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Effect of Rice Husk Ash as Partial Replacement of Cement in Concrete

A.V.S Sai Kumar [a], M.Fayaz [b], E.Arun[C]*

[a,b]*Assistant Professor, Dept of Civil Engineering, Holy Mary Institite of Technology & Science,Bhogaram,Hyderabad,India.*

A B S T R A C T

Rice husk ash is an agricultural based pozzolanic material, generated by rice mills in huge quantities. This paper summarizes the experimental work of concrete in which Portland Pozzolana cement cement were replaced by Rice husk ash (RHA). Partial replacement of OPC cement was carried out at 0%, 4% 8% 12% & 12%. Slump test, compaction factor, and compression test were used in this study to determine the appropriate percentage replacement of cement by RHA. Compression tests were carried out for 7 days, 14 days, and 28 days of curing, and the results show some difference in both tests in every proportion while using M20 (1:1.5:3) concrete and 53 PPC cement.

Keywords: Concrete, Ricehusk ash, RHS and compressive strength

1. Introduction

Due to the wide use of concrete the cost of building materials increasing very quickly in some parts of the world also in developing country like India so only the industries, business cooperation, government and few individual can afford it. This rising cost can however be reduced by use of alternative building materials that are locally available and cheap. Some industrial and agricultural waste products may be use as building material. There are different wastes available in large quantities that have properties to make concrete. Rice husk is one of them; Rice husk is a byproduct of agricultural waste generated in rice millsDuring paddy milling, 80 percent of the weight is discovered to be rice, while the remaining 20% is found to be husk. In industries, this husk is utilized as a fuel to generate steam and for other reasons. This husk contains around 75% organic plant matter, and the remaining 25% of its weight is turned to ash during the burning process, which is known as rice husk ash (RHA)..

2. Materials and its properties

2.1Cement: The cement that is used is of PPC 53 grade as per the standard specifications of the country. The cement according to the Indian specification must satisfy the IS 12269-1987(reaffirmed 1999).

Table: Properties of cement

S.no	Properties	Standards
1	Specific gravity	3.15
2	Initial setting time(min)	45 min
3	Final setting time(min)	330 min`

2.2 Fine Aggregates: Natural fine aggregates are river sand, which is the most often used natural material for aggregates, but a recent social issue that caused a lack of the material caused a significant difficulty in the construction industry. In all of the references, river sand from Zone-I is used for the studies. For creating reference concrete, river sand complying to zone 1 as defined by IS-383-1987 was utilized, with a specific gravity of 2.63.

Table: Properties of fine aggregate

s.no	Properties	Standards
1	Specific gravity	2.65-2.68
2	Fineness Modulus	3.28 kg/m^2
3	Water Absorption	1.6%
4	Surface Texture	Smooth
5	Particle Shape	Rounded

2.3 Coarse Aggregate:Ordinary granite broken stone aggregates of size greater than 12mm are used for the study. Crushed granite coarse aggregate confirming to IS 383 of size 12mm and down having a specific gravity of 2.67 was used.

Table: Properties of Coarse aggregate

s.no	Properties	Standards
1	Specific gravity	2.67
2	Fineness Modulus	6.2887 kg/m^2
3	Water Absorption	0.6%
4	Surface Texture	Rough
5	Particle	Angular

2.4Rice Husk Ash: Every year, India produces 218.2 million tonnes of paddy (18.90 million tonnes in Tamilnadu). Approximately 78 percent of the weight of paddy is obtained as rice during milling. Husk accounts for the remaining 22% of paddy weight. This husk is used to generate steam in rice mills during the parboiling process. Rice Husk Ash is made up of around 75 percent organic volatile matter and 25 percent of the weight of the husk that is transformed into ash during the burning process (RHA). This RHA, in turn, comprises amorphous silica in the range of 85 to 90%.

Fig: Formation of Rice Husk Ash

Table: Physical Properties of RHA

S.No	Particulars	Properties
01	Color	Grey
02	Shape Texture	Irregular
03	Mineralogy	Non Crystalline
04	Particle Size	<45 micron
05	Odour	Odourless
06	Specific Gravity	2.3

3.METHODOLOGY:

Mix design is the process of selecting appropriate concrete materials and determining their proportions to make cost-effective concrete.Concrete proportioning is an important aspect of concrete technology because it provides both quality and economy.The component materials should be chosen in the same way for the concrete to have the necessary performance characteristics.Then, taking these factors into account, an acceptable mix design is created.

4.RESULTS:

After a 7-day and 28-day curing period, the compressive strength of 150mm150mm150mm concrete cubes was tested.For each curing period, five cubes were examined.The compressive strength of each cube is displayed in the table below.

Compressive strength of hardened concrete results

Si.No	Rise husk ash percentage	Compressive strength at 7 days (MPa)	Compressive strength at 28 days (MPa)
01	0	11.3	19.7
02	4	11.99	21.8
03	8	12.5	22.79
04	12	13.8	23..6
05	16	10.9	16.8

4. Conclusion

Rice husk ash is one of the most active study fields, spanning a variety of disciplines such as civil engineering and building materials. Rice husk ash (RHA) is an agricultural waste product that is produced in significant quantities around the world every year and is becoming an environmental issue in rice-producing countries due to the difficulties in disposing of it. India produces approximately 120 million tons of paddy each year, yielding approximately 24 million tones of rice husk and 6 million tons of rice husk ash. Rice companies are under pressure to find a solution for the disposal of rice husk, which is stacking up every day. The development of environmentally friendly concrete from rice husk ash is critical.

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