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A Study on Rice Husk Ash as Partial Replacement for Cement and Crushed Stone Sand for Natural Sand in Concrete- A Review

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Abstract - *This research is conducted with the use of rise husk ash and crushed stone sand as modification. In terms of the use of rise husk ash and crushed stone sand, the percentage of rise husk ash and crushed stone sand should be determined because the strength of concrete would not be obtained by the high percentage of rise husk ash and crushed stone sand. The scope of study is about comparison between rise husk ash, crushed stone sand and natural aggregate in terms of specific gravity. Moreover, this research will also focus on the comparison between rise husk ash and crushed stone sand for 0%, 20%, 40% and 60% replacement. Indian standard recommends target mean compressive strength of the conventional concrete in terms of water cement ratio. The present work is an attempt to study the behavior of rise husk ash and crushed stone sand to the compressive strength, flexural strength Split tensile strength.*

The necessity to produce rise husk ash and crushed stone sand concrete with low–medium compressive strength was verified due to the requirement of the volume of cement. The influence of the order of materials used in concrete production (made with rise husk ash and crushed stone sand) with respect to improving its tensile strength will analyze with respect to conventional concretes was measured verifying the numeral models proposed by several researchers.

Key Words: **rise husk, concrete, compressive, crushed stone sand, cement, natural sand**

1. INTRODUCTION

Today, there are critical shortages of natural resources in present scenario. Production of concrete and utilization of concrete has rapidly increased, which results in increased consumption of natural aggregate as the largest concrete component. A possible solution of these problems is to reuse rise husk ash and crushed stone sand and produce an alternative aggregate for structural concrete in this way. Crushed stone sand is generally produced by crushing of quarry stone or rocks and rise husk ash is obtained as a waste from various industries. However, there is totally the beneficial use of rise husk ash and crushed stone sand in concrete construction. Crushed stone sand comprised of crushed, graded in organic particles processed from the quarry stone, rocks. The aim of this project is to determine the strength characteristic such as compressive strength and flexural strength of modified aggregate concrete, for application in structural concrete. Fine aggregate is important material in concrete for compressive strength, so there is utilization of crushed stone sand is replaced by natural sand and cement is replace by rise husk ash partially . Rise husk ash obtained from various industries instead of being stored, can be reused in building industry. An attempt has been made to study the possibility of using the rise husk ash and crushed stone sand in the place of cement and fresh aggregate. The basic properties of aggregates, such as water absorption and specific gravity, mechanical properties, such as abrasion resistance, effect, and crushing values were also calculated. Workability of fresh concrete and strength parameters of hardened concrete, such as compressive strength and flexural strength. The preceding properties will testing for three different periods of curing of 14, and 28 days. All these mixes will designe for M20 grade of concrete. In the present work, a comparison was made between the results of a laboratory investigation on various physical properties of concrete made with rise husk ash and crushed stone sand with fresh aggregate concrete and found that the results are encouraging to use concrete with rise husk ash and crushed stone sand by various researcher Concrete is the most widely used construction material across the world. It is used in all types of civil engineering works like infrastructure, low and high-rise buildings, defense structure, and environment protection structure. Concrete is a man-made product, essentially consisting of cement, coarse & fine aggregates, water and/or admixture(s). Modification of concrete is needed from the viewpoint of environmental preservation and effective utilization of resources.

2. OBJECTIVES:

The objectives of the study are:

- To investigate the effect of rise husk ash and crushed stone sand on the strength of concrete.
- To investigate the effect of rise husk ash and crushed stone sand on the workability of concrete.
- To determine the optimum percentage of rise husk ash and crushed stone sand in the concrete .

3. MATERIAL USE:

Materials:

●Cement

i)Portland pozzolana cement

The Portland Pozzolana Cement is a kind of Blended Cement which is produced by either inter-grinding of OPC clinker along with gypsum and pozzolanic materials in certain proportions or grinding the OPC clinker, gypsum and Pozzolanic materials separately and thoroughly blending them in certain proportions. Pozzolana such as fly ash is essentially a siliceous material which while in itself possessing little or no cementitious properties will, in finely divided form and in the presence of water, react with calcium hydroxide at ambient temperature to form compounds possessing cementitious properties.

Following tests will be conducted, on cement:

1. Consistency test
2. Initial setting time and final setting time

ii) **Rise husk ash**

The Rise husk ash is obtained by burning a rise husk in laboratory.

- **Sand**

i) River sand
The sand used in the investigation will be ordinary river sand. The sand passing through 4.75 mm sieve will be used in the preparation of specimens. Sieve analysis for the sand will be carried out in the laboratory as per the procedure mentioned in IS2386 (part-I)-1963. The sizes of sand vary between 2 mm to 4.75 micron
ii) **Crushed stone sand**
The source of Crushed sand is a quarry. It is manufactured by Crushing rocks, quarry stones or larger aggregate pieces into sand size particles in a factory or quarry. The shape of Crushed sand is cubical and angular and has a rough texture and hence better for concrete. It does not contain silt as it manufacturing by crushing aggregates. However, if screen is not proper sometimes it may contain some dust. It is artificially manufactured so there are no oversized materials.

- **Coarse aggregate**

Fresh crushed coarse aggregate

The coarse aggregate used in the investigation will be 20 mm size crushed granite stone obtained from quarries. The physical properties will be determined as per IS: 3286-1963.

- **Water**
The water used in the mix design was potable water from the water supply and is free from suspended solids and organic materials, which might have affected the properties of the fresh and hardened concrete. The presence of tannic acid or iron compounds is objectionable. The general required of water for mixing and curing concrete shall be as per IS: 456-2000.

4. REVIEW OF RELATED LITERATURE:

A large number of researchers have extensively studied the effect of rise husk ash and crushed stone sand on the compressive strength & workability of concrete..

I. **KG Rahul Varma, P. Jagadeesh et.**al. Mechanical properties of sustainable concrete incorporating manufactured sand and rice husk ash in this study, cement is partially replaced by RHA by 10% and sand by MS by 25%, 50%, 75% and 100% to get desired strength concrete. Various tests like compressive strength, split tensile strength and flexural strength were conducted on specimens. Present study revealed that to get M20 concrete, 100 % sand replacement with MS is the optimum proportion for 10% replacement of cement with RHA.

II. **T.Subramani, G.Unni Krishnan, R.Arumugam, A.Godwyn Michael Cornelies , H.Gopu** et. al. The studies showed that the study of the properties of concrete in which quarry dust and rice risk is used as a partial replacement for natural sand. The use of such materials not only results in conservation of natural resources but also helps in maintaining good environmental conditions. The basic strength properties of concrete were investigated by replacing natural sand by quarry sand and rice risk at replacement levels of 50% for three different mix proportion in M25 grade of concrete. Quarry dust & Rice husk can be replacing the fine aggregate in the concrete mixture up to various percentages (30% QA+ 20% RH),(20% QA+30%RH),(10% QA + 40%RH). The use of quarry dust and rice husk in concrete mix for a given w/c ratio, increases the tensile and Compressive strength.

III. **Rohit Siwacha, S.S. Kajalb, Nikita Rajpalc et.al.** Effect of Fly Ash And Rice Husk Ash On Strength Characterstics Of Pavement Quality Concrete. The present study is done to develop pavement quality concrete by partially replacement cement with Fly Ash & Rice Husk Ash. The aim of study is to compare the strength characterises of pavement concrete which as achieved by concrete mixtures. The work done in this study shows the effects on the behaviour of concrete produced from cement with combination of FA and RHA at different proportions on the mechanical properties of concrete such as compressive strength, flexural strength. The replacement of cement were done at three levels is 10%, 20% and 30% with both Fly ash & Rice husk ash as well as combination of both Fly ash and Rice husk ash. The tests on hardened concrete were destructive in nature which includes compressive test on cube for size (150 x 150 x 150 mm) at 7 and 28 days of curing as per IS: 516 1959, Flexural strength on beam (150 x 150 x700 mm) at 28 days of curing as per IS: 516 1959. The samples were prepared water-cement ratio of 0.40 for flexure design 4.5 MPa. The result so obtained showed that it is possible to achieve saving in cement if replacement is done.

IV. **T. Shanmugapriya, R. N. Uma et. al.** This paper present the optimization of partial replacement of manufactured sand by natural sand with silica fume in High Performance Concrete (HPC). Concrete mixes were evaluated for compressive strength and flexural strength. The ordinary portland cement was partially replaced with silica fume by 1.5%, 2.5 %, and 5% and natural sand was replaced with manufactured sand by four proportions (ie 10%, 30%, 50%, 70%). The results indicated that there is an increase in the compressive and flexural strength of HPC nearly 20% and 15% respectively with the increase of manufactured sand percentage. Addition of up to 50% of manufactured sand as sand replacement yielded comparable strength with that of the control mix. However, further additions of manufactured sand caused reduction in the strength. The optimum percentage of replacement of natural sand by M-sand is 50%. The results also revealed that increase in percentage of partial replacement of silica fume, increased the compressive and flexure strength of High Performance Concrete.

V. **Ashwini B.V, G.K Supriya1, Sathish D.M, Vijay kumar, Ashish Dubay B et.al.** An Experimental Study on Rice Husk Ash as Partial Replacement for Cement in According to the results of the compressive strength, addition of 20% of RHA shows a better result in compressive strength. According to the result of the flexural strength, addition of 20% RHA shows a better result in flexural strength. Rice husk ash is generated as a waste material in cities and adds to the waste content. Using it as a replacement to cement in concrete makes it a useful material. The pozzolonic activity of the rice husk ash is not only effective in enhance the concrete strength, but also in improving the impermeability characteristics of concrete. As the rice husk ash is waste material, it reduces the cost of construction.

5. PROPOSED METHODOLOGY

The experimental work was divided into two phases. In first phase, preliminary tests were conducted on materials. In second phase, Concrete cubes and beams will caste for compressive strength and flexural strength. The concrete is prepared by rise husk ash and crushed stone sand percentage from 20%, 40%, 60%,with water cement ratios of 0.5. Fresh concrete test for slump test and Hardened concrete test for compressive strength and flexural strength. After 14 and 28 days of curing.

6. EXPECTED OUTCOMES

It expected that proper disposal of rise husk ash is achieved by using it in concrete with the replacement of cement. Crushed stone sand gives higher durability and strength to concrete by overcoming deficiencies like segregation, bleeding and honeycombing.

REFFERENCES

[1] Mechanical properties of sustainable concrete incorporating manufactured sand and rice husk ash KG Rahul Varma, P. Jagadeesh

[2] Experimental Study of Quarry Sand And Rice Husk Replacing in Concrete T. Subramani, G. Unni Krishnan, R. Arumugam, A. Godwyn Michael Cornelies, H. Gopu

[3] Effect of Fly Ash and Rice Husk Ash on Strength Characterstics of Pavement Quality Rohit Siwacha, S.S. Kajalb, Nikita Rajpalc

[4] Optimization of Partial Replacement of M-Sand by Natural Sand in High Performance Concrete with Silica Fume T. Shanmugapriya, R. N. Uma

[5] An Experimental Study on Rice Husk Ash as Partial Replacement Ashwini B.V, G.K Supriya1, Sathish D.M, Vijay kumar, Ashish Dubay B.