The Effects of Magnetics Water and Properties of Concrete with Flyash

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Abstract— this research investigates the effects of magnetic water on compressive strength, porosity and soropitivity on samples prepared with magnetic water .test variables include the magnetic strength of water and curing age. The results shows that the compressive strength of concrete samples mixed with magnetic water with is higher than prepared with normal tap water. The compressive strength water is more significant early age the best results achieved for water absorption and porosity were obtained at magnetic strength of treated water is of 1t.the best results for sorpity was obtained at magnetic strength of treated water is of 0.9t.

Key words: Magnetics Water, Concrete with Flyash

I. Introduction

Concrete is the majority of widely used man-made building material on the universe and cement is used to produce around 2.5 t (over one cubic meter) of concrete per person per year.

Concrete structures have been constructed since the discovery of Ordinary Portland cement (OPC) in the middle of the nineteenth century. The effect of OPC with water results in hydration products, which glue the reacting cement particles with each other to form a hard cement paste. When cement and water are combined with sand, the producing product is called mortar. If the mix also contains coarse aggregate, the resulting product is called concrete. Right from the invention of the concrete, the concrete has under gone many changes to suit the needs in the construction sites. Many additives and admixtures are being included to change the physical form of concrete and also concrete without cement, aggregates is under use. One essential thing for the word concrete to acquire strength is hydration or some other reactions by usage of water for mixing the ingredients, so water is very essential for the hydration process to take place in the concrete made with OPC

Water consumption is rising as the manufacture and human needs grow. Industrial sector comes in the second place with 20 % water consumption after the agricultural sector which accounts for 70 % of water use. In concrete manufacturing practice there is more than one billion tonnes of water devour each year. Water used in concrete manufacturing plays effective role in the concrete mix, starting from governing the hydration process of cement, along with proper curing in order to reach the desired strength is not mention managing the workability and permanence of the concrete structure. Drinking water or tap water is usually used in concrete manufacture to avoid the aspect of impurities. This limitation along the limited availability of drinking water across the planet raised the important issue of optimizing the use of water in concrete constructions. Using magnetized water is encouraging potentials in saving water amount used in the concrete construction.

II. Objective of the Project

1) The main objective is to improve the workability and strength of concrete using magnetic field treated Water and to reduce the Cement content in the concrete mix.
2) To improve the workability and strength of concrete using magnetic field treated water and flyash to Reduce the cement content in the concrete mix
3) Then the best results for the 72hrs of the magnetic field treated water and flyash.

III. Procedure

The properties of constituent of concrete, cement, sand, coarse aggregate and water is analyzed based on standard investigational procedures laid down in IS codes. The standard investigational procedures are adopted for the determination of normal firmness, initial and final setting times and compressive strength of cement.

These are conducted of coarse aggregate and fine aggregate to find the water soaking up, specific gravity and bulk density. Slump test is conducted on fresh concrete and also test were conducted of hardened concrete to find compressive strength.

IV. Materials

The materials are used in experimental investigations are:
1) 53 grade OPC (Ordinary Portland Cement)
2) Fine Aggregate
3) Coarse Aggregate
4) Magnetized water
5) Potable water
6) Fly ash

The properties of these materials are given in following section.

A. Test on Cement:

Portland cement grade 53 is used in this test. It is the basic ingredient of concrete, mortar and plaster. Cement is anshapeless (glassy) powdered siliceous material that Is Answer to the alkali contented in cements to react with the lime in the high pH environment in concrete to form added C-S-H (calcium silicate hydrate) binder with the opining structure of the concrete. The chemistry related with certain Pozzolana, such as sulfides, carbon, sulfates, and alkalis can be completely harmful to the long-term permanence of the concrete. As shown in Fig 3.1

Fig. 3.1: Cement

B. Fineness of cement by dry-sieving method

The proposition of this we determine the amount of the cement was grain size is the larger than the identify reticulation size. The equipment used are 90µm IS Sieve, Balance ability of the weighing 10g to the close 10mg, a nylon or pure hair brush, preferably with 25 to 40mm, hair, for cleaning the sieve.

1) Weigh correctly 100 grams of the cement and move to the clean, dry I.S. Sieve No.9 smash any air piece.
2) Possessions the sieve and pan in hands, sieve up until most of the material has passed through and the remainder is the fairly clean.
3) Place the puts something on top of the sieve and separate the pan. Possessions the sieve and cover firmly in one hand confine the other side of sieve with the handle of the cleaning brush. Sweep cleans the underside of the sieve.
4) Empty the pan clean replacing the sieve in the pan and remove the cover carefully come back any coarse material that has been capture in the cover the sieve(during tapping).
5) Carry on with the sieve for 15 minutes, rotating the sieve continual through without upset the cement.
6) Weigh the remainder.

C. Observations:

Weight of cement taken in to the sieve (gm): 100
Weight of residue after sieving IS sieve No. 9(gm): 2.25

$$\text{Quantity of the cement retained (\%)} = \frac{(\text{wt of residue})}{\text{wt of cement taken}}$$
$$= \frac{2.25 \times 100}{100}$$
$$= 2.25$$

Fineness of cement = 2.25%

D. Standard Consistency of Cement Paste:

The principle of the standard firmness of the cement is that the firmnessat theVicat plunger pierce to a point 5-7mm from the bottom of Vicatmould. Equipment usedfor Vicat'sequipment using 10mm diameter plunger shaped into needle-holder, vicatmould, measure trowel, measuring crock, stability, glass dish, finish watch, blend tray, and sample of cement.

Normal firmness is defined as percentage water need of thecement paste for the viscosity of avicat plunger pierce up to a point 5-7mm from the bottom of vicatmould. The water is added to the cement, the resulting paste starts stiffening and gaining strength simultaneously losing its firmness. Two stiffening states arerecognize as initial and final setting times respectively. Initial setting time is defined as the time taken by the paste to become stiff ofarea such that the vicat needle is notallow to move down through the paste within 5±0.5mm measured from the bottom of mould. Final setting time is the time when the paste becomes so hard that the circular attachment to the needle under standard weight fails to leave mark on the hardened cement paste. Thus normal stability and setting times are archeological properties since these concepts are defined extent tothe standard flow of cement paste under standard force apply by the weight of theapplicable plunger.

The water need for making cross-section for the determination of the initial and final setting times and of tensile and compressive strength of the cement sand motors and for soundness test is a depends upon the normal stability of the cement to be used. This normal stability or water demand of the cement depends upon the compound configuration and fineness of the cement.

1) Take 400gms of cement and prepare a paste of the weighed amount of the water taking care that time of mixing is between 3-5 minutes and shall be completed before any indication of setting become visible. The time of measure shall be counted from the time of adding water to the dry cement until the beginning of filling cast
2) Fill the vicatcastwith paste of the cast resting on a non-porous plate and then smooth off the surface of the paste making it level with the top of the cast.
3) Plan the test block in the cast together with the non-porous resting place under the rod bearing the plunger lower than the plunger gently to touch the surface of the test block and quickly release allowing it to sink into the paste. The operation shall be carried out the immediately after filling the cast and at room temperature. Prepare the trail paste with varying percentages of water and test as described above and measure the penetration of the needle. This test is be carried cut until the specified penetrations is obtained.
4) Repeat till a paste which allows into the plunger to settle to a point with in 5mm to 7mm from bottom of vicatcast is got.

E. Observations:

Weight of cement taken: 400 gm
Percentage of water required for consistency: 30%
The values are shown in table 3.1.

Sl.No	Percentage of water	Quantity of water added (in ml)	Vicat's plunger reading
1	28	112	14mm
2	30	120	7mm

Table 3.1: Consistency of cement

V. SOUNDNESS OF CEMENT (BY LE-CHATELIER METHOD)

Soundness ofcement is to beintent by Le-Chatelier method. Le-Chatelierequipment is used for the determination for the soundness of cement. It be composed of a small cylinder of theleap brass of 0.5mm thickness, set up a cast 30mm inner diameter and 30mm high. On either side of the break are devoted to two indicators with the pointed ends AA the distance from these ends to the center of the cylinder being

165mm. the cast shall be kept in good condition with the jawbone more than 0.5mm apart.

A. Procedure:

1) Place the cast on a glass bed linen and the fill it with the cement paste formed by gauging cement with the water required to be give a paste of normal stability.
2) Cover the cast withthe another piece of glass sheet, place a small weight on this covering glass sheet and immediately submerge the whole assembly in water at a temperature of 27˚c and keep there for 24 hours.
3) Measure the distance from the separating the indicator points.
4) Submerge the cast again into a water at the temperature prescribed above. Bring the water to cooling, the cast kept into the submerged for 25-30 minutes, and keep it there for 3 hours.
5) Remove the cast from the water, allow it to cool and measure the distance between the indicator points. The difference between these two measurements represents the expansion of cement.

B. Observations:

Type of cement : OPC 53 grade
Normal consistency :P =30%
Water required for soundness test = 0.78 × P = 24.96 ml
Initial distance = 9mm
Final distance = 12 mm
Expansion of cement = 12-9 = 3mm

VI. SPECIFIC GRAVITY OF CEMENT

Specific gravity is normally defined as the ratio between the weight of a given volume of material and weight of an equal volume of water. To determine the specific gravity of cement, kerosene which does not recent with cement is used. Apparatus used are specific gravity bottle, balance, weigh box, cement, kerosene, cement.

A. Procedure:

1) weigh the empty specific gravity bottle(w1 gm)
2) weigh the bottle filled with distilled water(w2 gm)
3) weigh the bottle filled with kerosene(w3 gm)
4) Pour some of the kerosene out and introduce a weighed quantity of the cement (about 50gm) into the bottle. Roll the bottle gently in the inclined position until no further air bubbles rise into the surface. Fill the bottle to the top with kerosene and weigh it (w4 gm)
5) Weigh of cement (w5 gm)

B. Observations:

$$\text{Specific gravity of kerosene} = \frac{w3-w1}{w2-w1}.$$
$$= 0.84$$
$$\text{Specific gravity of cement} = \frac{w5(w3-w1)}{(w5+w3-w4)(w2-w1)}$$

The properties of cement were within limits as per IS 8112:1989. The properties are shown in Table 3.2

S.No.	Property	Results
1.	Fineness	1.66%
2.	Specific gravity	3.12
3.	Normal Consistency	31%
4.	Setting time(min)	
	Initial	90 min
	Final	350 min

Table 3.2: physical properties of 53 grade ordinary Portland cement

VII. TESTS ON FINE AGGREGATE

Sand shall be dense, tough, clean and free form supported coatings and the living matter and shall not be contain any considerable amount of clay. Sand shall not contain damaging impurities such as iron, pyrite, coal particles, lignite, mica shale or similar overlay material, alkali, and living impurities in such form or amount as to affect the strength or permanence of concrete or mortar. Also it should accommodate any material responsible to charge the steel reinforcement. Grading of fine aggregate shall confirm to IS and shall within limits of one of the four zones given in IS 383-1970. As shown in fig 3.2

Fig. 3.2: Fine aggregate

A. Grain Size Distribution of Fine Aggregate:

Sieve investigation is helps to determine the application size issuing the coarse and fine aggregate. This is done by the sieving aggregates as per IS: 2386 (part-I) -1963. It can be used different sieves as systematize by the IS code and then passed through the aggregate and thus gather different size particles left over different sieves.

1) The apparatus used are –

1) A set of IS Sieve of sizes – 80mm, 63 mm, 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm, 4.75 mm, 3.35 mm, 2.36 mm, 1.18 mm, 600μm, 300μm, 150 μm, and 75 μm.
2) Balance or scale with the correctness to measure 0.1 percent of the weight of the test sample.
3) The weight of the representative available should not be less than the weight given below:-
4) The representative for the sieving should be prepared from the great representative's breakdown or by means of a representative divider.

2) Procedure to Determine Particle Size Distribution of Aggregates:

1) The test representative is drought in constant weight at temperature of 110+5˚C and weighed.
2) The representative is sieved by using the set of IS Sieves.
3) The realization of sieving, the material of each sieve is weighed.

4) Increasing weight passing throughthe each sieve is calculated by percentage of the total representative weight.
5) Strength modulus is obtained by adding increasing percentage of the aggregates keep on each sieve and dividing the sum by 100.

B. Reporting of Result

The results should be calculated and reported as:

1) The increasing percentage by weight of the total representative.
2) The percentage by the weight of the total representative passing through the sieve and keep the next smaller sieve, to the nearest 0.1 percent. The result of the sieve examination may be recorded reachable in a semi-log graph with the particle size as abscissa (log scale) and the percentage smaller than the identify diameter as ordinate. The grade examination of excellent aggregate are shown in table 3.3.

Sieve size in mm	Weight retained (gm)	Percentage weight retained(%)	Cumulative percentage wt. retained (gm)	Percentage of wt. passing	Percentage of cumulative wt. passing
4.75	5	0.5	0.5	99.5	99.5
2.36	45	4.5	5	95	194.5
1.18	130	13	18	82	276.5
0.6	360	36	54	46	322.5
0.3	350	35	89	11	333.5
0.15	50	5	94	6	339.5
0.75	10	1	95	5	344.5

Table 3.3: Grade analysis of Fine Aggregate

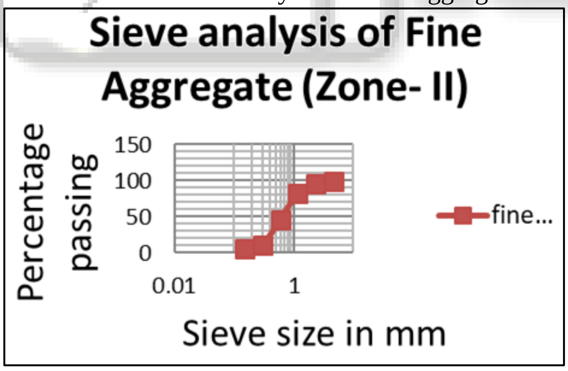


Fig. 3.3: Grading curve of Coarse Aggregate 2Specific Gravity of Fine Aggregate

C. Apparatus:

1) A stability of capacity is not less than the 3 kg, legible and correct to 0.5gm and such a type as to allow the weighting of the boat accommodate the aggregate and water.
2) A well aerate oven to continue a temperature of 100˚c to 110˚c.
3) Pycnometer of about 1 litervolume having a metal conical bolt top with a 6mm hole at its peak. The bolt top shall be water tight.
4) A means supplying a current hot air. The area is not less than 32 cm2.
5) An air compact receptacle large enough to take the sample.
6) Filter papers and tube.

D. Procedure

1) Take about 500g of representative and place in the pycnometer.
2) Stream distilled water into the it until is full.
3) Elimination in the entangle air by the revolve the pycnometer on its side, the hole in the summit of the cone being covered with in a digit.
4) Clean out the outer exterior of the pycnometer and weigh it (w).
5) Move into the pacify of the pycnometer into a tray, care being taken into the ensure that all the aggregate is moved.
6) Refill the pycnometer with in the distilled water to the same level.
7) Find out the weight (W1)
8) Drink water from the sample through a strainer paper.
9) Placing the representative oven into a tray at a temperature of 100˚c to 110˚c for 24±0.5 hours, during which the period, it is mix sometimes to make possible drying.
10) Cool the representative and weigh it (W2)

1) Tests on Coarse Aggregate

Fig. 3.4: Coarse aggregate

The rough aggregate used for the investigation work is both 12mm and 20mm aggregate. Coarse aggregate shall be procedure from the natural sources such as atone, grave etc., crushed or uncrushed or a amalgamation from acceptinquiry. Aggregate shall be a hard, strong, thick, long-lasting and clean and free from thelayer and supporter coatings. It shall be free from so mushy, weekly, narrow, lengthen and cover pieces and shall be violently cubical in the shape. It shall consist of coarse material, most of which is retained on 4.75 mm IS sieve.

Aggregate shall be stockpile into such a way is does not get assorted within the mire, greenery, vegetables and other then thedistant matter. The best way is to have a hard surface policy made out ofthe concrete, bricks or board. Once a particular source of supply of coarse aggregate is accept, the source shall not be changed. In this study, graded 20mm crushed into the granite coarse aggregate is used in the natural coarse aggregate. As shown in fig 3.3

E. Specific Gravity of Coarse Aggregate

1) Apparatus:

1) A balance or scale of thevolume is not less than the 3 kg, legible and then thecorrect to the 0.5kg and of such a type and shape as to be allow there ceptacle hold the sample to be suspended from the beam and the weighed from the water.
2) A well aerate oven the thermostatically then the controlled into acontinue the temperature of 100˚c to 110˚c.
3) A wire basket of not more than 6.3mm netting or a pierce container of suitable size.
4) A fat water compact receptacle of thesuitable size.
5) Two dry soft porous cloths each not less than 75×45cm.
6) A superficial tray of area not less than the 650cm2.
7) An air compact receptacle of the capacity similar to that of the basket.

2) Procedure:

1) Take 2 kg of aggregate. Representative into larger than 10mm.
2) Wash the representative thoroughly the removed from the finer tiny bit and fine powder.
3) Place the representative intothe wire basket and massive is distilled water at a temperature between 22˚c and 32˚c with a place something over at least 5 cm of water above the top of the basket.
4) Remove from the trap air by theraise the basket accommodate in the representative 25mm above the base of the tank and allowing it to let fall per second, care being taken from to see that the representative is to completely submerge into the water during the operation.
5) With the representative in water at a temperature of 22˚c-32˚c (w).
6) Remove from the basket and then the aggregate from the water and allow into theevacuate for a few minutes.
7) Empty to the aggregate from the basket to a superficial tray.
8) Submerge the empty basket into the water jolt 25 times and then the weight in water (w2).
9) Place the aggregate into a oven at the temperature of 100Vc to 110Vc for 24+0.5 hours.
10) Remove from the oven and cool it and find the weight (w2).

$$\text{Apparent specific gravity} = \frac{\text{weight of a substance}}{\text{wt of an equal volume of water}}$$

$$= \frac{w3}{w3-(w1-w2)}$$

3) Grain Size Distribution of Coarse Aggregate:

Sieve investigation helps as to determine in the particle size issue of the coarse aggregate. This is done by the sieving the aggregates as per IS: 2386 (part-I) -1963. In this we use different sieves as a systematize by the IS code and then the pass aggregate through them and thus collect different sized tiny bit left over the different sieves.

4) The apparatus used are –

1) A place of the IS Sieve of sizes – 80mm, 63 mm, 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm, 4.75 mm, 3.35 mm, 2.36 mm, 1.18 mm, 600µm, 300µm, 150 µm, and 75 µm.
2) ii) Balance or scale with in thecorrectness to calculate 0.1 percent of the weight of the test representative.
3) The weight of sample available should not be less than the weight given below:-
4) The representative for the sieving should be the prepared from the larger sample either by breakdown by means of a representative divider.

5) Procedure

a. The test representative is drought to a constant weight at a temperature of 110+5˚C and weighed.
b. The representative is sieved by using a set of IS Sieves.
c. On realization of sieving, the material on each sieve is weighed.
d. Increasing weight passing through each sieve is calculated as a percentage of the total representative weight.
e. Fineness modulus is to be obtained by the adding increasing percentage of the aggregates keep on each sieve and then dividing the sum by 100.

F. Reporting of Results:

The results should be calculated and reported as:

1) The increasing percentage by the weight of the total sample.
2) The percentage by weight of the total representative by passing through the one sieve and keep on the next smaller sieve, to the nearest 0.1 percent. The results of the sieve survey may be recorded into the graphically on a semi-log graph with particle size as abscissa (log scale) and the percentage smaller than state diameter of ordinate. The grade investigation of the coarse aggregate are

Sieve size in mm	Weight retained (gm)	Percentage weight retained (%)	Cumulative percentage wt. retained (gm)	percentage of wt. passing	percentage of cumulative wt. passing
80	0	0	0	100	100
63	0	0	0	100	200
40	0	0	0	100	300
20	5300	5.3	53	47	347
10	4700	4.7	100	0	347
4.75	0	0	100	0	347
2.36	0	0	100	0	347

Table 3.4: Grade analysis of coarse aggregate for 20mm

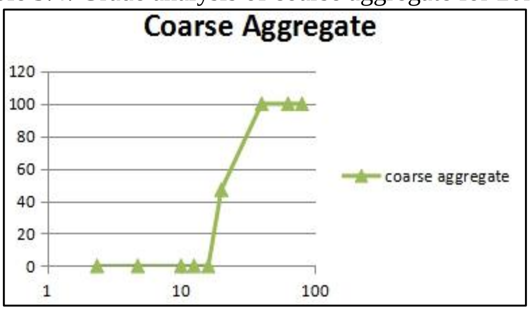


Fig. 3.5: Grading curve of Coarse Aggregate

G. Cement Factors:

Because fly ash addition contributes to the total cementitious material available in a mix, the minimum cement factor (Portland cement) used in the PCC can be effectively reduced for FAC. The ACI acknowledges this contribution and the recommends that a water/ (cement plus pozzolan) ratio to be used for the FAC in lieu of the conventional water/cement ratio used in PCC.

Fly ash particles react with the free lime into the cement matrix to produce the additional cementitious material, and thus, to increase long-term strength.

H. Fly Ash Properties:

1) Fineness:The expertise of the fly ash is important because it affects with the rate of pozzolanic venture and the workability of the concrete. Statement require a minimum of 66 percent passing the 0.044 mm (No. 325) sieve.
2) Specific gravity: Although the specific gravity does not straight affect with the concrete grade, it has value in the recognize changes in other fly ash characteristics. It should be contour into regularly as a standard control measure, and then correspond to other characteristics of the fly ash that may be fluctuating.

I. Chemical composition:

The reactive with the alum inosilicate and then calcium alum inosilicate components of the fly ash are to be conformation to represented into their oxide nomenclatures such as the silicon dioxide, aluminium oxide and calcium oxide. The variability of the chemical composition is contour in the regularly as a quality control measure. The alum inosilicate components react within the calcium hydroxide to manufacture with the additional cementitious materials. Fly ash tend to donate to the concrete strength at a faster rate when these components are to be present into the finer fragment of the fly ash.

Sulphur trioxide content is to be limited to five percent, as greater amounts have been shown into the increase mortar bar growth.

Available into the alkalis in the most ashes are to be less than the statement limit of the 1.5 percent. Appease greater than the this may be donate to alkali-aggregate growth problems.

Carbon content: LOI is a quantification of the unburned carbon remaining the ash. It can be range up into the five percent per AASHTO and six percent per ASTM. The unburned carbon can be absorb air entraining admixtures (AEAs) and increase with the water demand. Also, some of the carbon into the fly ash may be summarize in the glass or otherwise is less than active and, therefore, not pretentious the mix. Conversely, some fly ash with the low LOI values may be have a type of the carbon with a very high outside area, which will be into the increase the AEA dosages. Variations in the LOI can be donatethevariation in air content and call for the more careful field monitoring of particles entrained air into the concrete. Further, if the fly ash is a very high carbon content, the carbon may be float to the top during the concrete finishing inthe process and may be produce dark-coloroutsideband.

VIII. OTHER CONSTITUENTS:

A. Aggregates:

As with any concrete mix, suitable representing and with the testing are needed to make sure that the aggregates used into the mix design are to be a good quality and are representative of the materials will be used on the project. Aggregates accommodate the received into a silica may be used in the FAC.

B. Cement:

Fly ash can be used into the successfully in the mixture with all the types of cements: portland cement, production cement, and combined cements. However, special care should be taken when using into the fly ash with high early strength or pozzolanic cements. Appropriate mix design and testing should be conducted into the assess in the impact of the fly ash addition into the production of high early strength concrete. Blended or pozzolanic cements already contained into the fly ash or other pozzolan. Additional cement renewal with the affect early strength development. Characteristics of the cement vary, as do fly ashes, and not all be the combinations of produce a good concrete. The selected to be portland cement should be tested and the approved on its own merit, as well as the evaluated into the mixture with the specific fly ash to be used.

C. Air Entraining Admixtures (AEAs):

The higher than the carbon contented in the fly ash, the more hard it is to be control into the air contented. Further, if the carbon contented varies from the air content must be a closely observe and admixture dose changed into insure proper levels of the air entrainment.

D. Retarders:

Adding the fly ash should not be aconsiderably alter the success of a chemical retarder. Some fly ashes may be delay the time of set and may decrease the need for a retarder.

E. Water reducers:

Fly ash concrete normally the need the less water, but it can be further improved with the use of water-reducing admixture. The effectiveness of these admixtures can be vary with the addition of fly ash.

F. Figure 3-5: Fly ash concrete finishing

Normal PCC. FAC contains more paste than normal PCC, which is advantageous to the finishing. The measured early strength development of FAC may also be result in the longer.

G. Troubleshooting:

First-time users for the fly ash in concrete should be assess the performance of the suggest mixes earlier to the construction. All concrete constituent must be tested and assess into the develop the desired mix design.

H. Air content:

The strength of the fly ash and the improved into the workability of FAC make it naturally more hard into the develop and hold the entrained air. Also, remaining unburned carbon in the ash soak up the air entraining representative and then make it more challenging to develop the desired air contented. Higher then the carbon content ashes naturally require a higher AEA contents. Quality word of honour and quality control testing of the ash at the source must sure that fly ash used into a maintains of a constant carbon content (LOI) to prevent the unacceptable variation in the entrained air. New technologies and procedures to the address unburned carbon in the fly ash are report into the Chapter 10.

I. Lower early strength:

Fly ash concrete mixes typically with the result in lower strengths at ultimately ages. The slower strength may be require forms to be strength to reduce hydraulic loads. It should be noted that form the moving and opening into the traffic may be detained due to the slower strength gains. Lower ultimately strengths can be overcome by using accelerators.

J. Seasonal limitations:

Building arrange should be allow into a time for FAC to gain enough density and strength to be resist de-icing applications and freeze-thaw the cycling earlier to winter months. Strength gain of FAC is minimal during inthe snowy months. Although the pozzolanic reactions are to be remarkably diminished below 4.4 degrees C (40 degrees F), strength gain may be continue at a slower rate resulting from the continued cement hydration. Chemical admixtures can be make use of in off-set seasonal.

To study and compare the strengths of concrete with magnetized water and without magnetized water on different pozzolanic materials.

IX. RESULTS & DISCUSSION

The results of the experimental investigation are presented in this chapter. In order to facilitate the interpretation of the result, the analysis was carried out at each phase of experimental work. The significance of the results were assessed with the reference to relevant IS codes.

The compressive strength of concrete cubes of grade M 25 with conventional water is compared with that of concrete cubes prepared with magnetized water. The compressive strength tests are carried at 3 days, 7 days and 28 days and 56 days of curing. It is inferred that the compressive strength of concrete cubes with magnetized water is around25% more than conventional water concrete cubes at 28 days and 72hrs of magnetized water.

A. TEST RESULTS

1) Compressive Strength

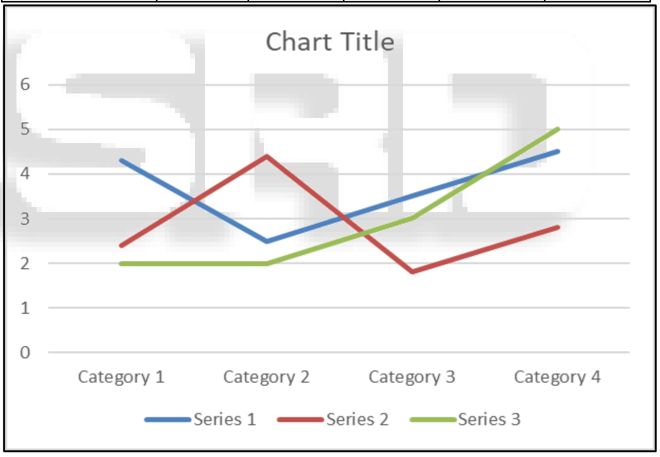
Compressive strength of concrete is commonly considered as the most reliable property because the strength is usually reliable measure of the quality of concrete.

The results of compressive strength of conventional water and magnetized water of cubes are presented in table and graphical forms. The compressive strength values of both conventional water and magnetized water are compared and shown in Figure 6.1

Compressive strength of cubes of CW and MW concrete(M25) at 3, 7, 28 and 56 days are shown in Table 6.1and Figure 6.1

MAGNETIC WATER WITH COMPRESSIVE STRENGTH

Types of mix		Compressive Strength (N/mm^2)			
		3 days	7 days	28 days	56 days
Conventional mix		24.15	32.52	35.9	37.82
Magnetized Water mix	24 hrs	21.88	33.57	36.2	43.1
	48 hrs	24.15	38.79	41.09	48.31
	72 hrs	33.92	43.55	44.9	49.2
	96 hrs	25.9	34.6	38.9	42.3



2) REBOUND HAMMER TEST:

Rebound hammer is the one of the nondestructive test on the hardened concrete. In this experiment to be study n the test is conducted on the specimen with a curing period of 3,7,28,48 and 56days for all the eight mixes.

The table 6.2.2 shows the Rebound hammer values with the curing period of 3,7,28,48 and 56days and the table 6.3 shows the rebound values with under curing period of 56 days. The combined values for the Table 6.2.2shows the Rebound hammer values under curing period of 56 days of the compressive strength shows for the figure 6.2.2

Type of mix		RBH TEST (N/mm^2)			
		3 days	7 days	28 days	56 days
Conventional mix		29.44	30.1	31.2	33.9
Magnetized Water mix	24 hrs	26.5	28.2	30.1	36.5
	48 hrs	30	32.1	32.1	35.8

	72 hrs	29.72	30.61	32.3	38.4
	96 hrs	29	32	33.8	38.9

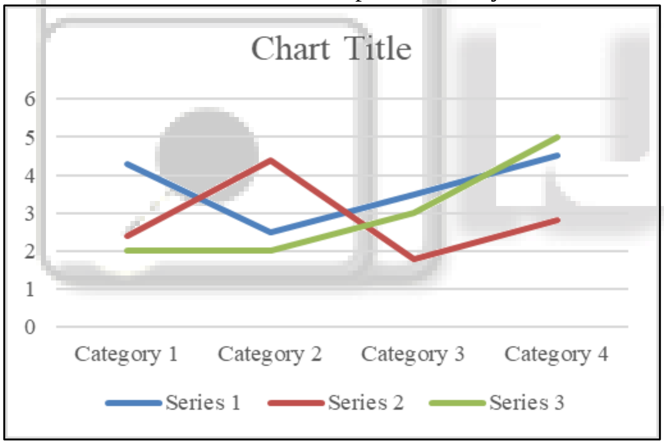
B. ULTRA PULSE VELOCITY:

Ultrasonic pulse velocity is the one of the nondestructive test on the hardened concrete. In this experiment to be study n the test is conducted on the specimen with a curing period of 3,7,28,48 and 56days for all the eight mixes.

The table 6.2.1 shows the ultrasonic pulse velocity values with the curing period of 3,7,28,48 and 56days and the table 6.2.1 shows the ultrasonic pulse velocity values with under curing period of 56 days. The combined values for the Table 6.2.1shows the ultrasonic pulse velocity values under curing period of 56 days of the compressive strength shows for the figure 6.2.1

Types of mix		UPV Test (m/s)			
		3 days	7 days	28 days	56 days
Conventional mix		4209.5	4560.5	4730.4	4923.1
Magnetized Water mix	24 hrs	4239.5	4525	4731	5012
	48 hrs	4464	4594.5	4582	4693
	72 hrs	4464	4666	4823	4999
	96 hrs	4334.5	4560.5	4730	4921

Table: 6.2.1 Ultrasonic pulse velocity test

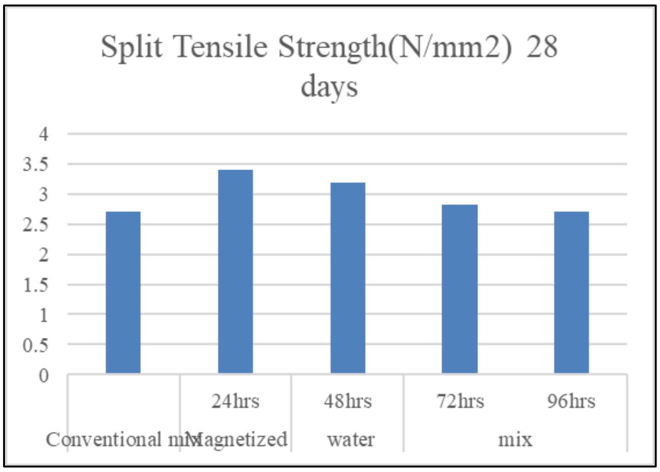


Split tensile strength is the one of the nondestructive test on the hardened concrete. In this experiment to be study n the test is conducted on the specimen with a curing period of 28 days for all the eight mixes.

The table 6.2.4 shows the tensile strength values with the curing period of 28 days and the table 6.2.5.4shows the tensile values with under curing period of 28 days. The combined values for the Table 6.2.4 shows the tensile values under curing period of 28 days of the compressive strength shows for the figure 6.2.4

Types of mix		Split Tensile Strength(N/mm^2) 28 days
Conventional mix		2.7
Magnetized water mix	24hrs	3.4
	48hrs	3.192
	72hrs	2.82
	96hrs	2.7

Table 6.2.4: MW WITH SPLIT TENSILE STRENGTH:

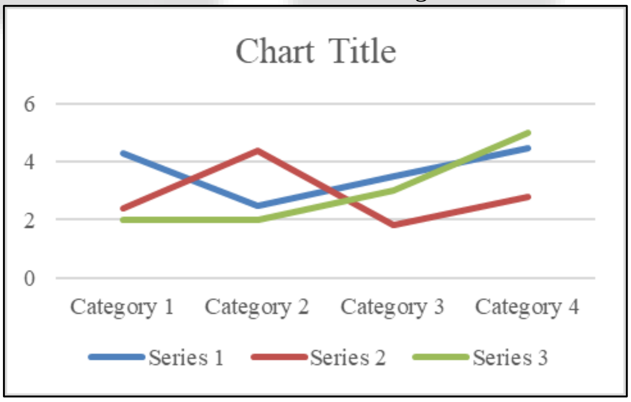


Flexural strength is the one of the nondestructive test on the hardened concrete. In this experiment to be study n the test is conducted on the specimen with a curing period of 28 days for all the eight mixes.

The table 6.2.5 shows the flexural strength values with the curing period of 28 days and the table 6.2.5shows the Flexural values with under curing period of 28 days. The combined values for the Table 6.2.4 shows the flexural values under curing period of 28 days of the compressive strength shows for the figure 6.2.4

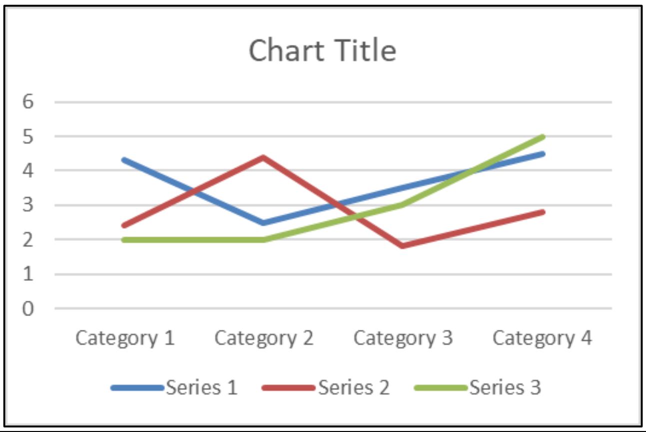
Types of mix		Flexural strength (N/mm^2) 28 days
Conventional mix		5.62
Magnetized water mix	24hrs	3.75
	48hrs	4.2
	72hrs	4.9
	96hrs	5.2

Table 6.2.5: Flexural Strength Test



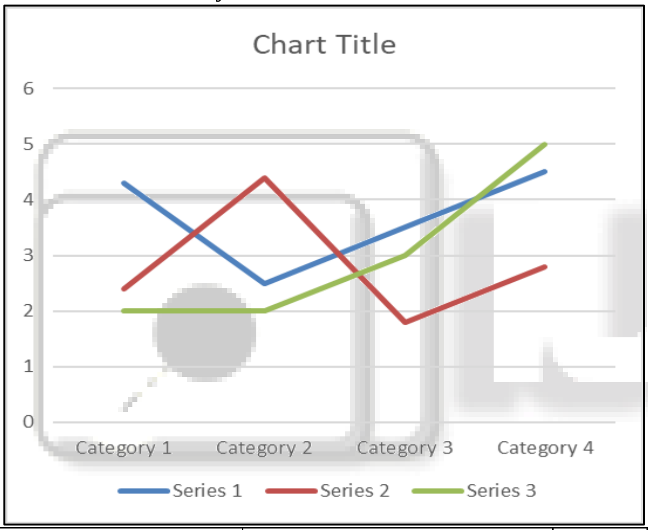
Types of mix		UPV test (N/mm^2)			
		3 days	7 days	28 days	56 days
Magnetized Water and fly ash mix	10%	3922.3	4372.67	4021.1	4213
	20%	4361.5	4471.3	4498	4502
	30%	4472.1	4532.1	4642	4510

Table 6.2.6: Fly Ash with Ultrasonic Pulse Velocity Test



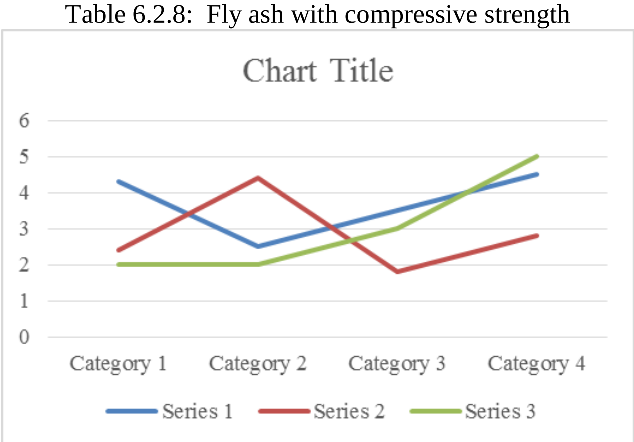
Types of mix		Split Tensile Strength(N/mm^2) 28 days
Magnetized water mix with fly ash	10%	4.1
	20%	4.7
	30%	3.6

Table 6.2.7: Fly Ash with Rebound Hammer Test



Types of mix		Rebound hammer test (N/mm^2)			
		3 days	7 days	28 days	56 days
Magnetized Water and fly ash mix	10%	25.37	28.49	29	30
	20%	25.5	27.3	31	31.2
	30%	24.7	27.5	25.2	32.9

Table 6.2.8: Fly ash with compressive strength



Types of mix		UPV test (N/mm^2)			
		3 days	7 days	28 days	56 days
Magnetized Water and fly ash mix	10%	3922.3	4372.67	4021.1	4213
	20%	4361.5	4471.3	4498	4502
	30%	4472.1	4532.1	4642	4510

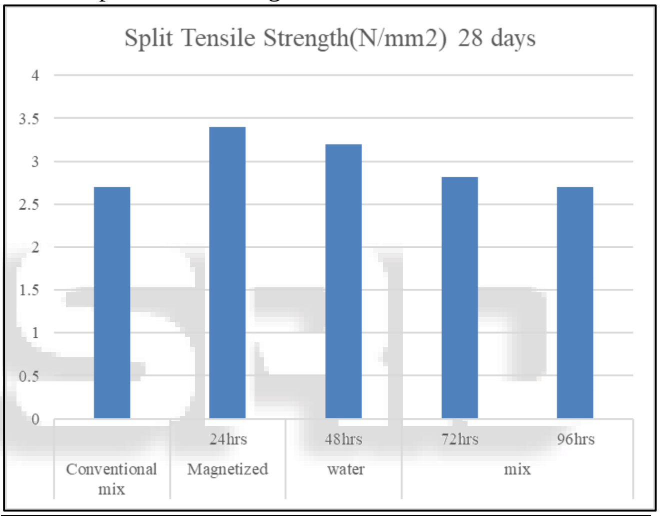
Table 6.2.8: Fly ash with compressive strength

X. SPLIT TENSILE STRENGTH

The results of Split Tensile strength of conventional water and magnetized water of cubes are presented in table and graphical forms. Split Tensile strength values of both conventional water and magnetized water are compared and shown in Figure 6.2

Splitting tensile strength of cylinders of CW and MW concrete(M50) at 28 days are shown in table 6.2.9 and Figure 6.2.9

6.2.9 Split tensile Strength (N/mm2) of cylinders at different periods of curing:



Types of mix		Fly ash Flexural Strength(N/mm^2) 28 days
Magnetized water mixWith fly ash	10%	3.3
	20%	3.8
	30%	4.12

Table 6.2.10: FLY ASH WITH FLEXURAL STRENTH:

XI. CONCLUSION

Based on the test results of the present investigation, the following conclusions are drawn.

1) Compressive Strength of Concrete has increased around 25% more than conventional water Concrete at 28 days of curing and mixed with 72hrs of magnetized water.
2) Split Tensile Strength of Concrete has increased around 25% more than cube compressive strength than conventional water Concrete at 28 days of curing and mixed with 72hrs of magnetized water.
3) Flexural strength of concrete is increased around 25% more than cube compressive strength than normal water concrete at 28 days of curing and mixed with 72hrs of magnetized water.

4) Compressive strength of fly ash has increased around 25% more than conventional water concrete at 28 days of curing and mixed with 72hrs of magnetized water.
5) Split tensile strength of fly ash increased around 25% more than cube compressive strength than conventional water concrete at 28 days of curing and mixed with 72hrs of magnetized water.
6) Flexural strength of concrete is increased around 25% more than conventional water concrete at 28 days of curing and mixed with 72hrs of magnetized water.
7) Decrease the amount of water required as there is break down of clusters of water.
8) Magnetized water has less water consumption compared to conventional water.

XII. Scope for Future Work:

The work can be extended for:
1) To study on high strength of concrete.
2) To study on amount of magnetic field applied on water and fly ash.

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