Seven Days Compressive Strength of concrete to Partial Replacement of Cement by RHA & GP

NITIN S. TAKSANDE[1], G. D. DHAWALE[2], M. R. NIKHAR [3]
[1] *Department of structural Engineering, B.D.C.O.E. Sevagram, Wardha-442102, Maharashtra India*
[2 3] *Department of Civil Engineering, B.D.C.O.E. Sevagram, Wardha-442102, Maharashtra India*

Abstract-— the levels of replacement of cement by rice husk ash, and glass powder are 5%, 10%, 15% and 20%. The properties which are determined and compared in this study are workability, 7, 14, 21 and 28 days compressive strength. Pozzolanas are an important ingredient in the production of alternative cementing materials to Portland cement reactive aggregates. Waste glass powder in proper proportion can be used to resist chemical attack. The aim of this project work is to use rice husk ash and glass powder in the range 5%, 10%, 15% and 20% of as replacement of cement and concrete cube, cylinder and beam strength compared with conventional concrete cubes, cylinder and beam respectively. The present study investigates the effect of pozzolanic material in concrete and hence improving the strength of concrete. This work evaluates the performance of Rice Husk Ash and glass powder as a partial replacement of cement in concrete. In this project the rice husk ash percentage is with same replacement of glass powder. The strength properties of concrete are compared with the above varying percentage and the result on which it gives maximum strength is found out. In Civil Engineering 'Cement' plays the important role as it is impossible to produce any sustainable infrastructure without use of cement. We can say everything is incomplete without 'Cement' as construction is the factor which rapidly growing with new innovations and ideas. Rice husk ash (RHA) industrial are a by-product from the burning of rice husk. Rice husk is extremely prevalent in East and South-East Asia because of the rice production in this area. The rich land and tropical climate make for perfect conditions to cultivate rice and is taken advantage by these Asian countries.

Keywords— Compressive strength, flexural strength, splitting tensile strength, glass powder.

I. INTRODUCTION

Natural resources are of two types- the renewable and the non-renewable. Renewable resources which can be recycled again and again which are utilized for our benefits. But non- renewable resources are those, which once removed and utilized are lost forever. The major problem facing by mankind today is about the utilization of natural resources in order to meet the human needs and maintain the economic growth without exhausting the resources and endangering the environmental integral on which life economic prosperity and our security depend. The worldwide utilization of regular sand is high because of the broad utilization of cement. Specifically, the interest for regular sand is high in creating nations inferable from quick infrastructural development, buildings and different structures since cement assumes the critical part and a substantial quantum of its being used.

Concrete is the 2nd largest of the most widely used materials; but there are environmental issues associated with its use which are needed to be taken under consideration and cannot be ignored. Concrete production uses large quantities of natural resources as aggregates and contributes to the release of carbon dioxide during the production of cement. One ton of carbon dioxide is released into the atmosphere for the production of one ton of cement , which is approximately 7% of the world's total yearly production of CO2 (Meyer, 2004). Concrete is a common construction material in India and its production causes the same environmental concerns as that of regular concrete. In recent years, there has been an increasing incentive to minimize the environmental effect of the construction industry through programs such as the Leadership in Energy and Environmental Design (LEED) Green Building Rating System, which rewards points for sustainable construction practices (Ca GBC, 2009). Greater sustainability of the construction industry can be achieved if a portion of the virgin aggregate or cement is replaced with waste materials. Significant experimental work were performed on the use of

recycled concrete aggregate to replace virgin aggregate and on the use of pozzolanic materials to be used as partial replacement of cement in concrete, such as fly ash, silica fume and ground granulated blast furnace slag. Due to the successful implementation of these waste materials into regular concrete there is increased desire to find new post-consumer materials which can be used as a partial replacement for cement.

The experimental work presented in this research looks at the use of glass and rice husk ash, as an eco-friendly material to replace cement in the production of concrete.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

A-Badorul Hisham Abu Bakar, Ramadhansyah Putrajaya C and Hamidi Abdulaziz developed "Malaysian Rice Husk Ash – Improving the Durability and Corrosion Resistance of Concrete: Pre-review" The objective of this paper is to presents and study a pre-review of Malaysian rice ash ask as a partial cement replacement in different percentage, grinding time and performance corrosion of RHA blended concrete. The increasing demand for producing durable construction materials is the outcome of the fast polluting environment. Supplementary cementitious materials prove to be effective to meet most of the requirements of durable concrete. Rice husk ash is found to be greater to other supplementary materials like silica fume and fly ash. Due to its high pozzolanic activity, both strength and durability of concrete are enriched. Addition of rice husk ash to Portland cement not only improves the early strength of concrete, but also forms a calcium silicate hydrate gel around the cement particles which is highly dense and less porous. This may increase the strength of concrete against cracking. Previously, investigation on the corrosion performance of rice husk ash blended concrete is very limited. Further researches are ongoing or have started recently by the authors to study the performance of RHA and corrosion of concrete mixes. Various tests were carried out to evaluate durability of concrete made with 10, 20, 30 and 40% replacements of RHA by weight of cement. Nevertheless, the results of compressive strength, absorption test and chloride penetration from previous investigation were presents in this study.

B-Shayan Ahmad (2002) et al studied the value-added utilization of waste glass in concrete. From a few experiments he concluded that there is great potential for the utilization of waste glass in concrete in several forms, including fine aggregate, coarse aggregate and glass powder. It is expected that the latter form would provide much greater opportunities for value adding and cost recovery, as it could be used as a replacement for expensive materials such as silica fume, fly ash and cement. The use of glass powder in concrete may prevent expansive ASR in the presence of susceptible aggregate. Strength gain of GLP-bearing mortar and concrete is satisfactory. Microstructural assessment has also shown that GLP would produce a dense matrix and improve the durability properties of concrete incorporating it. It was concluded by him that 30% GLP could be incorporated as cement or aggregate replacement in concrete without any long-term detrimental effects. Up to 50% of equally fine and coarse aggregate could also be replaced in concrete of 32 MPa strength grade with acceptable strength development properties.

C- Salek m. Seraj and salowa sultan developed "Potential of Indigenously Produced Rice Husk Ash in Concrete" After aluminium and steel, Portland cement is the most energy intensive product and efforts are being made to find cement replacement material. The use of rice husk ash offers one such possibility. Due to growing environmental concerns and the need to conserve energy resources, efforts have been made to burn the rice husk at a controlled temperature and atmosphere, and to utilize the ash so produced as a supplementary cementing material. Rice husk ash does not adversely change the strength and durability of concrete, it would be cost effective. In the present study, investigation was carried out using. Rice husk ash as cement replacement of 0%, 5%, 10% and 15% with both brick and stone chips as coarse aggregates. Mix proportions of both1:1.5:3 and 1:2:4 by volume were adopted. In some of the samples super plasticizer was used to have slightly higher strengths and more workability. Strength properties of concrete produced by using rice husk ash as a supplementary cementing material have been compared with their plain concrete counterpart.

Results from tests on about 300 cylinders at different ages have shown that unrefined rice husk ash has a moderate potential of economically producing good quality concrete.

D- Cesar David Verdugo (2016) et al studied practicality of versatility and feasibility of utilizing recycled glass as a concrete aggregate and he recommended that this particular method involving glass as coarse aggregate within concrete can be used limitedly. More investigation needs to be performed as to surely find the expansive response of different cements to different types of glass. Glass concrete containing glass as coarse aggregate should be placed in applications where cracking and high strength are not of importance. For other types of construction, especially structural ones, it is highly recommended to use a concrete mix combining glass as fine aggregates as well as glass power (GLP) as an additive. The addition of GLP into a concrete reduces ASR expansion and thus cracking. In conclusion he said that glass is a reliable material that could be implemented throughout the United States in order to lower the amount of glass being land filled. The recycling of glass into aggregate applications and additives is economically feasible and an environmentally viable solution to waste glass. Also, as presented, the value of concrete using waste glass can be lower than that of regular concrete creating the possibility of a lucrative market focusing on the production of environmentally sound materials.

III. WRITE DOWN YOUR STUDIES AND FINDINGS

A. MATERIAL USED:-

1. Ordinary Portland cement: IS: 8112-1989 conforming to 43 Grade OPC cement. The properties of the cement tested ware normal consistency 34%, Fineness (90micron sieves) 5.55%, Initial and final setting time155 minute and 270 minutes and after curing (28 Days) compressive strength 48.98 Map.

2. Water- Potable water was used in this study. Water is a crucial component of concrete as it is viably included in chemical responses with cement, particularly hydration. In the present examination consumable water is used according to IS 456: 2000 was used for preparation of cement, the water concrete proportion chooses the quality of cement. It is an adequately taking an interest constituent material in the synthetic response with bond. The workability of the concrete is controlled by various components, for instance, the beginning measure of water, the reactivity of cement.

3 Natural sand- In terms of particle size as used by geologists, sand particles range in diameter from 0.0625 mm (or 1⁄16 mm) to 2 mm. An individual particle in this range size is termed a sand grain. Sand grains are between gravel (with particles ranging from 2 mm up to 64 mm) and silt (particles smaller than 0.0625 mm down to 0.004 mm). The size specification between sand and gravel has remained constant for more than.

4. Aggregates-The ASTM standards (C125 and D8) define aggregate as a granular material such as sand, gravel, crushed stone, or iron- blast furnace slag used with a cementing medium to form mortar or concrete, or alone as in base course or railroad ballast. Crushed stone, sand, and gravel are the three main types of aggregate Aggregates are one of the imperative constituents of concrete and they constitute about 75 to 80% of total volume of concrete. They help in decrease of shrinkage and influence economy as it were. Coarse aggregate is the most grounded and scarcest penetrable part of concrete. It is all around that pounded stone aggregate lead to higher qualities than adjusted ones. In the present examination, provincially accessible smashed rock of size 20 and 1.5mm in the degree of 67% and 33% exclusively by volume were used.

Specific gravity of Aggregate-2.86%

5. Glass Powder- Glass has been used for construction and decoration purposes for ages. The durable nature of Glass has a noble appearance, and is consequently in great demand. India is among the top world exporters of glass. The Indian glass industry has been growing steadily at an annual rate of around 10% per year. Cutting of glass produces heat, slurry, rock fragments and dust.25 to 30% of glass blocks are converted in to powder. The result is that this huge unattended mass of glass waste consisting of very fine particles is today one of the

environmental problems around the world. One of the logical means for reduction of the waste glass masses calls for utilizing them in building industry itself. Sand is filtered through three different size screens having three different sizes. The finest sand makes the finest glass the largest sand makes the strongest glass. Sand is melted in crucible to make glass.

Physical properties of Glass Powder

- Colour - White
- Form - Powder
- Odour - Odourless
- Specific gravity - 2.42 gm./cm3

6 Rice Husk Ash- Substantial research has been carried out on the use of amorphous silica in the manufacture of concrete. There are two areas for which RHA is used, in the manufacture of low cost building blocks and in the production of high quality cement. Cement is made by heating limestone and other ingredients to 1450°C in a kiln to produce clinker; this involves the dissociation of calcium carbonate under heat, resulting in lime (calcium hydroxide) and CO2. The lime then combines with other materials to form clinker, while the CO2 is released to the environment. The pulverized /ground clinker mixed with gypsum is called Portland cement. RHA is a very fine material. The average particle size of rice-husk ash ranges from 5 to 10μm. Physical properties values as reported by few authors. Rice husk ash is very rich in silica content. Silica content in RHA is generally more than 80- 85%.

Table.3. *Physical Properties of RHA*

Property	VALUES		
	Mehta	Zhang	Feng
MEAN PARTICAL SIZE	-	-	7.4
SPECIFIC GRAVITY	2.06	2.06	2.10
FINNESS PASIISG 454μm (%)	99	99	-

B. METHODOLOGY:-

In this experimental investigation an attempt has been made to find out the strength of concrete produced by replacing the cement with Rice husk ash & waste glass powder in various percentages ranging from 5% to 20% in increments of 5% [0%, 5%, 10%, 15%, and 20%,]. Ordinary Portland cement (OPC) 43 grade, locally available sand and coarse aggregates were used in this experiments. The sand used was a Zone II had the specific gravity 2.6. The specific gravity of the coarse aggregate was 2.59. The coarse aggregate used were of 12mm and down size. The glass powder was obtained by crushing waste glass pieces in a wardha market. The 150 micron passing fraction was used for the experimentation. Mix design carried out for M25 as per IS 10262:2009 yielded a mix proportion of 1: 1.55: 3.02 with water cement ratio of 0.45. Specimens were prepared according to the mix proportion and by replacing cement with rice husk ash & glass powder in different proportion and use of sand. An increasing trend in compressive strength and flexural strength was observed with increasing replacement of cement. To find out compressive strength, split tensile strength and flexural strength specimens of dimensions 150x150x150mm, 150x300mm and 150x150x700mm were cast and tested as per IS 516:1959. Details of mix content with constant coarse aggregate and w/c ratio as shown in Table.

ANALYSIS THE RHA AND GP PHYSICAL AND CHEMICAL PROPERTIES

+

PREPARING CONCRETE MIXED

+

TESTING CONCRETE CUBES

+

RESULT ANYALYSIS

+

CONCLUSION

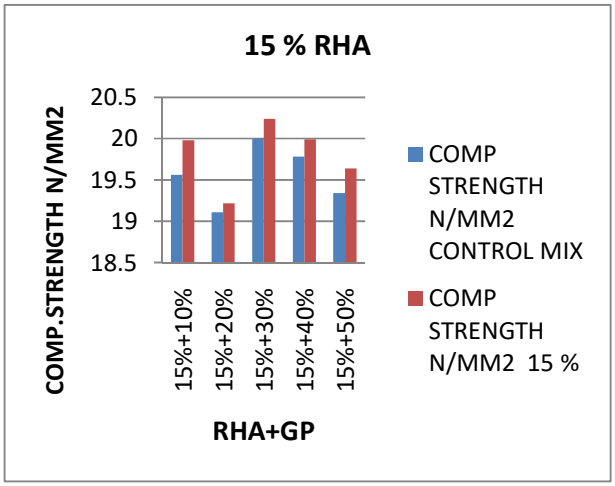
C-Test Procedure:-

The 150 mm size conforming to IS: 10086-1982 concrete Cube was used as test specimen at the end of 7 days and 28 days were subjected to compressive load by compressive testing machine until failure.

IV- RESULT.

Test result on the specimen shows there is improvement in compressive strength because of continuous increase of Rice husk ash and Glass powder. The strength increases with addition of Rice husk ash & waste glass powder at 0%, 5%, 10% and after that declines at 15% and 20% gradually because of more alkali silica reaction freed during hydration of cement.

The rice husk ash to take 15% and glass powder mixed in 10%, 20%, 30%, 40% and 50% in concrete to found the new comp. strength. That strength compare with control mixed 7 days strength. The graphical representation shows the comp. strength increased, shows bellow table. Table No.1 Comp. Strength of Concrete for 15 % RHA and 10%, 20%, 30%, 40% and 50% glass powder.



V.CONCLUSION

Following conclusion have been drawn from the present study

1. Utilizing the rice husk ash and glass powder it is conceivable to diminish the utilization of concrete and the related vitality interest effect on air contamination and Co2 emanation, the compressive strength of concrete is higher than that of the control. Over 20% rice husk and glass powder the quality significantly decreases.

2. As a conclusion, all the destinations of this study are accomplished; concrete with utilizing rice husk ash and glass powder has a high workability from control test. In term of Compressive, Split tensile and Flexural strength concrete with Rice Husk Ash and Glass Powder shows better performance as compared to control mix.

3. Considering the strength criteria, the replacement of cement by rice husk ash & glass powder is feasible. Therefore we can conclude that the utilization of rice husk ash glass powder in concrete as cement replacement is possible.

4. Used of rice husk ash and glass powder in concrete will eradicate the disposal problem of rice husk ash and glass powder, reduce emission of harmful pollution by cement manufacturer industry into our environment and thus prove to be environment friendly.

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