A COMPARATIVE STUDY ON RICE HUSK AND METAKAOLIN

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Abstract : Concrete is a construction material composed of cement, fine aggregates and coarse aggregates mixed with water which hardens with time and has a compressive strength and flexural strength.This project was conducted on aggregates and cement is replaced by Rice Husk Ash and Metakaolin. The purpose of this experimental is to increase mechanical properties of concrete; when cement is partially replaced with RHA and Metakaolin. Metakaolin is obtained from industrial wastes. Metakaolin is the anhydrous calcined form of the clay mineral kaolinite .As Metakaolin is cost effective, fine and pozzolanic in nature it can be used a substituent for cement material. Rice husk ash is an abundantly available and renewable agriculture by-product from rice milling and it contains about 30%–50% of organic carbon. By using rice husk ash it gives future strength to the structures. The mix proportion of the concrete is adopted as 1:1.5:3 for the M20 grade concrete.

IndexTerms - **compressive strength, flexural strength, split tensile strength, Rice husk ash, Metakaolin.**

I. INTRODUCTION

Concrete's versatility, durability and economy have made it the world's most used construction material. India uses about 7.3 million cubic meters of concrete each year. Due to this the cost of construction increases and it causes environment pollution. As the demand for concrete as a construction material increase, so the demand for cement increases. Global warming and environmental destruction have become manifest problems in recent years, heightening concern about global environmental issues, and a changeover from the mass production, mass consumption, mass-waste society of the past to a zero-emission society is now viewed as important. Due to the increase of rate of population, the rate of waste materials increases due to growth of consumerism, development of industry and technology. The disposal of these waste materials poses a very big problem to the society and hence conversion of these solid wastes into useful materials is the need of the present day. Rice mills produce extremely large amounts of rice husk, and hence it is necessary to recycling technologies and intermediate treatment technologies. The rice husk is a suitable industrial waste material for replacing cement in concrete. By using this we can increase strength of concrete and reduce environmentpollution

II.MATERIALS

ORDINARY PORTLAND CEMENT (53GRADE):

Portland cement referred as (ordinary Portland cement) is the most important type of cement and is a fine powder produced by grinding Portland cement clinker .The opc is classified into three grades, namely 33 grade,43 grade,53 grade depending upon the strength of 28 days. It has been possible to upgrade the qualities of cement by using high quality limestone, modern equipment's, maintaining better particle size distribution, finer grinding and better packing.

METAKOALIN:

In the recent time, the importance and use of metakaolin is concrete has grown so much that it has almost become a common ingredient in concrete, particularly for making high strength and high performance concrete. Extensive research has been done all the world on the benefits that could be accrued in the utilization of metakolin has a supplementary cementitious

RICE HUSK ASH:

Rice husk ash (RHA) is an abundantly available and renewable agriculture by-product from rice milling in the rice-producing countries. Rice husk ash (RHA) is a highly reactive pozzolana obtained when rice husks are calcinated below the crystallization

temperature at 780°C. Rice husks are the hard protective coverings of rice grains which are separated from the grains during milling process.

III.CHEMICAL PROPERTIES AND MIX PROPORTIONS

Mixes	Cement	Metakolin	Rice husk ash
Nominal	100%	0	0
MIX 1	86%	5%	9%
MIX 2	83%	5%	12%
MIX 3	80%	5%	15%

Material	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O	LOI
OPC (%)	20.25	5.04	3.16	63.31	4.20	0.08	0.51	3.08
RHA (%)	87.89	0.19	0.28	0.73	0.47	0.66	3.43	4.36
MK (%)	51.80	43.75	0.82	0.09	0.03	0.07	0.02	0.34

LOI- Loss on ignition

IV.TESTS TO BE CONDUCTED

COMPRESSIVE STRENGTH:

Compression test is done confirming to IS: 516-1953. All the concrete specimens that are tested in a 2000 KN capacity compression testing machine. Concrete cubes of size 150mm x 150mm x 150mm and cylinders of size 150mm diameter and 300mm height and prisms of size 100mm x 100mm x 500mm were tested for crushing strength, crushing strength of concrete was determined by applying load at the rate of 1400 N/Cm2/min till the specimens fail. The maximum load apply to the specimens was recorded anddivided.

SPLIT TENSILE STRENGTH:

This test is conducted in a 2000 KN capacity compression testing machine by placing the cylindrical specimen, so that its axis is horizontal to the plates of the testing machine. Narrow strips of packing material i.e., plywood is placed between the plates and the cylinder to receive compressive stress. The load was applied uniformly at a constant rate until failure by splitting along the vertical axis takes place. Load at which the specimens failed recorded and the split tensile stress is obtained using the formula based on IS: 5816-1970.

$Ft = 2P/\pi DL.$

V.RESULTS AND DISCUSSIONS

1.RESULTS ON CEMENT:

SL NO	PROPERTIES	RESULT
1	Standard Consistency	32%
2	Initial setting time	28 min
3	Final setting time	380min
4	Fineness	3%
5	Specific Gravity	3.15

2.RESULTS ON FINE AGGREGATE:

SL NO	PROPERTIES	RESULT
1	Specific gravity	2.6
2	Water absorption	1.5
3	Bulking of sand	17.8

3.RESULTS ON COARSE AGGREGATE:

SL NO	PROPERTIES	RESULT
1	Impact test	1.8%
2	Crushing test	18%
3	los angles abrasion test	2.65%
4	Specific gravity test	2.70

4.COMPRESSIVE STRENGTH:

MIXES	COMPRESSIVE STRENGTH(N/mm^2)	
	7 DAYS	**28 DAYS**
Nominal	14.64	21.64
M1	16.64	23.64
M2	16.20	23.20
M3	15.82	22.82

VI.CONCLUSION

Extensive experimentation has been carried out to determine utilization of the Rice husk ash as cement replacement material by making Concrete cubes, cylinders and Prisms. Also to found out the effect of addition of metakaolin with the cement. Based on the results obtained from the experimental work the following conclusions can be drawn.

VII.REFERENCES

1. Narmatha.M, Dr.T. Felixkala ,Metakaolin is the best material for Replacement of Cement in Concrete Published by IOSR Journal of Mechanical and Civil Engineering,e-ISSN:2278-1684,P- ISSN-334X,vol No 13,Issue 4 (July-Aug2016),PP66-71.

2. Farah Alwani Wan Chik, Badorul Hisham Abu Bakar, Megat Azmi Megat Johari & Ramadhansyah Putra Jaya, Properties of Concrete block containing Rice husk ash subjected to GIRHA Published on IJRRAS 8(1).July 2011,www.arpapress.com ,vol 8 Issue1/IJRRAS 8 1 08.pdf.

3. Ehsan Mohseni , Mohammad Ali Yazdi , Bahareh Mehdizadeh Miyandehi , Mehdi Zadshir and Malek Mohammad Ranjbar , Combined effects of Metakaolin , Rice husk ash and Polypropylene Fiber on the engineering properties & Microstructure of Mortar Published by International journal of Materials in Civil Engineering,