Comparison of Strength Characteristics of Concrete by Using Fly Ash and Rice Husk Ash

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Abstract *- A state of large landfill areas redevelopment program in many parts of the country has cause to bring the use of recycled aggregate. The low quality of recycled aggregate has not use to low-grade applications such as roadwork sub-base and pavements, while its adoption for higher-grade concrete is rare because of the lower compressive strength and higher in mechanical performance of recycled aggregate. A new method, that is the two-stage mixing approach (TSMA), was publically recommends to improve the quality of recycled aggregate concrete (RAC) by splitting the mixing process into two stages. The variation of compressive strength by experiments involves new mixing method with the two-stage mixing approach by various proportion ingredients with varying percentage of fly ash and rice husk ash and with the constant percentage of recycled coarse aggregates (RCA). Based on experimental works and results, improvements in strength to fly ash, Rice husk ash and RCA were achieved with TSMA. This can be regarded as to the porous in nature of RA and the mixing process that fills up some of pores and cracks, resulting in a denser aggregate and concrete. A good RA gives a higher strength than the normal mixing approach (NMA).*

Keywords: Concrete, fly ash, Rice husk ash, Rapid hardening cement, recycled aggregate, two stage mixing approach (TSMA), Normal mixing approach (NMA).

I. INTRODUCTION

It is known that waste in India in the construction industry i.e., demolished waste is as higher as 30%. This is simple and straight forward challenge needs to be undertaken by engineers. These wastages are activities that soak up man hours, resources and materials but produce no value. In this project, you will use those waste materials to make something fertile by manufacturing a concrete using recycled aggregate, fly ash and rice husk ash. After making concrete you will compare the compressive strength characteristics of the concrete made through NMA and TSMA. Normal mixing approach (NMA) is the layman process where all the materials are mixed in describe proportion. The problem with this approach is when concrete gets hardened some voids remains in it which acts on its strength. In a two-stage mixing approach (TSMA) a thin layer of cement is made on the surface of RA which helps in filling voids. This results in the higher strength. In this project, you're getting to prepare two different sample of concrete using nominal mixing approach and two mixing approaches and determine compressive strength of these on day 7 and 28. These environmental issues are increasing and thoughtful sustainable approach towards our natural resources to which the recycling of the aggregates seems to be allowable cure. The comparison of compressive strength characteristics of the concrete made through NMA and TSMA. The use of recycled aggregate in concrete is not up to date, researches have been take out on recycled aggregate all over the world. Use of Recycled Aggregate in high strength concrete could not become in favour of India. There is an increases importance to stop the environmental issue in the present day world. Fly Ash is notable environmental damage and ways are being thought of to throw out them. Rice husk is actually a super pozzolonic since it is high in Silica and has about 85% to 90% Silica. A finer way of utilizing this material is to use it for making “High Performance Concrete” which gives high workability and long-term durability of the concrete.

II. AIM AND OBJECTIVE

Aim: To compare strength of concrete by using fly ash, rice husk ash replaced with Rapid Hardening Cement and Recycled coarse aggregate.

Objectives:

- To reduce industrial waste.
- To reduce demolished construction waste.
- To reduce cost of material.
- To inspect the profitable use of modern waste as the cement replacement in construction work.
- To evaluate the good proportion of rice husk ash as a favourable replacement with cement in cement concrete.

III. LITURATURE SURVEY

Tam V.W.Y et al, proposed the technique of alternative mixing of concrete. The researchers concluded that the poor quality of RAC resulted from the higher water absorption, higher porosity, weaker interfacial transition zone between Recycled Aggregates and new cement mortar hampers the application of RAC for higher grade applications. In this, the two-stage mixing approach (TSMA) is put forward to strengthen the weak link of RAC.

Sandeep Uniyal, Dr. Vanita Aggrawal et al, A new concrete mixing method, that is the two-stage mixing approach (TSMA), was recommended to improve the quality of RA concrete (RAC) by breaking the mixing process into two. The current paper describes the inequality of compressive strength by experimental analysis involving the new mixing method with some alteration to the two-stage mixing approach (TSMA) by proportioning materials with the percentage of RCA and fly ash.

Maurice E. Ephraim, Godwin A. Akeke and Joseph O. Ukpata et al, this research work was practically carried out to scrutinizing the effects of partially replacing Ordinary Portland cement (OPC) with our local additive Rice Husk Ash (RHA) which is known to be super pozzolanic in concrete at good replacement percentage which will help to decrease the cost of housing. With this research work, the issue of waste management of this agro-waste will be solved.

Satish H. Sathawanea, Vikrant S. Vairagade and Kavita S Kene et al, in this paper, the detailed experimental investigation was done to study the result of partial replacement of cement by Fly Ash and Rice Husk Ash in merge proportion started from 30% FA and 0% RHA mix together in concrete by replacement of cement with the moderate increase of RHA by 2.5% and at the same time gradual decrease of FA by 2.5%. Last proportion was taken 15%FA and 15% RHA. The tests on hardened concrete were ruinous in nature which includes compressive test on cube for size (150 x 150 x 150 mm) at 7,28,56 and 90 days of curing as per IS: 516 1959.

Mr. Nitin S.Taksande, Mr. G. D. Dhawale, Dr .S. G. Makrande, Mr.M.R.Nikhar et al, Test result on the samples is upgrade in compressive strength because of continual increase of Rice husk ash. The strength increases with addition of Rice husk ash & waste glass powder at 0%, 5%, 10% and after that decreases at 15% and 20% slowly because of more alkali silica reaction release during hydration of cement. The present study looks into the effect of pozzolanic material in concrete and hence improving the strength of concrete. This work assesses the performance of Rice Husk Ash and glass powder as a partial replacement of cement in concrete. In this project the rice husk ash (RHA) percentage is with same replacement of glass powder with cement. The strength properties of concrete are compared with the above different percentage and the result on which it gives highest strength is found out.[5]

Vashisht Patil, Prof. M. C. Paliwal et al, it is observed that the maximum result is acquire at 15% rice husk ash in concrete. The 28 days compressive strength for standard concrete is found 27.75 MPa and that for 15% rice husk ash concrete is32.78 MPa. It shows the 15.34% development from standard concrete. thus, optimum use of rice husk ash is 15%. To examine the profitable use of modern waste as the cement replacement in construction work. To assess the optimum proportion of rice husk ash as a useful replacement with cement in cement concrete. [6]

Mohammad Abushad, Misbah Danish Sabri et al, in this paper it is concluded that to compare the strength of concrete with normal waste materials is fruitful. Fly ash and stone dust in concrete mix show to be very

useful to solve environmental issue and up to some extent one can minimize the need of cement in large quantity. Hence it is safe and environmentally dependable method of disposal of fly ash. And it can be found that the power plant are uses the fly ash as replacement of cement. Based on the studies of different literature papers from book, journals on application of fly-ash cement concrete. It is being concluded that most of the experiment were based on different material such as, silica flumes, marble dust, stone waste, pond ash, sugarcane bagasse in the fly-ash cement. It is difficult the find actual proportion and types of fly ash in concrete cubes.[7]

IV. MATERIAL USED

Cement: Rapid Hardening Cement use in this project. Rapid Hardening Cement contains the following ingredient proportions. 60% Tricalcium silicate (C3S), 15% Dicalcium silicate (C2S), 10% Tricalcium aluminate (C3A) and 8% Tetracalcium alumino ferrite of the total weight of cement. OPC contains 50% C3S of its total weight. So, it is observed that Rapid Hardening Cement contains a higher percentage of C3S than OPC. Rapid Hardening cement with 28 percent normal consistency conforming to IS: 8041-1990 was used. The specific gravity of cement 3.15.

Fly Ash: Fly ash includes substantial amounts of silicon dioxide (SiO_2), aluminium oxide (Al_2O_3) and calcium oxide (CaO), the main mineral compounds in coal-bearing rock strata. Fly ash is used as partial replacement of cement of total cementitious material in all the cases of the experiments. The specific gravity as 2.4 and satisfying IS 3812-1999.

Rice Husk Ash: Rice husk ash is used as partial replacement of cement of total cementitious material in all the cases of the experiments. This material is actually a super-pozzolanic since it is rich in Silica and has about 85% to 90% Silica content.

Fine aggregate: Locally available sand was used of maximum size 4.35 mm was used.

Coarse aggregate: Locally available coarse aggregate of maximum size 10.0 mm was used.

Recycled Coarse Aggregates: Aggregates obtained by the demolished construction waste are known as recycled aggregates.

Water: Portable water was used for the experimentation.

V. TESTING OF MATERIAL

Normal consistency, Initial & final setting time of Cement**:** Initial setting time of cement is found to be 30 min. Final setting time of cement is found to be 10 hr. Normal consistency of the given cement sample is 32%.

Pycnometer method of Fine aggregate: Specific gravity of fine aggregate is 2.6.

Dessicator method of Coarse aggregate: Specific gravity of coarse aggregate is 2.8.

Impact value of Coarse aggregate: The average impact value of coarse aggregate is 17.04%.

Slump test of concrete: The measured slump of Concrete is 120mm.

VI. MIX PROPORTION

Cement	Fine Aggregate	Course Aggregate	Water
428.46	573.68	994.8	182.17
1	1.33	2.32	0.4

VII. METHODOLOGY

NMA follows the following steps:

- First, coarse and fine aggregate are mixed.
- Second, water and cementitious materials are added and then mixed.

TSMA follows different steps:

- First, coarse and fine aggregates are mixed for 60 seconds and then half of water for the sample is added and mixed for another 60 seconds.
- Second, cementitious material is added and then mixed for 30 seconds.

- Thirdly, the remaining water is added and mixed for 120 seconds.

VIII. RESULT AND DISCUSSION

In this chapter discussion will be focused on compressive strength of cubes. All the test method adopted was describe in the previous chapter. The result presented in this chapter are regarding the compressive test for different percentage of fly ash and rice husk ash in concrete.

The IS code for testing IS: 516 – 1959. The concrete cubes are casted of size 150mm ×150mm × 150mm. The samples are tested in UTM (Universal Testing Machine) of capacity 2000KN. The compressive strength test is carry out at 7 days and 28 days.

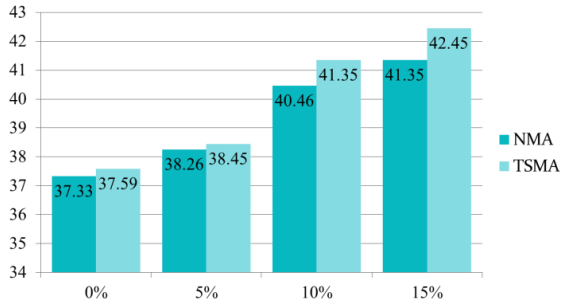
The addition of 5% of cementations material in which 2.5% fly ash and 2.5% of rice husk ash is replaced with rapid hardening cement. Then 10% of cementations material in which 5% of fly ash and 5% of rice husk ash is replaced with cement. Then 15% of cementations material in which 7.5% of fly ash and 7.5% of rice husk ash is replaced with cement. The addition of 25% of recycled coarse aggregate is replaced with coarse aggregate in each proportion. The compressive strength of cube is shown in table as

Methods / Percentage	Nominal mixing approach		Two stage mixing approach	
	at 7 days (N/mm^2)	at 28 days (N/mm^2)	at 7 days (N/mm^2)	at 28 days (N/mm^2)
0%	37.33	47.38	37.59	47.78
5%	38.26	49.59	38.45	49.51
10%	40.46	50.68	41.35	50.74
15%	41.35	52.23	42.45	52.69

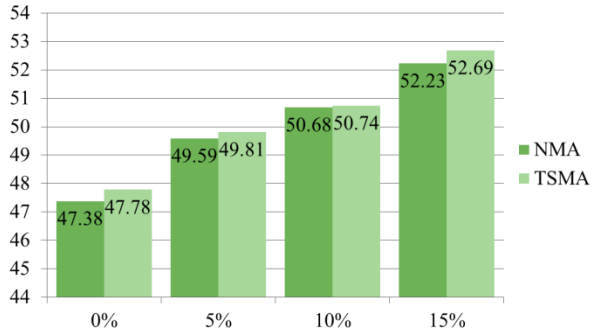
CONCLUSION

Following conclusion have been drawn from the present study the utilization of partial replacement of fly ash and rice husk ash is the best alternative for the conventional concrete. The disposal of fly ash and rice husk ash can be used as a provides the reduction in burden on land fill disposing and environmental pollution. The results shows that the good strength addition of fly ash and rice husk ash exhibits increase in compressive strength up to 15% replacement. Fly ash and rice husk ash can be used as binding material to partial replacement for rapid hardening cement. Recycled course aggregate can be used as coarse aggregate to 25% constantly replacing, this result in saving of natural aggregate.

Graphical representation at 7 days



Graphical representation at 28 days



FUTURE SCOPE

- These environmental problems are motivates in developing an urgent and thoughtful sustainable approach towards our natural resources to which the recycling of the aggregates seems to be allowable remedy.
- The use and utilization of industrial and agricultural residue in the production of concrete.

- Reduction of concrete materials in construction reduce emissions of carbon which is more efficient.
- The use recycled aggregate that reduce demolished construction material, use of fly ash reduce industrial waste, use of rice husk ash reduce agricultural waste.

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