

# Improvement of Compressive Strength of Concrete, by FA & RHA as 40% and 45% Replacement of Cement

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**Abstract**— In this experiment to study the compressive strength of concrete by combination of fly ash (FA) & rice hush ash (RHA) by partially replacement of cement from 40% & 45% by weight of cement. FA is a by-product of burned coal from power plant & RHA is a by-product of rice husk is well burned at high temperature. Rice husk has high reactivity after burning. FA & RHA is a pozzolanic material. RHA use as a concrete admixture due to high content of SiO<sub>2</sub>. It improve workability, stability, reduce heat of hydration. FA is also improve workability with lower water demand, less bleeding & segregation, reduce permeability of concrete. The 40% replacement is divided by two group's i.e.20% FA & 20% RHA and second one is 25% FA & 15% RHA. Similarly, 45% replacement is also divided into two parts 15% FA & 30% RHA and 10% FA & 35% RHA. Compressive test on cube for size (150\*150\*150mm) at 7, 14& 28 days curing as per IS 516-1959. For mix design as per IS 10262-1982 .This replacement concrete is economical by using waste of industry and power plant. Replacement of FA & RHA reduced the environmental issues by disposal of it.

**Key words:** Fly Ash, Rice Husk Ash, W/C Ratio, Compressive Strength, Workability

## I. INTRODUCTION

Fly ash, silica flume, ground granulated blast - furnace slag, fiber, rice husk ash is a some pozzolanic material as can be used in concrete. As partially replacement of cement to improve workability, reduce permeability, decrease heat of hydration, less bleeding & segregation in the concrete. Also affect the compressive strength of concrete. Fly ash is waste material of power plant. It's available by KORADI, KHAPERKHEDA power plant in Nagpur city. As partially replacement of cement in 40% and 45% by fly ash & rice husk ash. Rice husk is available on there today where rice cultivation is high and can be use rice husk is converted into RHA by burning of Rice husk at high temperature between (650-900° c). The high temperature burned ash produce high amount of SiO<sub>2</sub> or silica content it behave like a Admixture of concrete to improve workability , stability , thermal cracking , plastic shrinkage , increase strength development , impermeability and durability . It also reduce Alkali-aggregate reaction in concrete. The pozzolanic material like FA & RHA is a waste product of power plant and agricultural waste respectively. For using FA & RHA in concrete the percentage of cement is less and cost of concrete is also decrease.

## II. MATERIALS & METHODOLOGY

### A. Materials Used

#### 1) Cement

In this experimental study, OPC conforming to IS: 8112 (1989), 53 Grade ordinary Portland cement specification, was

used.the physical properties of cement used as shown in table 1

Property	Result
Specific gravity	3.15
Consistency	29.30%
Initial setting time	45min
Final setting time	225min

Table 1:

#### 2) Aggregate

Good quality river sand was used as a fine aggregate. Specific gravity of sand 2.69. Coarse aggregate passing through 20mm and retained 10mm sieve was used. It's specific gravity 2.82

#### 3) Rice husk ash

Rice husk ash contain high % of silica which helps in strength of concrete and it is corrosion resistance. In India RH is considered as a waste product but in foreign country it considered as an admixture .It's physical properties as shown in table 2.

Properties	Result
Specific gravity	2.74
Consistency	28%
Colour	Gray

Table 2:

#### 4) Fly Ash

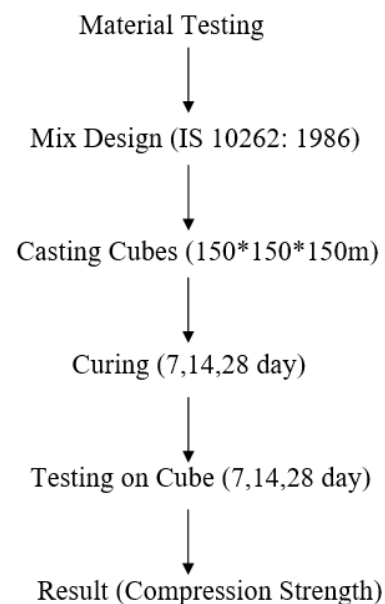
FA used as Reliance power plant, Buttibori. Fly ash is generated due to burning of coal. Fly ash contains amount of silcon dioxide, SiO<sub>2</sub> and CaO. Fly ash is passing through IS sieve in 600 μ due to it affects workability of concrete and it helps to pozzolanic activity.

#### 5) Water

For mixing and curing of cube, portable water can be used.

### B. Methodology

Its include the process of the experiment shown a by diagram.



C. Test Method

1) Primary Test

For primary test helped which material to be use us. In primary test specific gravity, sieve analysis, Elongation & flakiness index, initial & final setting time, is examined in this work & all value are in desirable limit.

- Fresh concrete test
- 1) Slump cone test.
- 2) Compaction factor test.

Sr no.	% of cement	% of FA	% of RHA	Slump cone (m)	Comparation factor
1	60	20	20	27	0.85
2	60	25	15	27.6	0.86
3	55	15	30	28.5	0.91
4	50	10	35	29	0.93

Table 3:

2) Hardness Concrete Properties

a) Compressive Strength

After casting and curing for 7, 14, 28 day if cube size 150\*150\*150 mm will test on compression testing mach

b) Caculation

Strength = P/A (N/mm<sup>2</sup>)

Where, P = Applied load

A = Cross section area

Unit = PMA or N/mm<sup>2</sup>

P in KN & A in mm<sup>2</sup>

III. MIX DESIGN/PROPORTING

For M<sub>20</sub> grade of concrete mix design is shown in table. The 0.43 w/c ratio is refered.

Mix	Cem ent (Kg/ m3)	Aggre gate (Kg/ m3)	Sand (Kg/ m3)	FA (Kg/ m3)	RHA (Kg/ m3)
60% C+20% FA +20% RHA	0.81	4.26	2.71	0.27	0.27
60% C+25% FA +15% RHA	0.81	4.26	2.71	0.34	0.20
55% C+15% FA +30% RHA	0.74	4.26	2.71	0.20	0.41
55% C+10% FA +35% RHA	0.74	4.26	2.71	0.13	0.47

Table 4:

The cube casted for every mix proportion.

IV. RESULT & DISCUSSION

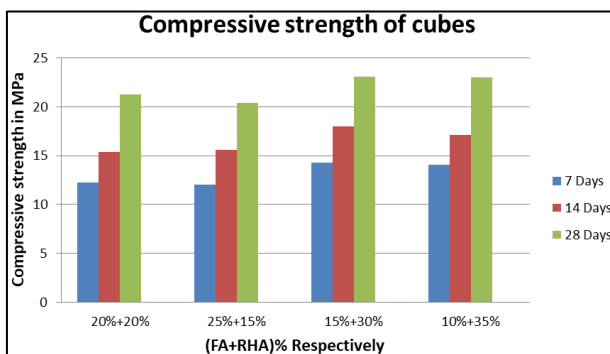


Fig. 1:

V. CONCLUSION

- 1) Compressive strength increases with increasing RHA % in 7 days, 14days, 28days.
- 2) As rice husk ash is a waste material, it reduced the cost of construction.
- 3) Reduce weight of structure due to replacement of cement.
- 4) Workability of concrete had been increases with increasing 5 of RHA.

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