

Experimental Study on Effect of Magnetized Water in Concrete Mix

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Abstract - In this examine study, the effect of magnetized water on workability and compressive strength of concrete was carried out. The magnetized water was arranged using the magnetic treatment system. In this system permanent ND-FEB Rare earth magnet of N50 grade was cast off. Two different gauss intensity power (1.4 Tesla, 0.8 Tesla) of magnet used. PH value and surface tension of normal water and magnetized water was measured. Three concrete mixes were prepared with different w/c ratio, one with normal tap water and two with magnetized water of 1.4 Tesla and 0.8 Tesla. Comparison of slump and compressive strength test were carried out on all three mixes. Compressive strength test performed at 28 days. Durability test were carried out at 56 days. Results display that the compressive strength of concrete samples mixed with magnetic water is higher than those prepared with normal tap water. It is also created that magnetic water improves the workability of fresh concrete.

Key Words: -Magnetized water, Normal tap water, Ordinary Portland cement, Compressive Strength, Slump test, Durability tests.

1. INTRODUCTION

Concrete is the most normally utilized structure material on the planet. It is assessed that the present utilization of cement on the planet is of the request for 10 billion tones each year. People devour no material aside from water in such enormous amounts.

"Concrete" begins from the Latin action word "cements" which intends to develop together. It is a composite material. Concrete is fake stone made of Portland concrete, coarse totals and fine totals and water. Totals are 65% - 80% of the volume of the solid. Sand, rock and squashed stone are the essential totals utilized. All totals should be basically liberated from residue or natural issue.

Solid discovers applications in establishments and chunks on-ground, dividers, radiates, segments, floors, rooftops, spans, dams, pools, homes, roads, yards, storm cellars, balustrades, plain concrete tiles, mosaic tiles, asphalt blocks,

Krebs, light posts, channel covers, seats asphalt and other foundation.

The primary ecological issues related with concrete creation are utilization of crude materials and energy use just as outflows to air. The key contaminating substances transmitted to air are dust, carbon oxides (CO_x), nitrogen

oxides (NO_x) and Sulfur dioxide (SO₂). Concrete is mix of various materials like restricting material, fine totals, coarse totals and water.

On the off chance that we can diminish the concrete with the material with attractive properties than we can save the characteristic materials and decrease the feelings of CO₂ into the environment. So that, to lessen non-biodegradable and biodegradable squanders of businesses, we utilize this waste as incomplete substitution of solid materials.

2. MATERIAL

2.1 Cement

Ordinary Portland Cement (OPC) is the most widely used cement in the world for producing concrete, mortar, stucco, and non-specialty grouts. Ordinary Portland Cement has 3 grades based on its strength namely 33, 43 and 53 grade that indicates the compressive strength obtained after 28 days of setting.

2.2 Coarse Aggregate

The size of coarse aggregate is used up to 20 mm. The aggregate is important constitute of concrete. The larger size of aggregate affects the thickness of rib.

2.3 Fine Aggregate

The fraction of particles which pass through 4.75 mm sieve and retained on 150 microns is termed as fine aggregate. River sand is use as a fine aggregate. According to particle size the fine aggregate is divided into four zone as per IS: 383(1970). Fine aggregate screened through 4.75 mm sieve to remove larger particles.

2.4 Magnetized Water

Pop Haydn (1849-1910) was a companion of Nikola Tesla and Charles P. Steinmetz, and in 1902, he found a technique for adjusting and organizing water using incredibly ground-breaking electromagnets. We utilize his indistinguishable techniques today to make the most empowered and most effectively absorbable water you will discover anyplace.

Water subsequent to going through an attractive field of certain strength is called attractive field treated water (MFTW) or attractive water. Comparative investigates were additionally directed in Japan, Taiwan affirming that MFTW could improve solid strength expanded 10-19% more than

those blended in with faucet water. Thus, it can save 5% of concrete measurements, seeping of concrete and improve protection from freezing. We as a whole realize that water is a polar substance which will in general be pulled in to one another by hydrogen bonds and structures groups. In attractive field, attractive power can split up water bunches into single particles or more modest ones, hence movement of water is improved. While hydration of concrete particles, the MFTW can enter the center locale of concrete particles all the more without any problem.

Right off the bat, hydration takes on surface of concrete particles. A slim layer of hydration items is in this manner framed on concrete particles, permitting a more complete hydration cycle to happen. Henceforth, hydration can be accomplished all the more effectively which thusly improves solid strength. Other than the expansion in compressive strength, there are additionally different preferences of getting ready cement with attractive water. Right off the bat, it improves strength properties, for example, decrease in water assimilation and porosity at attractive strength of treated water at 1T. Additionally, it doesn't need option of synthetic admixtures to increase compressive strength consequently it evades weather contamination. The charged water can be reserved in a supply for 0-12 h, over its favorable position might be lost Once it leaves the attractive field, its re-visitations of its unique state. This examination too researches the sorptivity attributes on examples contrasted and attractive water and arranged with typical faucet water.

Polarized water has a lower surface tension than standard outlet water, which is estimated utilizing a tool called a tensiometer. This lower surface tension impacts the hydration and solidifying cycle of concrete particles. As the water and concrete blend, the hydration cycle of concrete will firstly happen on the outside of the concrete particles. Thusly a slim layer of hydration items is shaped on the concrete particles, which irritates the further hydration of the concrete particles. The effect of this activity will be to thwart the turn of events of the mechanical strength of the solid. Going the water through a continuous attractive field forestalls the amassing of concrete particles and furthermore makes the water atoms enter all the more effectively into the concrete particles, further building up the hydration cycle of the solid blend. Thusly, the mechanical properties of the solid blend will improve. It has been accounted for that the polarization impact on the customary faucet water can stay for quite a long time or days after the polarization of customary nozzle water. Along these lines, attractive water influences the principal days of the concrete hydration measure.



Fig -1: Magnetized Water

Table 1 Properties of Magnetized Water

Property	1.4 Tesla	0.8 Tesla
PH	9.06	8.75
Density	1000.1 kg/m ³	998.5 kg/m ³
TDS	492	488
Surface tension	22.46 mN/m	46.88 mN/m

3. EXPERIMENTAL WORK

3.1 Mix Design

A standard mix M30 grade was calculated as per (IS 10262-2009). The Concretes were preparing at cementations material.

Table-2: Mix ratio of material for M30 grade

The Mix Proportion then becomes (By Wt.) (Consumption per cubic meter)				
Water	Cement	FA	CA	Total
202.74	460.77	736.92	1005.13	2405.56
0.44	1.00	1.59	2.18	5.21

3.2 Test Procedure

For preparing cube of concrete is done by hand or by machine a batch mixing was used coarse aggregate, fine aggregate, cement, hypo Sludge, silica fume was mixed with $\frac{1}{2}$ of the mixing water for 2 time. After this material is poured in to concrete block mould and pressing it.

3.3 Batch for 1.4 Tesla Magnetized Water

Table 3 Batch for 1.4 Tesla Magnetized Water

Batch Number	Type of Water	Magnetic field (Tesla)	W/C
1	N1	0	0.44
2	M1	1.4	0.44
3	N2	0	0.42
4	M2	1.4	0.42
5	N3	0	0.40
6	M3	1.4	0.40
7	N4	0	0.38
8	M4	1.4	0.38

3.4 Slump test result of 1.4 Tesla Magnetized Water

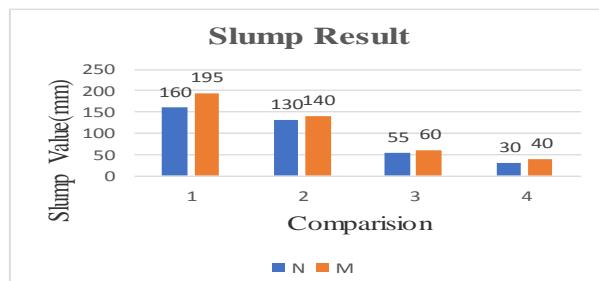


Figure 2 slump test result of 1.4 Tesla Magnetized Water

3.5 Compressive Strength Result of 1.4 Tesla Magnetized Water

The test used for determining the strength of concrete under applied load. The test is done on compression testing machine. It was done as per IS 516-1959. For the cube compression test, the specimens used generally are of two types either cubes of size having 150x150x150mm are used based on the consideration of the aggregate size.

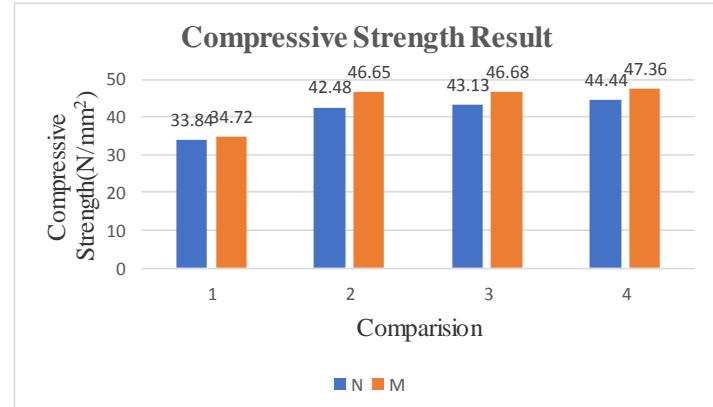


Figure 3 Compressive Strength @28 days

3.6 Acid Attack Test (HCL) Result for M30 Grade of 1.4 Tesla Magnetized Water

Concrete cube of size 150x150x150 mm is prepared for various percentages of Hypo sludge & Silica Fume addition. After that the specimens are casted and cured in mould for 24 hours. After 24 hours, all the specimens are demolded and kept in curing tank for 7 days. After that the specimens are weighed and immersed in 3.33% hydrochloric acid (HCL) solution for 28 days. The pH value of the acidic media was at 0.3. The pH value was periodically checked and maintained at 0.3. After 28 days of immersing, the specimens are taken out and kept in atmosphere for 2 days for constant weight. After that the specimens are weighed the change in compressive strength.

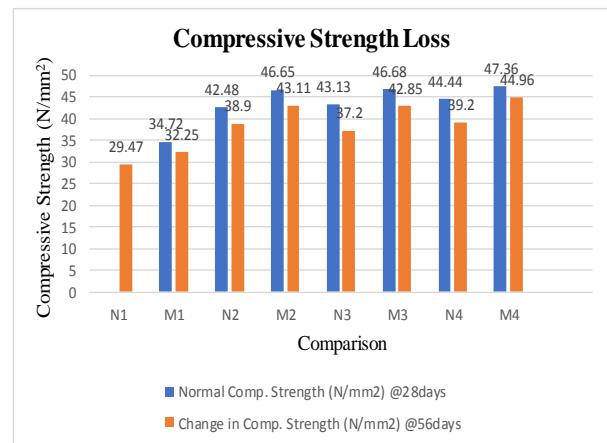


Figure 4 Compressive Strength loss of cube at @28 Days

3.7 Resistance Against Sulphate Attack (Na₂SO₄) for M30 grade

Concrete cube of size 150x150x150 mm is prepared for various percentages of Hypo Sludge & Silica Fume addition. After that the Specimen are casted and curing in mould. After 24 hours all the specimens are demoulded and kept in tank for 7 days curing. After 7 days all specimen is kept in atmosphere for 2 days for constant weight, subsequently, the specimens are weighed and immersed in 5% sodium sulphate

(Na_2SO_4) solution for 28 days. After 28 days of immersing, the specimens are taken out and washed in running water and kept in atmosphere for 2 days. After that specimens are weighted check the change in compressive strength.

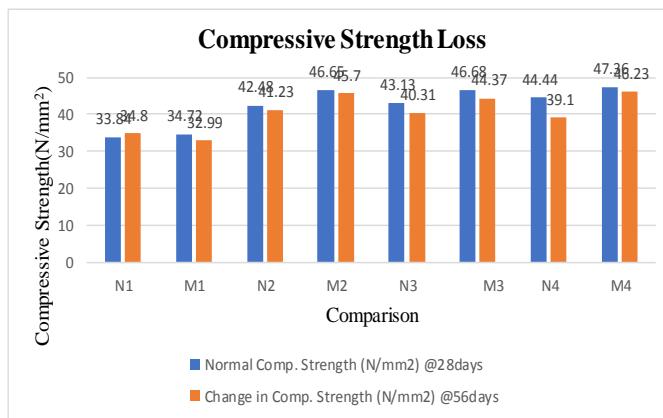


Figure 5 Loss of Compressive Strength N/mm^2 at 28 Days

4. CONCLUSION

The Compressive strength of Cubes are increased 10% by use of magnetized water instead of Normal water in concrete mix. With Increment of Magnetic Field, the Strength of Concrete Increase. Magnetic Field Decrease the Surface Tension of Water Tends to Better Hydration Process. Magnetized Water Improve the Slump. Achieved Good Durability of Concrete.

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BOOK:

Shetty M.S "Concrete Technology-Theory and practice.

IS Code:

IS 456-2000 Plain and Reinforced Concrete.

IS 383: 2016 Coarse and Fine Aggregate for Concrete - Specification required.

IS 10262 – 2009 Concrete Mix Design Procedure.