An Experimental Study On The Strength Of Concrete with Partial Replacement of Cement by Rice Husk Ash

N.Gopi *[1]
Department of Civil Engineering
Kongunadu College of Engineering and Technology
Tholurpatti, India

P.Sruthi*[2]
*S.Tamilselvi**[3]
Kongunadu College of Engineering and Technology
Tholurpatti, India

Abstract— *Now a day's reinforced concrete having low compressive strength due to improper design. My project is fully based on increasing compressive strength with the help of rice husk ash (RHA) as partial replacement. The objectives of the study is to investigate the mechanical properties of concrete with different replacement levels of Pozzolano Portland cement by rice husk ash. The cement has been replaced by rice husk ash (RHA) accordingly in the range of 2%, 4%, 6%, 8%, 16% by weight of cement in common for M40 mix. The compressive strength at 7days and 28 days have been obtained with normal curing condition. A study has to carry out with and without the impacts of Admixture to find the compressive strength of concrete cubes. By use of this RHA, the construction cost reduces by 30%. This also reduce the environmental pollution. This electronic document is a "live" template and already defines the components of your paper [title, text, heads, etc.] in its style sheet.*

Keywords— Partial Replacement, Rice Husk Ash, Strength of concrete.

1. INTRODUCTION

Concrete is most widely used construction material in world. It is manmade building material and can be mould into any shape. Concrete is composite material having properties of high compressive strength , low tensile strength , low post cracking capacity, brittleness and low impact strength. These properties can be improved by addition of RHA in the concrete. The Rice Husk Ash dispersed and distributed randomly in the concrete during mixing and this improves certain properties like compressive strength, tensile strength, etc. Cement will remain the key material to satisfy global housing and modern infrastructure needs. The need to reduce the high cost of Pozzolano Portland Cement in order to provide accommodation for the population has in-depth study into the use of some locally available materials that could be a partial replacement for Pozzolano Portland Cement (PPC) in Construction Engineering Works. Supplementary cementitious materials have been proved to be effective in meeting most of the requirements of durable concrete and blended cements are now used in many parts of the world.

The main aim of this research is to put Rice Hush Ash (RHA) into effective use a local additive, as it has been investigated to be super pozzolanic in a good proportion to reduce the high cost of structural concrete. Rice Husk Ash (RHA) is an agricultural by-product and a good pozzolans

Replacement:

- Cement –2%, 4%, 6%, 8%,16 %(Rice Husk Ash)
- Water -Superplasticizers (Conplast SP 430)

.

2. LITRATURE STUDY

***Obilade,* i.e. (Sept. 2014)**, The optimum addition of RHA as partial replacement for cement is in the range 0-20%. The compacting factor values of the concrete reduced as the percentage of RHA replacement increased. The Compressive Strengths of concrete reduced as the percentage RHA replacement increased.

***SumitBansal*(04 June, 2015)**, Replacement of cement by rice husk ash showed in M30 grade concrete compressive strength improvement up to the replacement of 10% in all ages. Both concrete mixes at 10% rice husk ash level showed 3 to 10% increase in compressive strength. Rice husk ash levels of 15 to 20% showed reduction in compressive strength in all ages.

***YogenderAntil*`(04 June, 2015),**(i) There was a significant improvement in Compressive strength of the Concrete with rice husk ash content of 10% for different grades namely M30 and M60 and at different ages i.e. 7 days and 28 days. (ii) The increase in Compressive strength was of the order of 4.23% to 10.93% for different grades and at different ages.

***M.udabai*(2009)**, (i). The chemical analysis done on rice husk ash indicated high amount of silica for rice husk ash (68.12%) which is a very good value for workability. (ii). The increase in setting time of paste having rice husk ash showed low level of hydration for rice husk ash concrete which result from reaction between cement and water, which liberate calcium hydroxide (Ca(OH)2).

***AlefiyaKachwala* (05 Aug-2015)**, The optimum addition of RHA as partial replacement for cement

for better performance is between the range of 0-20%.The compacting factor values of the concrete reduced as the percentage of RHA increased. The Bulk Densities of concrete reduced as the percentage RHA replacement increased.The Compressive Strengths of concrete reduced as the percentage RHA replacement increased.

3. RESEARCH SIGNIFICANCE

The main objective of present investigation is to study the properties of reinforced cement concrete by replacing the cement by manufactured sand at different percentages (0%, 2%, 4%, 6%,8% and 16%) with addition of superplasticizer. The study was carried out on M40 grade concrete with 0.45 water cement ratio.

3.1 Experimental Programme

Cube specimens of sizes 150 x 150 x 150 mm made of concrete with cement (Rice Husk Ash), Fine aggregate in the ratio (1:2.2:3.55) by weight are casted with following replacements of cement with and without admixtures.

- Concrete with cement 98% and RHA 2%
- Concrete with cement 96% and RHA 4%
- Concrete with cement 94% and RHA 6%
- Concrete with cement 92% and RHA 8%
- Concrete with cement 84% and RHA 16%
- Concrete with cement 100% and RHA 0%

4. MATRIALS AND METHODOLOGY

4.1 ***Cement*** In this experimental investigation Portland pozzolona cement (PPC) was used for all concrete mixes, the cement used was fresh and without lumps. The testing of cement was done as per IS 8112-1989.The specific gravity of cement was found to be 3.15.

4.2 ***Water*****:** Portable tap water is used for preparation of specimens and curing of specimens.

4.3 ***Fine aggregate*** As per IS 383-1970, table4 sand used for experimental program was locally produced and was conforming zone- II. The specific gravity of fine aggregate was found to be 2.64.

4.4 ***Coarse aggregate*** locally available coarse aggregate passing from 20mm sieve and conforming IS 383-1970 were used in present work. The specific gravity of coarse aggregate was found to be 2.74.

4.5 ***Rice Husk Ash*****:** Rice husk ash used was obtained from rice mill located in Sirsa. The Specific gravity of rice husk ash is 2.2 and bulk density is 105.9kg/m3 RHA, produced after burning of Rice husk (RH) has high reactivity and pozzolanic property. Indian Standard code of practice for plain and reinforced concrete, IS 456- 2000, Silica content in the ash increases with higher the burning temperature. Rice husk ash has sligth black in colour.

4.5 ***Mix design*** the mix was designed as per IS 10262:2009 for M40 grade concrete with 0.45 water cement ratio. Concrete mixes are prepared by partial replacement of cement by Rice Husk Ash with different percentages (0%, 2% ,4%, 6%,8% and 16%) respectively with and without addition of admixture for every mix.

4.6 Test specimens and test procedure

Cement, sand and aggregate were taken in mix proportion 1:2.2:3.55 which correspond to M40 grade of concrete respectively. The 150mm × 150mm× 150mm size concrete cubes were used as test specimens to determine the compressive strength.

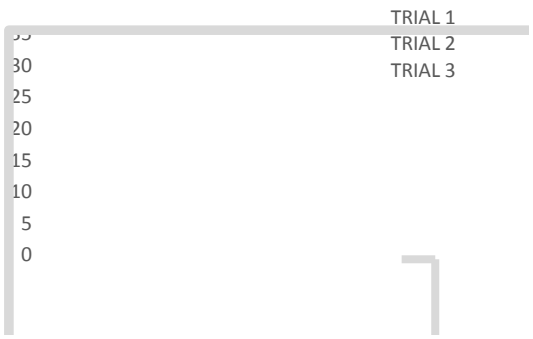
5. RESULTS AND DISCUSSION

The compressive strength results of different mixes are given by fig. In the present investigation compressive strength of concrete produced by replacing Cement by Rice Husk Ash without addition of superplasticizers (0%,2%,4%,6%,8% and 16%)adding.

COMPRESSIVE STRENGTH OF CONCRETE WITHOUT ADMIXTURE:

C	Vol of RHA	Cube Compressive Strength at 7 Days (N/mm^2)		
		Cube 1	Cube 2	Cube 3
100%	0%	25.76	25.25	26.02
98%	2%	26.97	27.15	26.76
96%	4%	28.73	28.61	28.35
94%	6%	28.95	29.07	29.15
92%	8%	29.45	29.34	29.66
84%	16%	23.86	24.06	23.67

Graph:

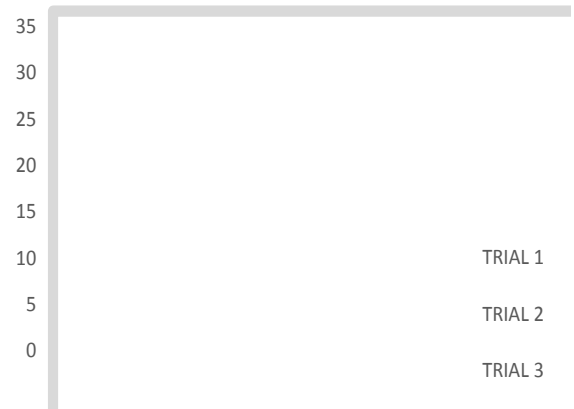


Cube Compressive Strength at 7 Days

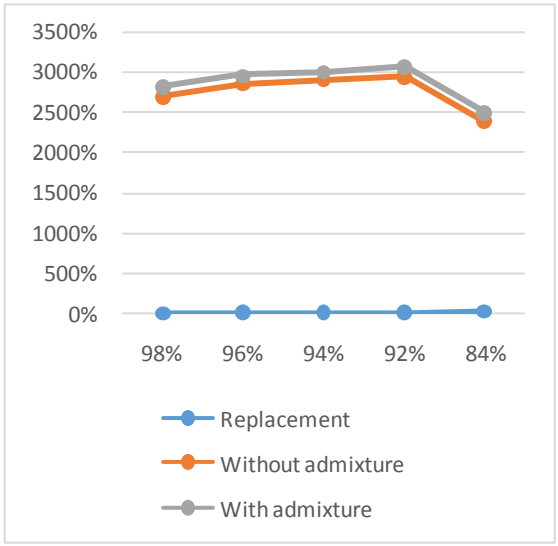
COMPRESSIVE STRENGTH OF CONCRETE WITH ADMIXTURE

Vol of Cement	Vol of RHA	Cube Compressive Strength at 7 Days (N/mm^2)		
		Cube 1	Cube 2	Cube 3
100%	0%	25.76	25.25	26.02
98%	2%	27.97	28.45	28.67
96%	4%	29.83	29.31	29.65
94%	6%	29.95	30.07	30.15
92%	8%	30.95	30.54	30.66
84%	16%	24.36	25.06	25.67

Graph:



Graph:

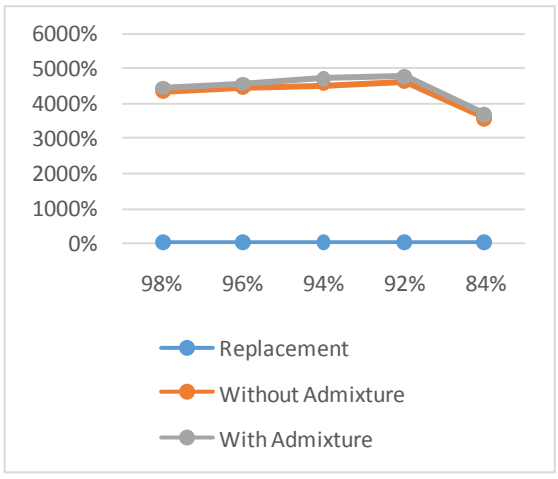


At 7 Days

AVERAGE VALUE COMPARISON FOR M_{40}

Volume of Cement	Vol of Rice Husk Ash	Cube Compressive Strength at 7 Days (N/mm^2) (Average Values)	
		Without Admixture	With Admixture
100%	0%	25.68	25.68
98%	2%	26.96	28.28
96%	4%	28.56	29.60
94%	6%	29.05	30.05
92%	8%	29.48	30.71
84%	16%	23.86	25.03

Graph:



At 28 days

5. CONCLUSION

Replacing Rice husk ash (0%,2%,4%,6%,8% and 16%) is done for M40 grade of concrete. The test results shows that the replacement of cement by Rice Husk Ash up to 8% by weight has considerably increases the physical and mechanical properties of concrete. By use of this agricultural waste, the construction cost reduces by 30%. The saving will be more if the Cement availability is at greater distance. This also reduces the burden of dumping the wastes like Rice Husk Ash in the earth so as to reduce the environmental pollution. The mechanical properties of concrete compressive strength is studied here shows considerable increase in strength. Durability test shows no variation for different replacements of Rice Husk Ash.

REFERENCE

1. Priyank Jilowa , Ravi Kant Pareek and Varinder Singh ,2015 "An Experimental Study on Strength of Concrete by Partial Replacement of Cement with Fly-Ash and Rice Husk Ash with addition of Steel Fibres",International Journal on Emerging Technologies 6(2): pp 131-138(2015).
2. Anwar, M., Miyagawa, T. and Gaweesh, M. (2000). Using Rice Husk Ash as Cement
3. Al-Khalaf, M.N. and Yousif, H.A. (1984). Use of Rice Husk Ash in Concrete. The Inter. J.Cement Composites Lightweight Concrete, 6(4): 241-248.
4. M.U Dabai, C. Muhammad, B.U. Bagudo and A. Musa "Studies on the Effect of Rice Husk Ash as Cement Admixture"Nigerian Journal of Basic and Applied Science (2009), 17(2): pp 252-256
5. AlefiyaKachwala, ArtiPamnani, Amit Raval, "Effect of Rice Husk Ash as a Partial Replacement of Ordinary Portland cement in Concrete", International Research Journal of Engineering and Technsology (IRJET) e-ISSN: 2395 -0056 Volume: 02 Issue: 05 | Aug-2015, Page 175
6. Bui, D.D.; Hu, J. and Stroeven, P. (2005). Particle Size Effect on the Strength of Rice Husk Ash Blended Gap-Graded Portland Cement Concrete, Cement and Concrete Composites, Vol. 27, pp 357-366.
7. De Sensale, G.R. (2006). Strength development of concrete with rice-ash. Cement & Concrete Composites, 28; 158-160.
8. Ho N.Y. and Yogesh Chhabra "Use of glass-fibre reinforced plastics for structural strengthening of reinforced concrete" The Indian Concrete Journal, Vol.3, 1999, pp.219-224.
9. IS 456:2000 Code of practice for plain and reinforced concrete Replacement Materiel in Concrete, Waste Mangt Series, 1: 671- 684.
10. IS 10262:2009 Concrete mix proportion guidelines.
11. IS 383-1970 Specification for coarse and fine aggregate from natural source of concrete.
12. IS 2386-1963 Indian standards test methods for aggregate for concrete.