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Effect of Fly Ash and Rice Husk Ash on Concrete Properties

Virendra Singh[1], Jyoti[2], Mahjabi Refat[3], Ujjwal Maheshwari[4], Ravi kumar[5]

UG Student[1, 2, 3, 4], Assistant Professor[5]

Department of Civil Engineering

MIT Moradabad, Uttar Pradesh, India

Corresponding Author: *vs5244422@gmail.com*

Abstract

In this paper, the detailed experimental investigation was done to study the effect of partial replacement of cement by Fly Ash (FA) and Rice Husk Ash (RHA) in combine proportion started from 30% FA and 0% RHA mix together in concrete by replacement of cement with the gradual increase of RHA by 2.5% and simultaneously gradual decrease of FA by 2.5%. Last proportion was taken 15%FA and 15% RHA. The tests on hardened concrete were destructive in nature which includes compressive test on cube for size (150 x 150 x 150 mm) at 7,14,28,56 and 90 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 and split tensile strength on cylinder (150 mm ø x 300mm) at 28 days of curing as per IS: 5816 1999. The work presented in this paper reports the effects on the behavior 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, and split tensile strength. Investigation reported that compressive strength increases by 30.15% in compared with targeted strength and reduces by 8.73% compared with control concrete at 28 days, flexural strength increases by 4.57% compared with control concrete at 28 days, split tensile strength decreases by 9.58% compared with control concrete at 28 days, were obtained at combination of

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22.5% FA and 7.5% RHA. Partial replacement of FA and RHA reduces the environmental effects, produces economical and eco-friendly concrete.

Keywords: *Fly ash, Compressive strength, Curing Rice husk, C.T.M*

INTRODUCTION

The excessive global population growth brings high demand for building with higher levels of comforts and to low cost, but it is also generates the need of producing sustainable architecture in order to reduce energy consumption while lathering environmental impact. Fly ash is a by-product of burned coal from thermal plants and Rice husk ash is the byproduct of burned rice husk from paper plant. Cement mortar and concrete are the most widely used construction materials.

According to the present state-of-the art concrete is not merely the four component system that is cement, water, fine aggregate and coarse aggregates. Now it is believed that it has many ingredients like fly ash, ground granulated blast furnace slag, silica fumes, rice husk ash, metakaoline and super plasticizers. One or more of these ingredients can be used in concrete and mortar as the situation demand. The use of pozzolanic material is as old as the art of concrete construction. The use of various pozzolonas mixed with OPC in optimum proportions improve many qualities of mortar and concrete in fresh and hardened state. This research work deals with change in properties of concrete on addition of fly ash & rice husk into it.

LITERATURE REVIEW

Fly Ash-Presents day construction industries needs faster development and also require high strength of concrete to facilitate the fast construction and economically construction for that purpose we used high early strength of cement to gain early strength of concrete. This demand of high early strength gain of concrete put forth the use of water content ratio .But when use of fly ash in concrete imparts several environmental benefits and thus it is eco friendly. Rice husk ash-Rice husk is a potential material, which is amenable for value addition. The usage of rice husk either in its raw from is many most of the husk from the milling is either burnt or

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dumped as waste in open field and a small amount is used as fuel for boilers electricity generation, bulking agents for composting of animal manure etc.

OBJECTIVE

The main objective of this research is:

- The production of fly ash & R.H.A in India
- Nessisty of the utilization
- Disposal method of F.A & R.H.A
- Characterization of different types of fly ash & R.H.A.
- Based on their physical and chemical properties.
- Utilization of F.A & R.H.A
- As a additive in concrete

MATERIALS

1) Cement- The cement used was ordinary Portland cement(43) grade confirming to I.S.8112-1989.

2) Fly Ash- Fly ash is defined as 'A finaly divided residue that result from that combustion of ground or powdered coal and is transported from the combustion chamber by exhaust gases'. Fly ash is generally used as replacement of cement, as an admixture in concrete, and in manufacturing of cement. Whereas concrete containing fly ash as partial replacement of cement poses problems of delayed early strength development, concrete containing fly ash as partial replacement of fine aggregate will have no delayed early strength development, but rather will enhance its strength on long-term basis.



Fig-1 Cement & Fly Ash

Rice Husk- Rice Husk Ash (RHA) is an agricultural waste product which is produced in large quantities globally every year and due to the difficulty involved in its disposal, can RHA becoming an

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environmental hazard in rice producing countries. For every 1000 kg of paddy milled, about 220 kg (22%) of husk is produced. This rice husk is mostly used as a fuel in the boilers for processing paddy. When this husk is burnt in the boilers, about 55 kg (25%) of RHA is generated.



Fig-2 Rice Husk &Rice husk Ash

METHODOLOGY

In this experimentation the replacement of cement they are done at three levels is 10%, 20% and 30% with both Fly ash & Rice husk ash as they all as combination of both Fly ash and Rice husk ash. Following table shows the percentage variation of cement, fly ash and rice husk ash:

*In our lab. We can only perform the compressive strength test so for this we have to follow the following procedure;

Compressive strength

1) The mixes with only fly ash replacement has a lesser rate of increase in strength from 7days to 28 days despite the fact that they have high initial strength, than the mixes with rice husk ash replacement only.

   The mixes with the inclusion of both rice husk ash and fly ash as replacement material show the highest rate of increase of compressive strength for all water to cement ratios which indicates indicates that pozzolanic activity initiates early for such mixes.

2) Concrete mix with up to 20% percent replacement of cement with fly ash for 0.40 w/c ratio have higher compressive strengths than minimum required as per specifications.

3) Concrete mixes with replacement of rice husk ash have lesser compressive strengths than minimum required as per specifications.

4) Combined replacement of fly ash and rice husk ash shotheyd higher compressive strengths than only

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replacement of concrete mixes with rice husk ash.

5) Concrete mixes with combined replacement of fly ash and rice husk ash have lesser compressive strengths than minimum required as per specifications.

RESULT

Table No. 1 Compressive strengths after 7 days

S NO	MIX PROPORTION		COMPRESSIVE STRENGTH (N/sq-mm)
	FA by % of cement	RHA by % of cement	
1	15	15	17.32
2	20	10	21.78
3	25	5	30.03
4	30	0	31.75

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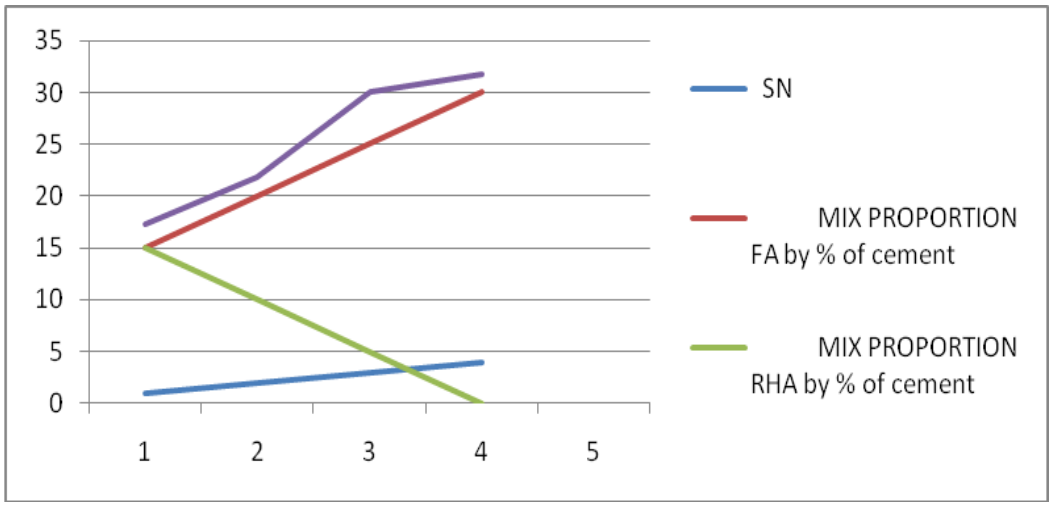


Figure: 1

Table No. 2 Compressive strengths after 7 days

SN	MIX PROPORTION		COMPRESSIVE STRENGT (N/sq-mm)
	FA by % of cement	RHA by % of cement	
1	15	15	28.42
2	20	10	33.18
3	25	5	40.13
4	30	0	38.75

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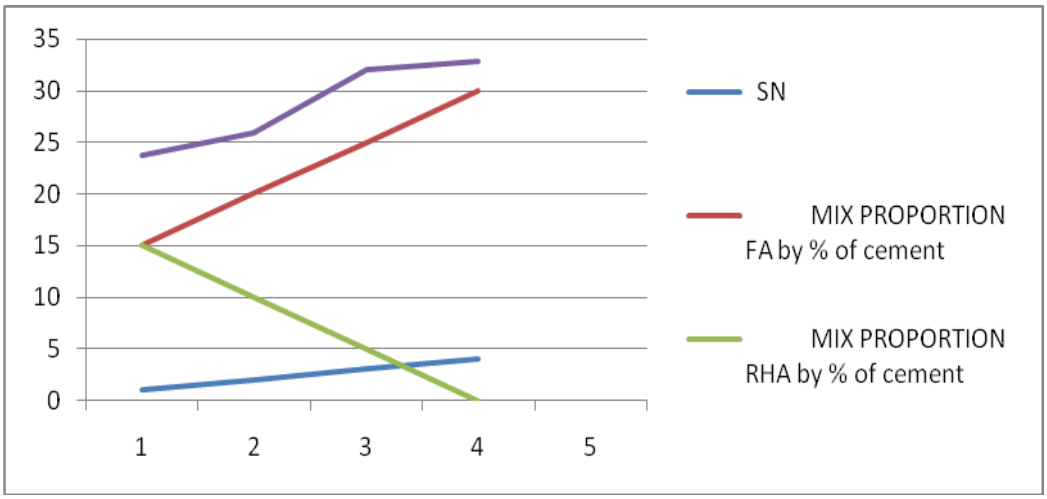


Figure: 2

Table No. 3 Compressive strengths after 7 days

SN	MIX PROPORTION		COMPRESSIVE STRENGT (N/sq-mm)
	FA by % of cement	RHA by % of cement	
1	15	15	23.69
2	20	10	25.87
3	25	5	32.07
4	30	0	32.91

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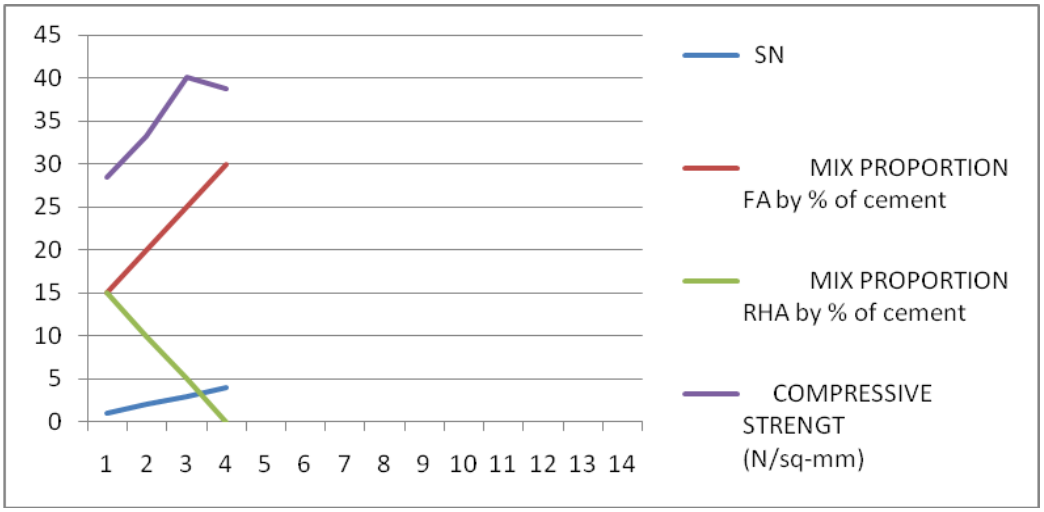


Figure: 3

CONCLUSION

Based on experimental investigations concerning the compressive strength of concrete the following observations are made:

- W/C ratio is increase respectively compressive strength of pervious concrete is increase.

- The Compressive Strength of previous Concrete is increases up to 10% replacement of Cement with RHA beyond than it is starting to decrease.

- With the increase in fly ash, expansion of soil decreases and drainage characteristics becomes better and make it suitable for sub-grade and sub-base.

- There is limitation in addition of fly ash in concrete to maintain the workability of concrete.

- The compressive strength and modulus of rigidity and toughness value also increases with the increase in concrete and up to 30% replacement, the values are acceptable according to IRC:SP:62-2004. With the increase in temperature the strength of fly ash concrete increases.

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