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EFFECTS OF RICE HUSK ASH ON PROPERTIES OF CEMENT CONCRETE

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ABSTRACT

Worldwide consumption ofconventional cement concrete is estimated to be more than 1000kg/person. Cement material presently is not in a position to cope this high demand. Hence, overstressing the reserves of traditional building materials. The wide spread need for conserving resources and environment will reflect major emphasis on the use of wastes and by-products like, saw mill waste, blast furnace slag or Rice husk etc. In the present investigation, effects on various properties like workability, initial and final setting time and compressive strengths are considered by replacing 20% of cement with RHA. The compressive strength test sales of dimension 15x15x15 cm were tested by replacing 20% of cement by weight. The results indicated that RHA can be used as a substitute for cement(around 20% replacement) after 3, 7 and 28 days of curing.

Keywords: Rice Husk Ash, RHA, Effects Of RHA On Normal Cement Concrete, Portland Cement, Properties Of Rice Husk

I. INTRODUCTION

RHA is produced by controlled burn and/or grinding. The world rice harvest is estimated in 500 million tons per year. Considering that 20% of the grain is husk and 20% of the husk after combustion is converted into ash, a total of 20 million tons of ash can be obtained. This report evaluates how different contents of RHA added to cement concrete may influence its properties. Here the effect of partial replacement (20% by weight) of cement with RHA on the compressive strength and other properties are examined.

Rice husk has recently been recognized as pozzolona. A pozzolona is a siliceous/aluminous materials which have no cementitious value of its own but in presence of moisture it chemically reacts with calcium hydroxide liberated during the hydration of Portland cement to produce stable cementitious compound which contributes to its strength and impermeability (Sima, 1974)

Many countries have the problem of shortage of conventional cementing materials. Moreover there are efforts being made worldwide to utilize waste materials and by-products in concrete. One of such materials is the rice husk which under controlled burning and/or grinding is used as a cement replacement materials in concrete (Anwar and team, 2000)

Need of RHA: RHA is a waste material which is freely available to us from rice mills. The widespread need for using alternate and waste materials leads to the importance of using RHA or other by products of the industries helps to preserve our resources and also it is environment friendly as well aseconomical from construction and research point of view.

Material Used: The various materials used in the experimental work were ordinary Portland cement of 43 grade, fine and course aggregates, RHA and water.

II. METHODOLOGY

Total 9 cube blocks of size 15x15x15 cm have been taken in consideration to find out the compressive strength of the concrete blocks for curing at 3, 7 and 28 days, 3 cubes for each type. Some of the other properties of RHA are also find out experimentally and recorded as follows:

Observations: Firstly various properties of RHA were examined and they are

1. Specific gravity
2. Bulk density
3. Fineness

III. SPECIFIC GRAVITY

Weight of empty pycnometer (M1) = 324.5g

Wt. of pycnometer + RHA (M2) = 355.9g

Wt. of pycnometer + RHA + water (M3) = 856.3g

Weight of pycnometer + water (M4) = 871.7g

Gravity of RHA = (M2-M1) / (M2-M1)-(M4-M3) = 1.96

IV. BULK DENSITY

Empty weight of calibrated container = 47g

Weight of container + RHA = 96.6g

Volume of container =100 mm^3

Bulk density of RHA= (96.6-47) / 100 = 0.496 g/mm^3 OR 496 kg/m^3

Bulk density of RHA= 0.496 g/mm^3 OR 496 kg/m^3

V. FINENESS

Mass of sample of RHA =100g

Mass passing 90 micron sieve = 40g

Fineness of RHA = 60%

High value due to ineffective grinding of sample

VI. EFFECTS OF RHA ON WORKABILITY

Workability of cement OPC grade-43 without any RHA

Using Slump Test

0-25mm slump = Low Workability

25-75mm Slump = Medium Workability

75-100mm Slump = High Workability

Workability of OPC without RHA comes out to be 0.60 of water content.

Whereas on replacing 20% of cement with RHA we achieve this much workability at 0.80 of water content.

VII. EFFECTS OF RHA ON INITIAL AND FINAL SETTING TIME

The initial setting time and final setting time of an ordinary Portland cement without RHA is 30 min and 135 min respectively.

Whereas if 20% of cement is replaced by RHA the initial and final setting times changes to 60 min and 180 min respectively.

VIII. EFFECTS OF RHA ON COMPRESSIVE STRENGTH

The Compressive Strength of M20 concrete at 3, 7 and 28 days are 14.50, 20.50 and 30.3 respectively.

Whereas on replacing cement with 20% of RHA it comes out to be 13.40, 21.60 and 30.70 respectively.

IX. RESULT AND DISCUSSIONS

The graphical and tabular data representation of the experimental results on the workability Initial and Final Setting Time and Compressive Strength of concrete at different curing periods has been shown as below:

Table 1: Water Content Vs Slump

WATER CONTENT	SLUMP (mm)
0.55	8
0.6	12
0.65	26
0.7	43
0.75	65
0.8	85

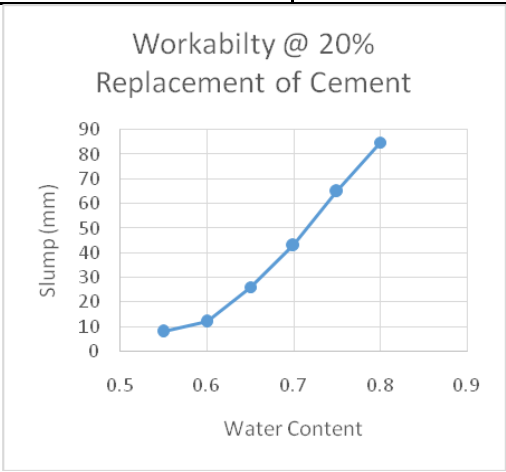

Fig: 1 Water Content Vs Slump

Table 2: Result of Vicat's Apparatus Test

TIME (MINS)	DEPTH NOT PENETRATED (mm)
10	0
20	0
30	0
40	0
50	0
60	0.5
80	0.5
100	1
120	2.5
140	3
160	4
170	4.5
180	5

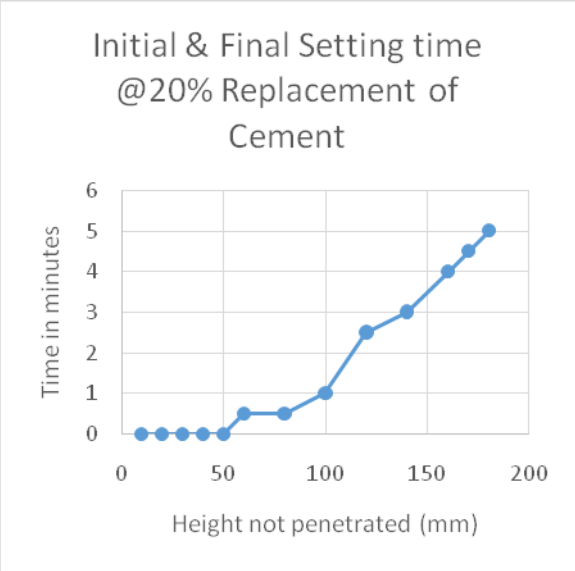

Fig: 2Test Results of Vicat's Apparatus

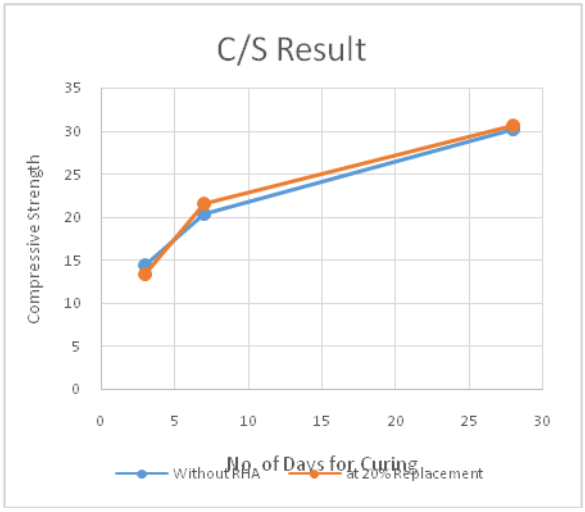

Fig: 3Test Results Compressive Strength

X. CONCLUSION

The following conclusions have been drawn from the present study on RHA:

1. Compressive Strength of concrete is significantly increased after 28 days.
2. Improve workability which leads to less transportation cost.
3. Segregation is reduced.
4. Initial setting time is increased from 30 minutes to 60 minutes whichhelpsin transportation from one place to another.
5. Final setting time is increased from 135 to 180 minutes and hence the time required to re-unite the cracks will be more.

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