Effect of Natural Admixture on Compressive Strength of Flyashblended Concrete

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Abstract— A durable concrete is one that has ability to withstand the damaging effect of the environment and of its service conditions without undue deterioration and excessive maintenance over the design life of a structure. The used of high performance concrete is an alternative in producing high-strength concrete, durable and construction friendly. In the present investigation, experimental results on compressive strength of concrete made with various mixture proportions i.e., fly ash (0%-20%) and egg (0%-0.35%) have been presented. The increasing trend in compressive strength and UPV values observed from 0% egg dosage to 0.35% egg dosage at all curing periods. At 0.5% egg dosage the compressive strength has decreased at all ages. Similar trend has been observed for the other fly ash proportions i.e. from 10% to 15%. At 20% fly ash dosage, all the values have decreased when compared to the 15% dosage mixes. From the results it is observed that 0.35% egg dosage and 15% fly ash dosage can be taken as optimum dosages.

Key words: Opc Cement, Fly Ash, Natural Egg, Compressive Strength

I. INTRODUCTION

While greatly varying from architectural masterpieces to the simplest of utilities. It is the most widely Concrete is the mostly used material in various types of construction, from the flooring of a hut to a multi storied high rise structure from pathway to an airport runway, from an underground tunnel and deep sea platform to high-rise chimneys and TV Towers. In the last millennium concrete has demanding requirements both in terms of technical performance and economy used construction materials. It is difficult to point out another material of construction which is as versatile as concrete.

Cement concrete is one of the seemingly simple but actually complex materials. The properties of concrete mainly depend on the constituents used in concrete making. The main important material used in making concrete is cement, sand, crushed stone and water. Even though the manufacturer guarantees the quality of cement it is difficult to produce a fault proof concrete. It is because of the fact that the building material is concrete and not only cement. The properties of sand, crushed stone and water, if not used as specified, cause considerable trouble in concrete. In addition to these, workmanship, quality control and methods of placing also play the leading role on the properties of concrete.

II. LITERATURE & REVIEW

In this chapter, a brief review of literature on influence of mineral admixtures on the strength and durability aspects such as saturated water absorption, sorptivity, corrosion resistance and acid resistance of high performance concrete is reported and discussed.

High compressive strength is generally the first property associated with fly ash concrete. Yogendran et al (1987), Hooton (1993) and Sabir (1995) reiterated that the strength development in concrete with condensed is higher in the range of 12-28%. Cong and Darwin (1992) reported that lower compressive strengths were achieved at the age of 3 days while higher strengths at 7 and 28 days with fume mortars.

III. INVESTIGATIONS

The physical and chemical properties of fly ash, aggregate, water and egg used in the investigation were analyzed based on standard experimental procedures laid down in *IS*, *ASTM* and *BS* codes. The experiments conducted on coarse aggregate are specific gravity and water absorption, Bulk density & Sieve analysis by using respective codes [4-9]. The experiments conducted on fine aggregates are specific gravity, moisture content, sieve analysis and bulking of fine aggregate using volume method. The tests conducted on geo polymer concrete are Compressive strength [10-12], are as per the respective *IS*, *BS* and *ASTM* codes.

A. Materials used

1) Cement

Cement is a material, generally in powder form, which can be made into a paste usually by the addition of water and, natural egg, will set into a solid mass. Numerous organic compounds used for adhering, or fastening materials, are called cements, but these are classified as adhesives, and the term cement alone means a construction material. The most widely used of the construction cements is Portland cement. It is a pure white colour powder obtained by finely grinding the clinker made by strongly heating an intimate mixture of calcareous and argillaceous minerals

2) Fine aggregate

Fine aggregate / sand is an accumulation of grains of mineral matter derived from the disintegration of rocks. It is distinguished from gravel only by the size of the grains or particles, but is distinct from clays which contain organic materials. Sands that have been sorted out and separated from the organic material by the action of currents of water or by winds across arid lands are generally quite uniform in size of grains.

3) Course aggregate

Coarse aggregate are the crushed stone is used for making concrete. The commercial stone is quarried, crushed, and graded. Much of the crushed stone used is granite, limestone, and trap rock. The last is a term used to designate basalt, gabbro, diorite, and other dark-coloured, fine-grained igneous rocks. Graded crushed stone usually consists of only one kind of rock and is broken with sharp edges. The sizes are from

0.25 to 2.5 in (0.64 to 6.35 cm), although larger sizes may be used for massive concrete aggregate. Machine crushed granite broken stone angular in shape was used as coarse aggregate. The maximum size of coarse aggregate was 20 mm and10 mm specific gravity of 2.78.

B. Natural admixture egg

Grill hen egg was utilized as Natural admixture, egg white and yellow yolk was thoroughly blended and added to concrete. The Natural admixture was supplanted to water at different substitution levels 0%, 0.15%, 0.25%, 0.35% and 0.50%.

C. Fly Ash

Fly ash is used in the manufacturing of geopolymer concrete and which is obtained from the by-product of coal-burning power stations. The production of fly ash will be increased day by day in our country, so it is best opportunity to employ this by-product in the geopolymer concrete. Approximately it is estimated that the production of fly ash is more than 780 million tons per year especially in the countries like China and India (Malhotra).

IV. METHODOLOGY

In the course of investigation, traditional fine mixture for the study of varied properties, completely different specimens are solid and tested. The physical and chemical properties of silica, water and egg used in the investigation were analyzed based on standard experimental procedures laid down in *IS ASTM* and *BS* codes. The tests conducted on fresh concrete are Compressive strength, as per the respective *IS*, *BS* and *ASTM* codes [10-16].

A. Compressive Strength test

The compression check is dispensed on specimens like cuboidal or cylindrical in form generally prisms are used. The tip components of beam area unit left intact when failure in the square cross section of the beam this a part of the beam may well be well accustomed determine the compressive strength. The compressive strength of concrete is that the most vital and helpful property of Concrete. The compression check was dispensed mistreatment 2000 KN compression testing machine.

The compressive strength of plain concrete and with addition of FlyAsh, with egg was conducted on the cubical specimens for all the mixes after 3 and 7days of curing as per code. Various cubes with C100% FA0%, C90% FA10%, C87.5% FA12.5%, C85% FA15%, C80% FA20% were casted and tested for compressive strength at 3and 7 days respectively.

Fig. 3.2: Testing of cubes for compressive strength

The compressive strength (f'c) of the specimen was calculated by dividing the maximum load applied to the specimen by the cross-sectional area of the specimen as given below.

$$f'c = P/A$$

Where, f'_c = Compressive strength of the concrete (in N/mm^2)

P = Maximum load applied to the specimen (in Newton)

A = Cross-sectional area of the specimen (in mm^2)

V. RESULTS & DISCUSSIONS

Tests were conducted on compressive strength of concrete specimens. Standard procedures were adopted for testing. The results of the experimental investigations are presented and discussed herein. The compressive strength results are given in Table 4.1.

A. General effect Fly Ash

With 0% silica fume and 0% egg, the basic M25 concrete has given the design strength of 15.87MPa at 3 days and 24.85 MPa at 7 days. These values increased to 20.42 MPa and 26.49 MPa with the increase of egg dosage at 0.35% at 3,7 and 28 days respectively. At 0.5% egg dosage the compressive strength values have decreased at all ages. Similar trend has been observed for the other Fly Ash proportions i.e. from 10% to 15%. At 20% Flyash dosage, all the values have decreased when compared to the 15% Fly Ash dosage mixes. From the results it is observed that 0.35% egg dosage and 15% Fly ash dosage can be taken as optimum dosages.

Mix content	% of egg addition	Avg. Compressive strength results(N/mm2)		
		3 days	7 days	28 days
	0%	15.87	24.85	28.79
	0.15%	15.09	16.27	29.38
C100%	0.25%	18.63	24.92	30.87
	0.35%	21.02	26.78	31.03
FA0%	0.50%	16.64	20.16	32.31
Mix content	% of egg addition	Avg. Compressive strength results(N/mm2)		
		3days	7days	28 days
	0%	17.67	21.6	28.89
	0.15%	18.8	20.58	31.33
C90%	0.25%	19.43	23.9	31.4
	0.35%	21.23	26.12	32.4

FA10%	0.50%	20.12	24.53	33.03
	0%	19.54	23.13	32.48
	0.15%	20.01	25.97	33.23
C87.5%	0.25%	21.89	28.74	34.51
	0.35%	24.01	29.04	35.8
FA12.5%	0.50%	22.7	26.07	36.98
	0%	19.73	23.78	33.49
	0.15%	20.92	26.86	34.42
C85%	0.25%	22.89	28.65	36.51
	0.35%	26.65	31.54	38.75
FA15%	0.50%	24.74	28.76	37.15
	0%	18.42	23.65	31.03
	0.15%	20.86	25.02	33.31
C80%	0.25%	22.65	26.76	33. 51
	0.35%	23.9	27.82	34.78
FA20%	0.50%	22.92	25.89	33.89

Table 4.1: Compressive strength for 3, 7 and 28days various % Fly Ash

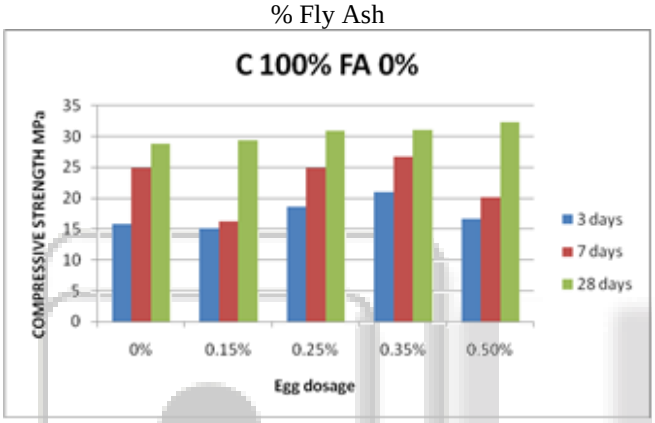

Fig. 4.1: Compressive Strength for C100% FA0%

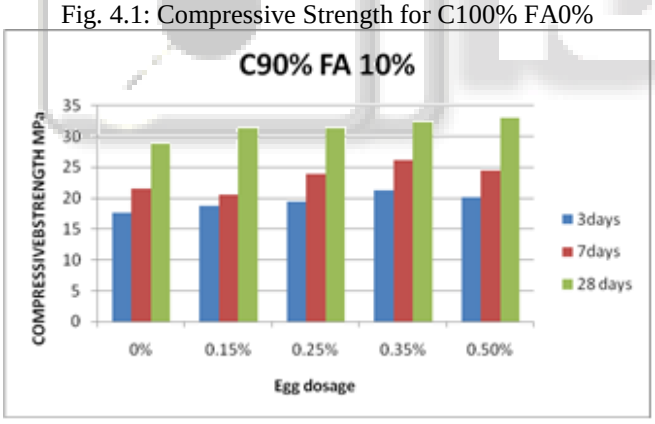

Fig. 4.2: Compressive Strength for C90% FA10%

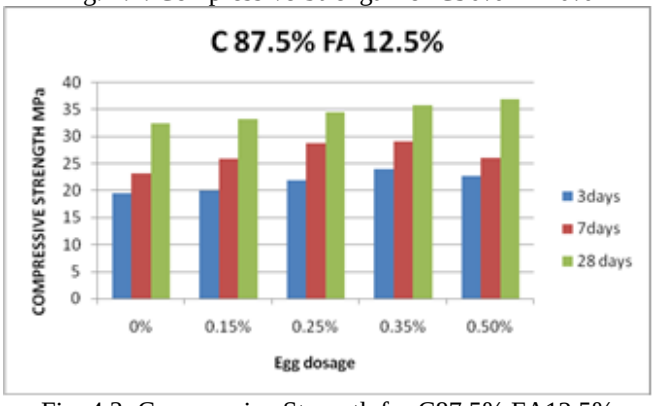

Fig. 4.3: Compressive Strength for C87.5% FA12.5%

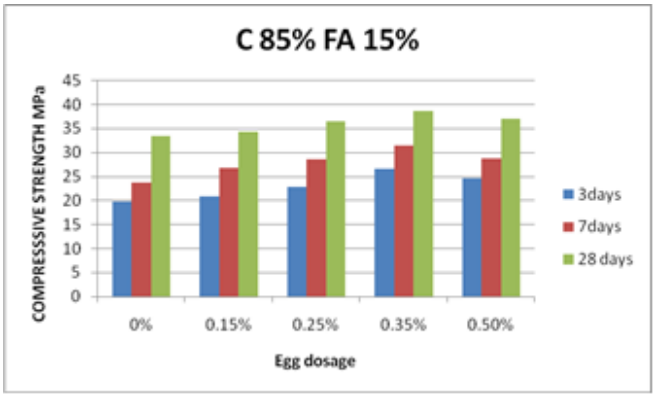

Fig. 4.4: Compressive Strength for C85% FA15%

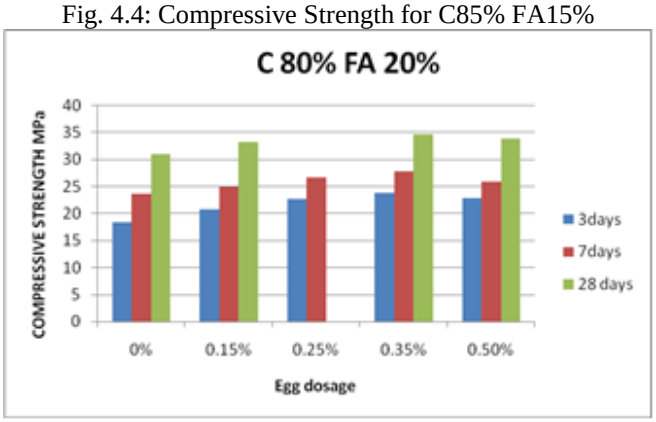

Fig. 4.5: Compressive Strength for C80% FA20%

Thus the graphs are plotted for the experiments conducted on Fly ash with addition of Egg for 3, 7 and 28 days respectively and the conclusions are derived.

VI. CONCLUSIONS

Based on the present experimental investigation, the following conclusions are drawn.

1) The increasing trend in compressive strength observed from 0% egg dosage to 0.35% egg dosage at all curing periods. At 0.5% egg dosage the compressive strength has decreased at all ages.
2) Similar trend has been observed for the other Fly Ash proportions i.e. from 10% to 15%. At 20% Fly Ash dosage, all the values have decreased when compared to the 15% Fly Ash dosage mixes.
3) From the results it is observed that 0.35% egg dosage and 15% Fly Ash dosage can be taken as optimum dosages.

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