%, 12.5% and 15% are chosen for the study concerned for replacement method. A range of curing periods starting from 3 days, 7 days, 28 days and 56 days are considered in the present study.

INTRODUCTION

India is a major rice producing country , and the husk generated during milling is mostly used as a fuel in the boilers for processing paddy , producing energy through direct combustion and / or by gasification . About 20 million tones of RHA is produced annually. This RHA is a great environment threat causing damage to the land and the surrounding area in which it is dumped. Lots of ways are being thought of for disposing them by making commercial use of this RHA. In the present investigation, Portland cement was replaced by rice husk ash at various percentages to study compressive and flexural strength (Min-Hong Zhang and Malhotra, 1996).

EXPERIMENTAL PROGRAMME
Materials Used

Cement

Cement used in the experimental work is PORTLAND POZZOLONA CEMENT conforming to IS: 1489 (Part1)-1991.

Rice Husk Ash

Rice Husk Ash used in the present experimental study was obtained from N.K Enterprises Jharsuguda, Orissa.

Aggregates

1. Fine Aggregate

Fine aggregate was purchased which satisfied the required properties of fine aggregate required for experimental work and the sand conforms to zone III as per the specifications of IS 383: 1970.

2. Coarse Aggregate

Crushed granite of 20 mm maximum size has been used as coarse aggregate. The sieve analysis of combined aggregates confirms to the specifications of IS 383: 1970 for graded aggregates.

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Super Plasticizers

Conplast SP430A2 (1)

This is the name of the super plasticizing admixture manufactured by "FOSCROC Chemicals" used in this study to produce workable concrete.

Water

In this project clean potable water was obtained from Department of Civil Engineering, GITAM ,University for mixing and curing of concrete.

Mix Design for M20-Grade Concrete

The mix proportions considered for each replacement by replacement method with RHA are presented in Tables (IS 120262 – 1975).

TESTS CONDUCTED

Test for compressive strength and flexural strength of RHA concrete specimen
Standard 200 T compression testing machine is used for testing of samples of size 150*150*150mm.The samples are placed in the machine with neat capping done to ensure uniform transmission of load.
The failure load is noted down and the strength is calculated (IS 516 – 1959 and IS 9399 – 1979). Three each of 0%,5%,7.5%,10%,12.5% and 15% RHA replaced and3, 7, 28, 56 days water used samples are tested.

Similarly, standard 40T universal testing machine is used for testing the flexural beams of size 500mmx100mmx100mm.

The samples are mounted over roller supports and the load is applied at the centre to note the failure .The strength is calculated using formulae as per the necessary code (0IS 516 – 1959 and IS 9399 – 1979.).

RESULTS

The above results clearly show that 7.5 % replacement of Rice Husk Ash in concrete exhibits comparatively better strengths with respect to normal concrete. Hence, 7.5% RHA concrete may be compared with normal concrete for cost effectiveness.

Table 1.

Percentage replacement of rice husk ash	Grade of Concrete	Cement in Kgs in Kgs	Rice Husk Ash in Kgs	Fine Aggregate in Kgs	Coarse Aggregate	Water in Ltrs in Ltrs	Super Plasticizer
5	M20	0.95	0.05	1.55	3.54	0.5	1.2
7.5	M20	0.925	0.075	1.55	3.54	0.5	1.2
10	M20	0.90	0.1	1.55	3.54	0.5	1.2
12.5	M20	0.875	0.125	1.55	3.54	0.5	1.2
15	M20	0.85	0.15	1.55	3.54	0.5	1.2

Table 2. Highest Compressive strength obtained at different ages

Age in days	0%	5% RHA	7.5% RHA	10% RHA	12.5% RHA	15% RHA
3	14.51	12.96	13.32	12.7	10.7	8.88
7	20.58	19.3	19.7	18.96	18.58	16.22
28	30.3	31.5	31	30	30.14	21
56	36.36	35.84	37.62	36.15	32.88	25.88

Table 3. Flexural strength of Control and Rice Husk ash concrete in N/mm^2

Curing Period	3 days	7 days	28 days	56 days
0%	1.01	1.17	4.21	4.95
5%	1.22	1.36	3.62	4.21
7.5%	1.44	1.62	3.84	4.62
10%	1.34	1.41	2.75	3.29
12.5%	1.22	1.44	2.24	2.76
15%	1.04	1.25	2.08	2.35

BRIEF ESTIMATE OF COST SAVINGS

1) Quantity of cement/cu.m= 383kg = 8 bags(apprx) x Rs 240/bag(50kg) = Total= Rs.1920
2) Rate per kg= Rs.4.80
3) 7.5% Of 383 kg = 28.725 kg
4) 28.725 kg x Rs.4.80= Rs.137.88 per cu.m of concrete can be saved

However, transport and logistics have not been considered since rice husk is abundantly available at countryside and may be used.

CONCLUSIONS

Based on the limited study carried out on the strength behavior of Rice Husk Ash Concrete, the following conclusions are drawn:

1) Strength and cost savings (as shown above) of Rice Husk Ash concrete proves it to be a better material than various other supplementary materials which involve higher transport cost.
2) By using this Rice husk ash in concrete as replacement the emission of green house gases can be decreased to a greater extent. As a result there is greater possibility to gain more number of carbon credits.
3) The technical and economic advantages of incorporating Rice Husk Ash in concrete should be exploited by the construction and rice industries, more so for the rice growing nations of Asia.
4) This study is relevant in the global scenario towards attaining sustainable development.

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