A Study on Consumption of Pond Ash as a Partial Replacement of Fine Aggregate Using Alccofine in HSC-High Strength Concrete

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Abstract —Pond ash is the byproduct and is produce from coal plants. These plants release byproduct in fore most quantity which material goods the environment. In this paper, an experimental work has been done on the conservative concrete with pond ash as replacement of fine aggregate. The grade of the concrete is M-40 and nine concrete mixes name as F1, F2, F3 ,G1, G2, G3, G4, G5 and G6 were ready with different replacement ratios (10, 15 and 20 percent) of pond ash using alccofine 2.5 and 5 percent as alternate of cement. Each set of concrete mix comprised of 6 cubes, tested at the age of 7 and 28 days of curing period. it is completed that optimum replacement of fine aggregate in M-40 is achieved at 15% pond ash using 5% alccofine. There fore, the utilization of pondash as partial replacement of fine aggregates will be feasible, reasonable and safe from environmental point of view and hence can be used as an alternative to fine aggregates.

Keywords: Concrete, Coarse Aggregate, Compressive Strength, Pumice aggregate, Light weight concrete

I.INTRODUCTION

Pond ash is a result which has some constituent to make bond with the concrete [1]. Its manufacture from thermal power plants judge as waste material which effect the environments [2]. When these two types of ash, fly ash and bottom ash, mixed together is transported in the form of slurry and store in the pits, the put down is called pond ash. Pond ash (PA) means stack particles contain fly ash, bottom ash and small soil particles in reclamation site [3-5]. Fly ash (FA) or bottom ash (BA) or both mixed in any amount and conveyed in the form of water slurry and deposited in pond or lagoon [6]. It has several limits for direct use for fine aggregate of concrete. More than 40% of PA is wet in revival site, and infrequently it contains much chloride contents in reclamation site since it is almost situated near to sea. Furthermore superiority control of PA is difficult for concrete aggregate since it contains various particles and mineral ions [7-10]. This type of waste material is obligatory to use in the concrete structures and other type of structures such as road, rigid pavements [11]. If make the structure fromthis type of waste materials, cost of the structure is also less and befall cheap. In this study, use the pond as with the unlike percentages in concrete and check the mechanical strength of the concrete.

II.MATERIAL USED

Cement

The cement taken was Ordinary Portland Cement (OPC) of 43 grade of consistent consistency, compliant to IS 8112-1989 [15- 19]. The test for specific gravity, normal consistency, initial and final setting time and 28 days compressive strength have been conduct Table 1.

Fly Ash

In the examination Class C fly ash was used. Class C fly ash generally comes from coals which may generate an ash with higher lime content generally more than 15% often as high as 30%. Fly ash obedient to IS 3812 (part-1) has been used and identical merger of fly ash with cement was ensured.

Table 1: Physical Properties of Ordinary Portland Cement.

Sr. No.	Characteristics	Values Obtained	Standard Values
1.	Specific Gravity	3.17	-
2.	Normal Consistency	29%	-
3.	Initial Setting Time	1 hour 35 min	Not to be less than 30 minutes
4.	Final Setting Time	3 hour 52 min	Not to be greater than 600 minutes

Table 2: Physical Properties of Fine Aggregate.

Characteristics	Type	Specific Gravity	Fineness Modulus	Grading Zone	Water absorption
Value	Natural Sand	2.72	2.55	II	1.04%

Table 3: Physical Properties of Coarse Aggregate.

Characteristics	Colour	Shape	Maximum Size	Specific Gravity	Fineness Modulus	Water absorption
Value	Grey	Angular	10 mm	2.63	6.61	.92%

Fine Aggregate

The fine aggregate (river sand- Badarpur) used in the experimental work is nearby procured. Sieve analysis of the fine aggregate was accepted out in the laboratory as perIS383-1970,and the results are tabulated in Table 2.

Coarse Aggregate

The aggregates which are retained over IS sieve 4.75 mm are called as coarse aggregate. The coarse aggregate used in the present study was nearby available crushed stones of maximum size of 10 mm. exact gravity and other physical property of coarse aggregates are given in Table 3.

Fig- 1 Coarse Aggregate

Pond Ash

The physical properties and chemical composition of pond ash is given in Table4.

Fig. 2 Pond Ash

Table 4: Physical Properties of PondAsh.

Characteristics	Specific gravity	Dry unit weight	Plasticity	Absorption
Value	2.1-2.7	7.07-15.72 kN/m^3	None	0.8-2.0%

Super Plasticizer

Workability of concrete decreased with the add to in pond ash content, which is included by using super plasticizer. In this study For soc SP430 super plasticizer is used.

III. EXPERIMENTAL WORK

Concrete Mix Design

The mix design of conservative concrete having the design procedure as per given in IS 10262:2000 adopted for the M-40 grade of concrete. The ratio of the ingredients material is 1:2.07:2.65 and the water/cement ratio is 0.40 the for all the mix proportions. The concrete specimens are prepared with pond ash for the M40 grade of concrete. Three cubes of each variation of pond ash are casted and the average of three test results is taken for the accuracy of the results.

Table 5: *Mix proportion of M-40.*

Cement	395 kg/m^3
Water	158 kg/m^3
Fine Aggregate	819.15 kg/m^3
Coarse Aggregate	1050.55 kg/m^3
Admixture	4 kg/m^3
w/c	0.40

Mix Proportions

Pond ash is added in the normal concrete and prepared nine batches of mix proportions inthe laboratory. Six cubes for each mix proportions and three cubes tested after 7 days and 28 days of curing. Take the results as the average value of the three cubes. In mix F (F1, F2 and F3), addition only pond ash with replacement of fine aggregate. In mix G1, G2, G3, replaced cement with alccofine 2.5% and pond ash varies as 10%, 15%, 20% as replacement of fine aggregate. Similarly, in mix G4, G5, G6 alccofine 5% replaced with cement and pond ash same as 10%, 15%, 20% as shown in Table 6.

Table 6: Proportions of Various Concrete Mixes.

MIX NO.	F1	F2	F3	G1	G2	G3	G4	G5	G6
ALCCOFINE	0%	0%	0%	2.5%	2.5%	2.5%	5%	5%	5%
POND ASH	10%	15%	20 %	10%	15%	20%	10%	15%	20%
NO. OF CUBES	6	6	6	6	6	6	6	6	6

Compressive strength test

Concrete samples were made by using ordinary Portland cement. The work of art of the mortar mix is shown in table -2. Moulds with dimensions of 150 mm× 150 mm× 150 mm. After casting, all moulds were located in a normal warmth of room with a relation dampness of more than 90% for a phase of 24h. After de-moulding, the specimens were placed for the curing At the time of testing, cubes were took out from the water, excess water was wipe out by jute cloth and placed it on the platform of compression testing machine. 7th and 28thdays compressive strength was measured. The compressive strength result shown in table no.7

Fig. 3 Compressive strength test

IV.RESULT AND DISCUSSION

Compressive Strength

The replacement of sand by pond ash using alccofine was done in proportion of 10%,15%, 20% and also cement was replaced with alccofine in proportion of 0% , 2.5% and 5% .Its effect on properties of concrete was investigate. The variation in compressive strength and ultrasonic pulse speed on varying percentage of pond ash using alccofine is discussed in Table7.

Variation of Compressive Strength forM-40 Concrete Using Pond Ash Only

Compressive strength of concrete has been obtained at different percentages of pond ash in mix F1(10%), F2(15%), F3(20%), as shown in Figures 1 and 2.

Table 7: Results of Compressive Strength after 7days and 28 days.

MIX NO.	F1	F2	F3	G1	G2	G3	G4	G5	G6
7 days Strength	27.50	25.42	23.33	28.47	29.03	28.25	30.08	31.48	28.78
28 days Strength	37.57	39.28	36.56	40.25	42.73	41.67	41.48	43.98	41.90

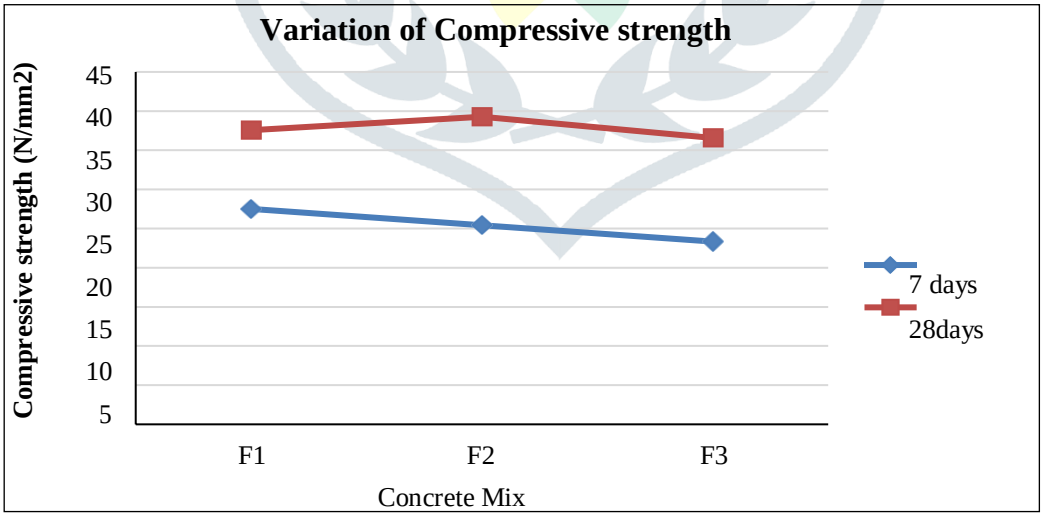

Fig. 1: Compressive Strength of Pond Ash Concrete.

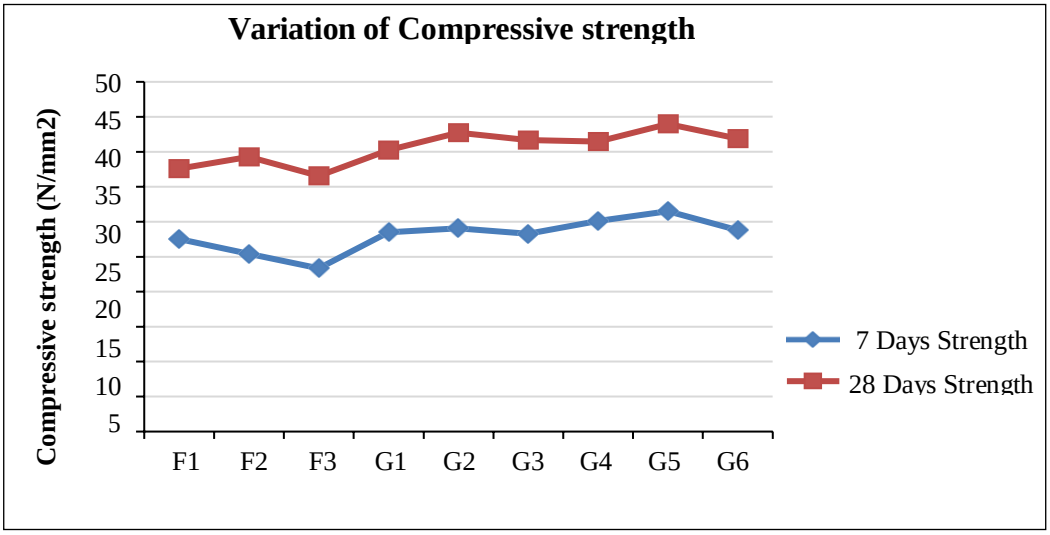

Fig. 2: Compressive Strength of Pond Ash Concrete of All Mixes.

V.CONCLUSION

On the basis of the results obtained from present study, following conclusions are.

- The physical properties of the constituent of the pond ash replaced concrete satisfy the needs as per respective codes.
- The density of concrete reduces with the increase in the percentage of pond ash and the compressive strength of concrete with pond ash increases with increased curing period.
- Workability of concrete decreases with the increase in pond ash and hence the super- plasticizer For soc SP430 is used in this study.
- The compressive strength of 15% pondash and 5% alccofine replaced concrete is found to be highest after 7 and 28 days of curing but the compressive strength for 28 days is found to be slightly higher for 5% alccofine replacement only than the combine replacement of pond ash and alccofine.
- Thus, the compressive strength increases up to 15% pond ash and 5% alccofine by weight in place of sand and cement respectively and with an addition of pond ash more than 15% , the compressive strength decreases. it sows the optimum percentage for replacement of fine aggregate with pond ash in concrete is15% pond ash using 5%alccofine.
- Considering the compressive strength criteria and cost of concrete, the replacement of fine aggregate with pond ash is feasible and the variation of strength of ponded ash concrete in comparison to reference concrete lies within ± 10% up to the age of 28 days for various mixes.

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