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A Study on A Rice Husk ASH Concrete

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Abstract:

In this study the effect of Rice husk ash (RHA) on compressive strength and workability of concrete. It is an agricultural by-product originating from the burning of rice husks. It is widely available in the Northern states of India, the largest rice producer in India, accounting for approximately 45% of the country's rice production. Rice husks are burned as a source of power in a number of different industries, some of which manage to incorporate the resulting ash to their products. In this study use of M20 grade of concrete as per IS 10262 and the maximum size of concrete is 20mm..

Keywords **—Rice Husk, Concrete, Cement, Compressive Strength, Indian Standard**

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1. INTRODUCTION

It is understood that the use of active mineral additions in the elaboration of concretes gives these Portland cement conglomerates several benefits such as control of the heat of hydration, lower permeability and consequently improvements in the durability of concrete, greater compactness, greater resistance, etc. that they allow you to expand the field of your application.

One of the main study additions in recent years is husk ash from rice and sugarcane bagasse ash. Rice husk is highly silicic like sugarcane bagasse, which after controlled combustion and at a certain time it provides ash with silica content that makes it a pozzolanic material. The temperature and burning time are decisive and variable for the two materials and in the conditions in which it is found, to obtain silica in an active state or not.

One of the ashes constitutes a by-product of the rice industry that comes from the burning of the rice husk that is discarded but used as an energy source for the drying of the grains, and for the sugarcane bagasse ash, it constitutes a by-product of the sugar industry that comes from the burning of bagasse from sugarcane sugar, used as an energy source for the operation of the automatic system from some sugar company.

1.1 RESEARCH OBJECTIVE

Evaluate the resistance of the concrete when making additions with ashes of rice husk and sugar cane bagasse ash.
Carry out a comparative analysis of the compressive strength in concrete with the proposed materials.
Carry out a comparative cost-benefit analysis of concretes made with the new additions. The other main objective of this study to save the environmental pollution by the use of Rice husk in concrete production.

2. USED MATERIALS

CEMENT

Pozzolana Portland Cement is used in this experiment. It is easily available in the local market. The cement has been tested for various proportions as per IS: 4031-1988 and found to be conforming to be various specifications of IS: 1489-1991.

FINE AGGREGATE
Coarse sand is used as a fine aggregate in this experiment. The fine aggregate has been tested as per IS: 383-1970 and found the various specifications.

COARSE AGGREGATE
Crushed stone aggregate 10mm and 20mm is used as a coarse aggregate in this experiment. The coarse aggregate has been tested as per IS:383-1970 and found the various specifications.

WATER
Water is the one most essential element of cement concrete. So that potable water available at site is usedfor experiment.

FLY ASH
Fly ash is obtained from coal combustion waste at the various. Thermoelectric Plant, India. According to the standards given by ASTM C 618 (American Society for Testing and Materials - ASTM, 2014), this fly ash is included in class F.

3. WORKABILITY AND FLUDITY

It is considered as that property of concrete by which its ability to be properly positioned and consolidated and to be completed without any harmful segregation. This acceptance includes concepts such as malleability, cohesion, and compaction. This property is altered by the composition of the aggregates, the shape of the particles and the proportions of the aggregate, the amount of cement, the presence of entrained air, additives, and the consistency of the mixture.

CURRING AGENT :
Concrete curing is the process of maintaining an adequate content of humidity and temperature that starts immediately after installation and termination in the constructed element. The length of time required to perform the curing will depend on the necessary strength of the concrete to withstand stresses of use and the environment.

CONSISTENCY :
To perform the Abrams cone procedure, several samples are taken to be tested for better results. The cone procedure Abrams is as follows

- The Abrams cone is taken and its interior moistened.
- The cone must be located in a flat, rigid, and non-absorbent area.
- The cone must be held firmly, for this you can stand on the two support stirrups that the mold brings.
- The filling of the cone will be carried out in three stages, each of them corresponds to a third of the cone, each layer must settle evenly with a rod hitting him 25 times.
- Once the seating has finished, the upper surface of the cone is flush. with the same compaction rod.
- Pressing on the stirrups of the Abrams cone should remove the excess material that is at the base of the cone.
- Then the cone is lifted vertically with a constant movement, it will not be able to perform any lateral or twisting movement when lifting the Abrams.
- The settlement of the mixture must be measured immediately, taking the vertical distance between the top of the inverted cone and the original center displaced on the surface.

4. METHODS

WORKABILITY

The workability of cement concrete is tested as per using standard sizes of Slump Molds as per IS: 1199 - 1999.

Figure-1: Slump Test by Slump Cone

COMPRESSIVE STRENGTH

For find out compressive strength of cement concrete we casted steel cube mold of size of 150mm*150mm*150mm. After 24 hour casting of cube removing the mold and allowed for curing in a curing tank for a period of 28 days. After
7days & 28 days of curing of cube we tested the cube on Universal Testing Machine. The test procedure is used as per IS: 516-1979.

Figure-2: Compressive Testing Machine Set

5. RESULTS & DISCUSSION

- It was determined that additions of sugarcane bagasse ash (CBC), rice husk ash (CCA), work better than when a normal concrete to the same days of curing.
- An optimal percentage of rice husk ash substitution was acquired and sugarcane bagasse ash is 15%, they present a resistance higher than the established 240 Kg / cm2.
- It was observed that as the amount of ash in the concrete increases, its resistance decreases.
- It was established that the maximum compressive strength given, with the substitution of rice husk ash (CCA) at 14 days with 15% gives an average resistance of 221.53 Kg / cm2.
- It was determined that the maximum compressive strength given, with the substitution of sugarcane bagasse ash (CBC) at 14 days with 15%, gives an average resistance of 248.23 Kg / cm2.
- It was established that the maximum compressive strength given, with the substitution of rice husk ash (CCA) at 28 days with 15% gives an average resistance of 262.30 Kg / cm2.
- It was determined that the maximum compressive strength given, with the substitution of sugarcane bagasse ash (CBC) at 28 days with 15%, gives an average resistance of 304.30 Kg / cm2.

- It was stipulated that with the partial substitutions of 15% and 30% in the concrete, the production cost is low since rice husks and cane bagasse sugar are waste from pile machines and sugar factories, so it does not have a monetary value.
- It was verified with a cost-benefit analysis that concrete with ash rice husk (CCA), there is an economic benefit of 7.45%.
- It was determined with a cost-benefit analysis that concrete with ash from sugarcane bagasse (CBC), a profit of 7.29 is obtained economically %.
- It is determined that for the construction of a 54 m2 warehouse, 26.23m3 is used of concrete for columns, chains, foundations and slab, you get a benefit of $ 207.74 with CCA and $ 203.02 with CBC.

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