A Study on Mechanical Properties and Durability Studies of Concrete using Rice Husk Ash as a Partial Replacement of Cement using Sulphuric Acid

G.Vijay Mohan[1] M. Rama Chandra Rao[2]
[1,2]Department of Civil Engineering
[1,2]NRI Institute of Technology, Pothavarapadu, Agiripalli, India

Abstract— Rice husk slag is a stringy waste result of rice refining industry. This item causes extreme condition id contamination, which calls for dire methods for taking care of the waste. Bagasse fiery remains mostly check ins aluminum particle silica, press and calcium oxides The slag consequently turns into a mechanical waste and stances transfer issues. So few examinations have been accounted for that sugarcane bagasse fiery remains as great pozzolanic material in fractional substitution of bond In ibis venture objective is to ponder the impact of incomplete supplanting of Portland concrete with nee husk cinder in cement exposed to various relieving conditions Experimental examination on corrosive obstruction of cement in H2SO4 arrangement. The variable components considered in this investigation were solid review of M35 and relieving times of 7days, 28days, 60days, 90days, 180days of the solid examples in 1%. 2%, 3%, 4% and 5% H2SO4 arrangement. Rice husk fiery remains has been artificially and physically described and in part supplanted in the proportion of 0%, 5%, 10%, 15%, and 20% by weight.

Key words: Concrete, Sulphuric Acid, Rice Husk Ash, Cement

I. INTRODUCTION

The headway of solid innovation can decrease the utilization of common assets and vitality sources and less the weight of toxins on condition. As of late, numerous analysts have built up that the utilization of valuable cementitious materials (SCMs) like fly fiery remains (FA), impact heater slag, silica seethe, metakaolin (MK), and rice husk cinder (RHA), hypo muck and so forth can, not just enhance the different properties of cement - both in its crisp and solidified states, yet additionally can add to economy in development costs. Concrete is the most widely recognized development material on the planet since it joins great mechanical and sturdiness properties, functionality and relative minimal effort. Be that as it may, concrete creation emanates ozone depleting substances, for the most part CO2, being in charge of about 5% of worldwide anthropogenic CO2 discharges on the planet . Since 1 kg of bond creates around 1 kg of CO2, the utilization of low emanation pozzolans as concrete substitution is one of the conceivable outcomes to diminish ozone depleting substances outflows.

Despite the fact that the planet warming is an issue that might be respected from a worldwide point of view, the utilization of pozzolans as concrete substitution is an issue that would have neighborhood arrangements since transport is one of the primary cost segments for cementitious materials. Rice husk is additionally not utilized for encouraging creatures since it is less healthful properties and its sporadic rough surface isn't normally debased and can cause genuine collection issue it comprises mostly of silica (SiO2), which demonstrates its potential as mineral admixture. Rice husk which is an agrarian by– item is liberally accessible everywhere throughout the world. The vast majority of the rice husk, which is acquired by processing paddy, is going as waste materials despite the fact that some amount is utilized as bedding material, fuel in boilers, block ovens and so forth., the husk and its slag, which possess extensive zones causing space issues, as well as motivation natural contamination.

The following are the objectives of the present study

1) To find out optimum percentage of RHA in concrete by partial replacement of cement.
2) To use pozzolanic material such as RHA in concrete by partial replacement of cement.
3) To provide economical construction material.
4) To evaluate the sulphate resistance of the concrete blocks for 7 days,28 days and 60 days as per I.S specifications of cube size 150mmx150mmx150mm
5) Provide safeguard to the environment by utilizing waste properly
6) To study different strength properties of Rice husk ash concrete with age in comparison to Control concrete.

II. METHODOLOGY & EXPERIMENTAL INVESTIGATION

In the present execution thinks about on cement with Rice Husk fiery debris as been utilized as incomplete substitution of bond as an extra fixing in cement blends. On including bond with various weight level of RHA the compressive qualities are learned at various times of cement relieved in ordinary water and distinctive rates of MGSO4 arrangement and protection from sulfates, were examined. The subtle elements of trial examinations are as per the following.

III. MATERIALS

A. Cement

Ordinary Portland concrete is by a long shot the most imperative kind of bond. The OPC was ordered into three Grades viz., 33 Grade, 43 Grade and 53 Grade contingent on the quality of the bond at 28 days when tried according to IS 4031-1988. On the off chance that the 28 days quality isn't under 33 N/mm2, it is called 33 Grade concrete, if the quality isn't under 43 N/mm2, it is called 43 Grade bond, and if the quality isn't under 53 N/mm2 , it is called 53 Grade bond. The produce of bond is diminishing everywhere throughout the world in perspective of the fame of mixed concrete by virtue of lower vitality utilization, natural contamination, financial and other specialized reasons. In cutting edge western nations the utilization of concrete has come down to about 40% of the aggregate bond creation.. The bond acquired was tried for physical necessities as per IS: 12269-1987 and for compound

prerequisites as per IS: 4032-1977. The subtle elements are given in Table4.1. The bond fits in with 53 Grade.

B. Important Reactions in RHA

These husks that are removed during the refining of rice have no commercial interest as such. Another relevant factor is its low cost compared to its large applicability, and its growing demand also reduces the disposal and environmental pollution problems. Rice husk contains silica in hydrated amorphous form and cellulose which yields carbon when thermally decomposed. When such a product is further heated at high temperature (> 1400°C) a reaction no occurs between silica and carbon resulting in the formation of SiC. The possible reactions of such a process can be written as

- $C(s) + SiO2(s) = SiO(g) + CO(g)$,
- $SiO2(s) + CO(g) = SiO(g) + CO2(g)$,
- $C(s) + CO2(g) = 2CO(g)$,
- $2C(s) + SiO(g) = SiC(s) + C(g)$,

C. Curing of the Specimens

The test specimens shall be stored on the site at a place free from vibration, under damp matting, sacks or other similar material for 24 hours + ½ hour from the time of adding the water to the other ingredients. The temperature of the place of storage shall be within the range of 22^0 to 32^0C. After the period of 24 hours, they shall be marked for later identification, removed from the moulds and, unless required for testing within 24hours, stored in clean water at room temperature and cured for required period as per IS: 516-1969

D. Testing of Specimens

A time schedule for testing of specimens is maintained to ensure their proper testing on the due date and time. The specimens were taken out and allow drying under shade Specimens stored in water shall be tested immediately on removal from the water and while they are still in the wet condition. Surface water and grit shall be wiped off the specimens and any projecting fins removed. The cast specimens are tested as per standard procedures, immediately after curing the specimens in water for a period of 7, 28 and 60 days

IV. RESULTS AND DISCUSSION

A. Materials & Their Properties

S. No.	Properties/Characteristics	Test results	Requirements as per IS 12269-1987
1	Normal Consistency	32.6%	---
2	Setting time a) Initial Setting Time b) Final Setting Time	44 minutes 293 minutes	Not less than 30 minutes Not more than 600 minutes
3	Specific Gravity	3.13	---
4	Fineness of cement by sieving through sieve No.9 (90 microns) for a period of 15 min.	2.82%	<10%
5	Soundness (Le-Chatlier Exp.)	1.29 mm	Not more than 10mm
6	Compressive strength of cement (28 days)	53 MPa	53 MPa
7	Specific surface area	3200 cm^2/gm	---

Table 4.1: Physical properties of Portland cement (53 grade)

1.	Silica	90% minimum
2.	Humidity	2% maximum
3.	Mean Particle size	25 microns
4.	Colour	Gray

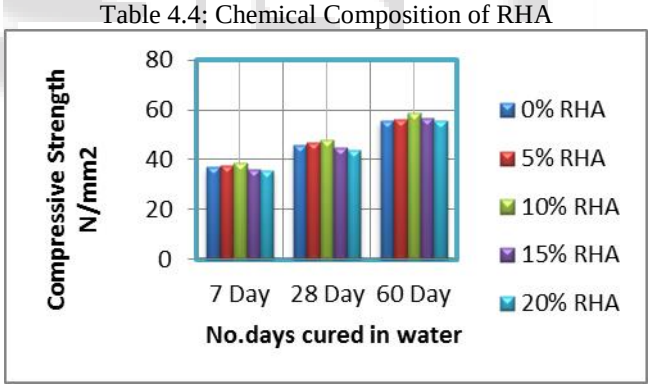
Table 4.2: Specifications of Rice Husk Ash

S. No.	Property	Test Result
1.	Density	96 kg/m^3
2.	Physical state	Solid non-Hazardous
3.	Appearance	Very fine powder
4.	Particle size	25 microns – mean
5.	Colour	Gray
6.	Specific gravity	2.3

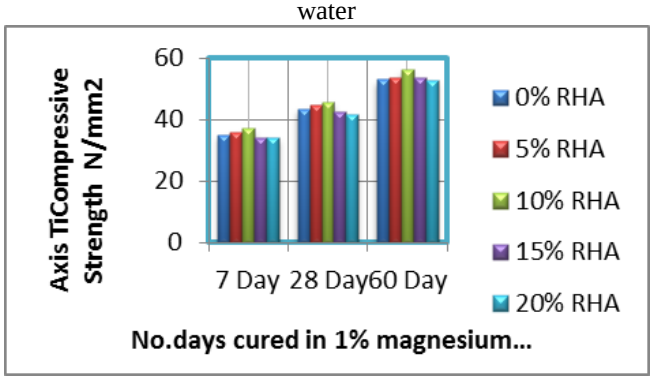
Table 4.3: PHYSICAL PROPERTIES OF RHA

S. No.	Characteristic	Test Results %
1	SiO_2 % by mass	93.80
2	Al_2o_3 by mass	0.74
3	Fe_2o_3 by mass	0.30
4	Tio_2 by mass	0.10
5	Cao by mass	0.89
6	Mgo by mass	0.32
7	Na_2o by mass	0.28
8	K_2o by mass	0.12
9	LOI	3.37

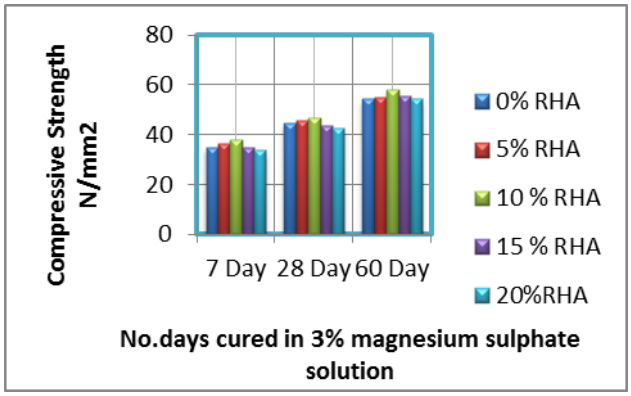
Table 4.4: Chemical Composition of RHA



Graph 5.1: Compressive strength results cured in normal water



Graph 5.2: Compressive strength results cured in 1% magnesium sulphate solution



Graph 5.3: Compressive strength results cured in 3% magnesium sulphate solution

V. CONCLUSIONS

1) The explicit surface region of RHA is 420 m2/kg more noteworthy than 330 m2/kg of bond. The functionality of RHA cements have diminished in contrasted and customary cement. It is surmised that decrease in usefulness is because of extensive surface zone of RHA.
2) The compressive qualities of cement (with 0%, 5%, 10%, 15% and 20%, weight supplanting of concrete with RHA) relieved in Normal water for 7, 28, 60, 90 and 180 days have achieved the objective mean quality.
3) The compressive qualities of cement (with 0%, 5%,10%,15% and 20%, weight supplanting of bond with RHA) relieved in various centralizations of (1%,3%,5%) Magnesium Sulfate answer for 7, 28, 60 90 days (Table 4.13 to Table 4.15), demonstrate that at 5% substitution there is increment in quality and it stretched out in 10% substitution likewise and after that diminish in quality is seen at 15% and 20% substitutions .
4) The split qualities of cement (with 0%, 5%,10%,15% and 20%, weight supplanting of bond with RHA) relieved in various groupings of (1%,3%,5%) Magnesium Sulfate answer for 28, 60 90 days (Table 4.26 to Table 4.28), show that at 5% substitution there is increment in quality and it stretched out in 10% substitution additionally and after that diminish in quality is seen at 15% and 20% substitutions .
5) Because of moderate pozzolanic response the Rice Husk Ash(RHA) concrete accomplishes critical enhancement in its mechanical properties at later ages.
6) In cements bond can be supplanted with 20% RHA without relinquishing quality.

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