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Rice Husk Ash as a Partial Substitute to Cement

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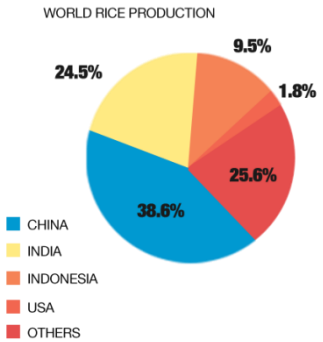
Abstract - Concrete is most widely used construction material today. Concrete has attained the status of a major building material in all the branches of modern construction. It is difficult to point out another material of construction which is as variable as concrete. . Concrete is the best material of choice where strength, durability, permeability, fire resistance & absorption resistance are required. Rice husk & saw dust are the waste products which are abundantly available & which can be used as a substitute for white cement. Rice husk is an agro-waste material which is produced in about 100 million of tons. Approximately, 20 Kg of rice husk are obtained for 100 Kg of rice. Rice husks contain organic substances and 20% of inorganic material. Rice husk ash (RHA) is obtained by the combustion of rice husk. The aim of this project is to prove that RHA can be easily used as a substitute while replacing slight amount of cement in construction industry.

1. INTRODUCTION

Rice is a heavy staple in the world market as far as food is concerned. It is the second largest amount of any grain produced in the world. The first largest is corn, but is produced for alternative reasons as opposed to rice which is produced primarily for consumption.



The outermost layer of the paddy grain is the rice husk, also called rice hull. It is separated from the brown rice in rice milling. Burning rice husk produced rice husk ash (RHA). The rice husk ash is a highly siliceous material that can be used as an admixture in concrete if the rice husk is burnt in a specific manner. The characteristics of the ash are dependent on the components, temperature and time of burning. During the burning process, the carbon content is burnt off and all that remains is the silica content. The silica must be kept at a non-crystalline state in order to produce an ash with high pozzalonic activity. If the rice husk is burnt at too high temperature or for too long the silica content will become a crystalline structure. If the rice husk is burnt at too low a temperature or for too short a period of time the rice husk ash will contain too large an amount often-burnt carbon.

2. SYSTEM DEVELOPMENT

The system development applied to achieve the objective of the study is shown in this chapter. The main objective of the laboratory is to determine the ability of replacing cement by RHA. Most of the result in designing the RHA concrete is obtained from previous studies. The information in designing the report and the result obtained from the study are provided in chapter result.

Rice hulls (or rice husks) are the hard protecting coverings of grains of rice. In addition to protecting rice during the growing season, rice hulls can be put to use as building material, fertilizer, insulation material, or fuel. It has been tested and found that the ideal temperature for producing such results is between 600 °C and 700 °C. The following graph shows the curve for obtaining reactive cellular rice husk ash with certain burning temperatures and time fired.

Collection of rice husk from farms

Dumping of rice husk at the mill

Incinerator

Chemical Composition of RHA Used

Elements	Percentage (%)
	03/04/2014
SiO2	88.85
Al2O3	0.18
Fe2O3	0.14
CaO	0.74
MgO	0.48
CaO	2.78
S	0.037
Humidity	1.05
LOI	5.61

Using RHA as Substitute to Cement

Cement (%)	RHA (%)	Cement (kg)	RHA (kg)
100	0	4.81kg	0kg
95	5	4.57kg	0.240kg
90	10	4.329kg	0.481kg
80	20	3.848kg	0.962kg
70	30	3.367kg	1.443kg

Compressive strength of concrete:

Out of many test applied to the concrete, this is the utmost important which gives an idea about all the characteristics of concrete. By this single test one judge that whether concreting has been done properly or not.

Cement (%)	RHA (%)	Compressive Strength of 7 days (N/mm^2)
100	0	19.3
95	5	24.47
90	10	18.9

80	**20**	**13.88**
70	**30**	**10.69**

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CONCLUSION

- Replacement of cement with Rice Husk Ash leads to increase in the compressive strength at 10% replacement.
- RHA concrete gains less strength at early stage in contrast to the ordinary concrete.
- Using RHA concrete will decrease the weight of the finished project, decrease the cost, and dispose of the rice husk ash waste product. This is the best option where rice production is prevalent, including most of Asia especially South East Asia.
- It can be used in mass construction.
- As the percentage of RHA increases workability decreases