AN EXPERIMENTAL STUDY OF CONCRETE BY REPLACING WITH FLYASH AND GGBS

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ABSTRACT:

Testing the properties of concrete by replacing with flyash and GGBS. Our main aim is to reduce the percentage of cement content in the construction, thus the co_2 can be reduced in the environment by using fly ash and GGBS. Fly ash and GGBS are available in thermal power plants and steel plant as a waste materials. So if we replacing them with the cement, it can be beneficial in economical point of view and it is ecofriendly.

The suitable ingradients of concrete and determining their relative proportions with the object of producing concrete can be selected as economical as possible. Our first objective is to reduce co_2 and second objective is to make the concrete in the most economical manner.

Key words: GGBS, Fly ash, Compressive strength, Eco-friendly concrete.

INTRODUCTION

FLYASH

The ash generated from the volcanoes was used extensively in the construction of roman structures. Colosseum in roman is a classic example of durability achieve by using volcanic ash.

The combustion of pulverized coal at high temperatures and pressures in power stations produces different types of ash. Fly ash is also known as flue ash, is one of the residues generated during combustion of fuel and comprises the fine particles that rise with the flue gases. Fly ash is generally captured by electro static precipitators. Depending upon the source and makeup of the coal being burned, the components of fly ash vary considerably, but all fly ash includes substantial amounts of silicon oxide(sio_2) and calcium oxide(cao), both being endemic ingredients in many coal bearing rock strata.

Tests conducted on cement:

Test results:

(1)Consistency test---water consumed 93ml.

(2)Initial setting time---55minutes.

(3)Final setting tim----171minutes.

(4)Compressive strength of cement mortar cubes

Tests on Coarse Aggregates:

(1)Sieve analysis.

(2)Flakiness.

(3)Elongation.

(4)Impact value.

(5)Crushing value.

(6)Specific gravity.

(7)Water absorption

PROCEDURE

The raw materials are used in this procedure are:

1. Cement
2. Fly ash
3. GGBS
4. Fine aggregate(sand)
5. 20mm Coarse aggregate
6. 10mm Coarse aggregate
7. Admixture
8. Water

- As per mix design, the quantities of raw materials are taken of their respective proportions.
- The sample should be re-mixed thoroughly on a steel sampling tray.
- A cube mould of size 150*150*150mm is considered and it should be cleaned and lightly oiled.
- Plane table vibrator is used in this process for the purpose of compaction which liquefies it, allowing the trapped air to rise out.
- After compaction the concrete along with the moulds is left for it setting time.
- If the ambient temperatures are very high, it may be advantageous to place the freshly made cubes in their moulds into the curing tank.

CONCRETE CURING

Curing means to coverthe concrete so it stays MOIST.By keeping concrete moist the bond betweenthe paste and the aggregates gets stronger.Concrete doesn't harden properly if it is leftto dry out. Curing is done just after finishing the concrete surface, as soon as it will not be damaged.

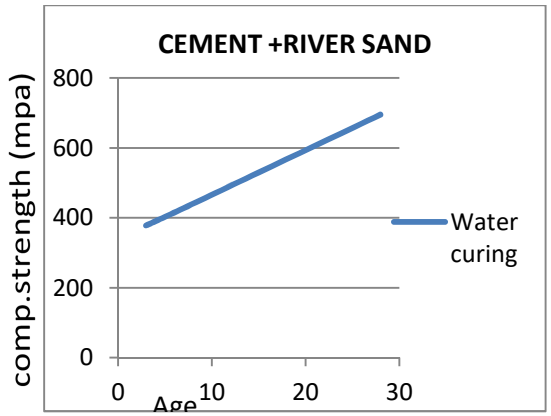
C+R	**300.8**	**301.9**	**303.8**	**337.5**	**335.3**	**339.8**	**537.75**	**528.75**	**544.5**
C+15 F	**276.8**	**283.5**	**279**	**335.3**	**330.75**	**321.75**	**551.3**	**562.5**	**560.3**
C+20 F	**266.75**	**258.75**	**254.2**	**312.75**	**315**	**319.5**	**580.5**	**596.3**	**589.5**
C+25 F	**243**	**227.3**	**236.3**	**297**	**306**	**312.75**	**609.75**	**621**	**616.5**
C+15 G	**288**	**294.75**	**303.8**	**335.3**	**342**	**324**	**673**	**589.5**	**582.8**
C+30 G	**267.8**	**276.75**	**283.7**	**315**	**326.3**	**310.5**	**618.7**	**623.3**	**607.5**
C+50 G	**247.5**	**258.7**	**270**	**310.9**	**303.75**	**315**	**661.4**	**650.25**	**668.25**

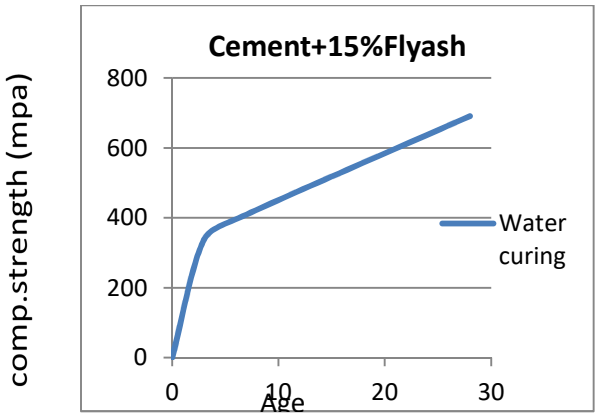
RESULT ANALYSIS

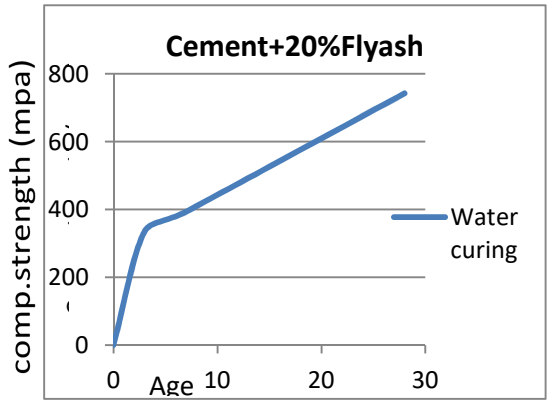
M20 GRADE TEST VALUES (ALL VALUES ARE IN NEWTONS)

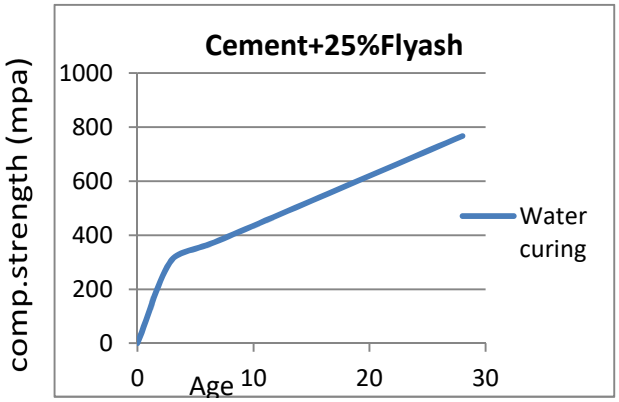
M25 GRADE TEST VALUES (ALL VALUES ARE IN NEWTONS

M20 GRAPH RESULTS



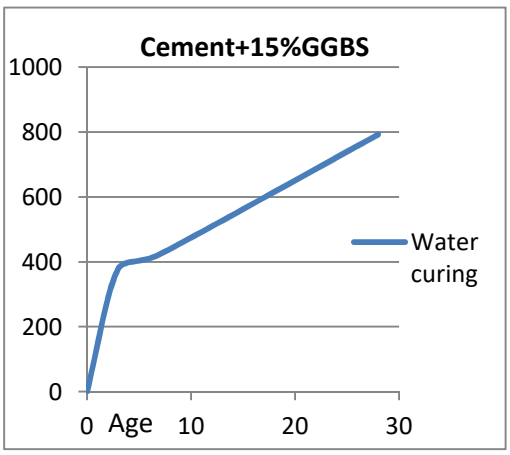


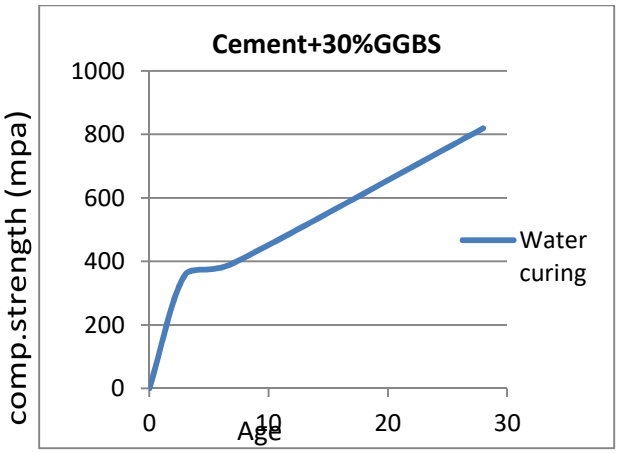


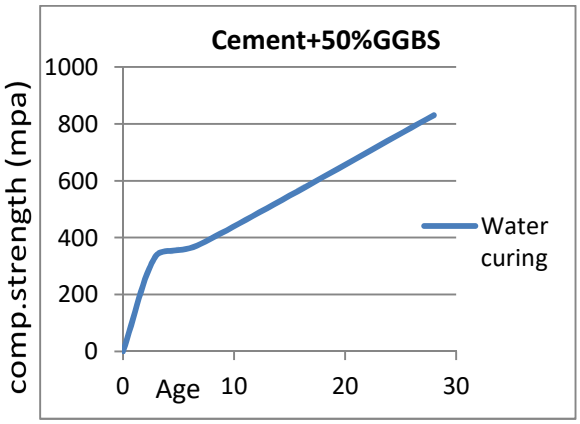


C+R	393.7	382.5	378	427.5	438.5	445.8	695.3	702	708.2
C+15F	371.2	378	337.5	425.2	418.	409.5	721.2	731.2	690.7
C+20F	351	342	335.2	393.7	402.	409.7	760.5	751.5	742.5
C+25F	310.5	326.2	330.7	380.2	391.5	396	787.5	778.5	767.25
C+15G	393.75	384.7	378	423	427.5	438.75	812.25	803.25	792
C+30G	358	364.5	371.25	400.5	409.5	393.75	828	819	832.5
C+50G	355.5	348.8	337.5	393.8	398.3	378	850.5	343.8	330.3

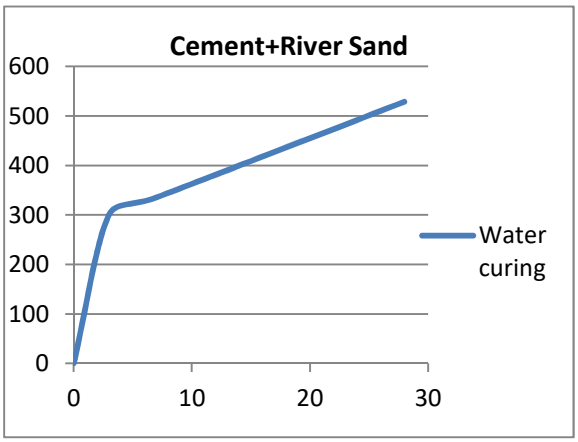
comp.strength (mpa)

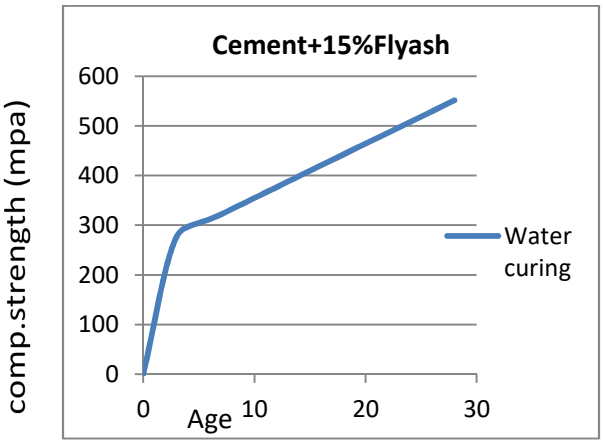


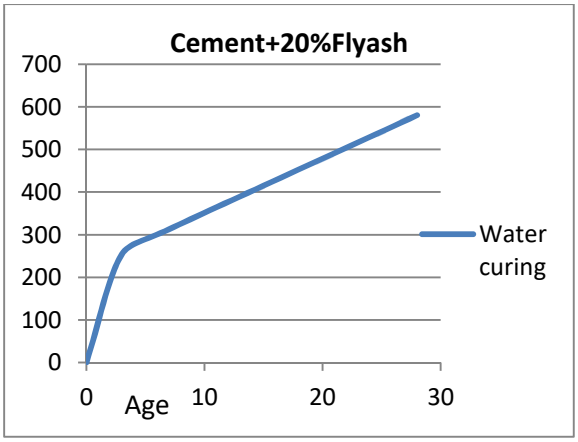


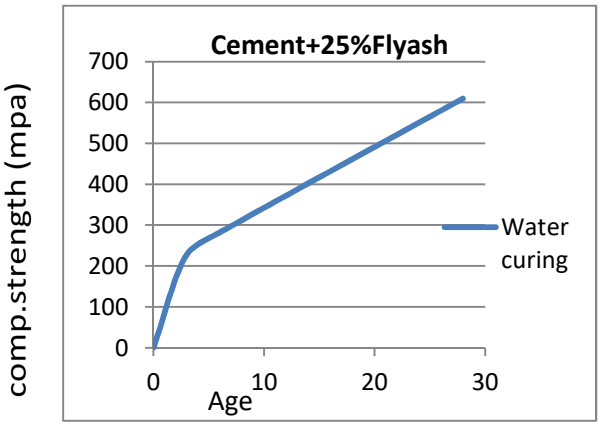


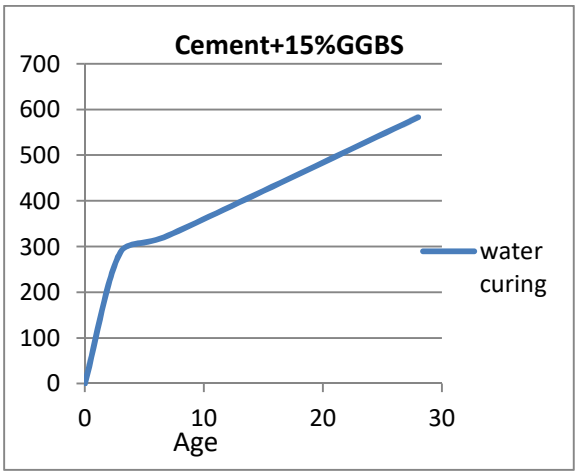
M25 GRAPH RESULTS

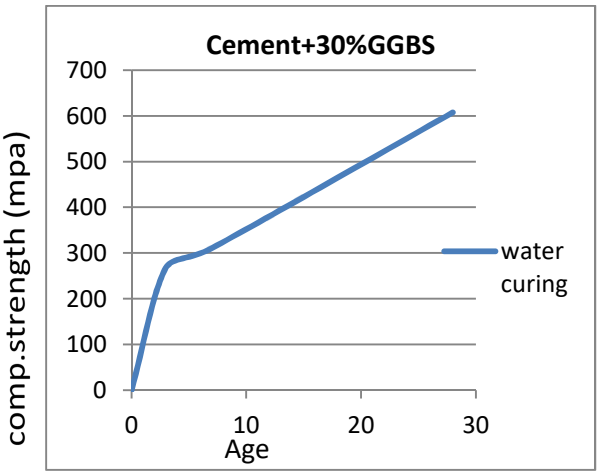


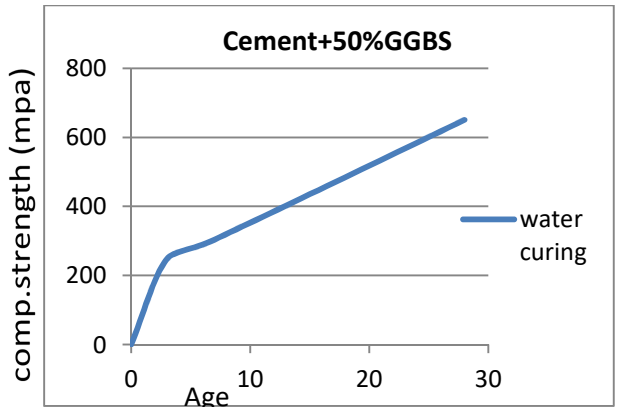



Cement+20%Flyash
700
600
500
400
300
200
100
0
0
Age
10
20
30
Water curing


Cement+25%Flyash
comp.strength (mpa)
700
600
500
400
300
200
100
0
0
Age
10
20
30
Water curing


Cement+15%GGBS
700
600
500
400
300
200
100
0
0
10
Age
20
30
water curing


Cement+30%GGBS
comp.strength (mpa)
700
600
500
400
300
200
100
0
0
10
Age
20
30
water curing


Cement+50%GGBS
comp.strength (mpa)
800
600
400
200
0
0
10
Age
20
30
water curing

CONCLUSION

By replacing cement with FLY ASH and GGBS

i. Environment can be saved from co_2
ii. Construction of the structure is economical.
iii. Rate of colour variation and setting time gradually increases with increase in the concentration of fly ash and GGBS.
iv. Compressive strength of concrete is varying according to percentages used in fly ash and GGBS.
v. Based on the experimental work carried out we can conclude that fly ash can be safely used upto 20-25 percentage and GGBS can be safely used upto 50 percentage.
vi. As per IS code, based on the climatic conditions the usage of fly ash and GGBS can be restricted.
vii. Thermal cracks in concrete can be reduced by using fly ash and GGBS.
viii. Fly ash and GGBS cannot show early age strength but they show ultimate strength after 28 days.
ix. GGBS concrete, which consistently achieves improved sustainability ratings relative both to normal concrete and made with fly ash.
x. GGBS as having only one tenth of the environmental effect.

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