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MAGNETIC WATER IN CONSTRUCTION

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Abstract - The most important challenge of the construction industry is to extend the life of the project / work. This is possible by improving the quality of materials like steel bars, cement etc. But in this project, we focus specifically on concrete, what are the possible ways to enhance the properties of concrete. In the last decades, Russia and China have discovered new technology called magnetic water technology. This technology is used in construction industry. Magnetic water was created using circular magnets. The water that passes through the magnetic field is called magnetic water.

In this magnetic water technology, a mechanism was developed to process magnetic water and using it on water ions to pass water through a magnetic field to check the effect of magnetic water on concrete parameters and change the physical properties of the tendency. And as a result of such changes, the number of water clusters is reduced from 13 to 5, which reduces the water surface tension with the improved strength of concrete. The benefits of using magnetic water in curing have been found in recent studies. This research study studied the effect of magnetic water on the Compressive strength and performance of concrete to achieve strength with high resistance at low cost. This data has been collected from previous studies and research

Key Words: Magnetic water, Magnetic technology, Magnetic field, compressive strength, workability, water quality.

1. INTRODUCTION

As you know water is a limited resource, so it must be used effectively. This can be done by using magnetic water. What is magnetic water? Magnetic water is water passing through a magnetic field. It is an inexpensive, eco-friendly water treatment that has a small installation fee and does not require energy. The effect of magnetism on water is a matter of controversy. Improving the properties of concrete is one of the most important challenges for concrete technicians. The goal is to increase the compressive strength of concrete and to obtain a more efficient concrete with a lower water content, which most researchers are looking for using a variety of methods.[7] The cost of these methods cannot be compared with their advantages. Therefore, it is necessary to focus on making economical concrete with high strength. Water is an important component of concrete as it is actively involved in chemical reactions with cement. As it helps in formation, it is necessary to carefully consider the strength cement gel, water quantity and quality. Compressive strength can be improved by using magnetic water and more efficient concrete can be obtained by reducing the amount of water and further cost[1]. A magnetic water treatment device has a powerful magnet which is a source of magnetic energy. This powerful magnet is fixed in a small tube with such high technology that can create a magnetic field reaching a high rate of about 12000 Gauss.[4]

2. MATERIALS

Cement: 53-Grade ordinary Portland cement (Chettinad cement) with specific gravity of 3.14 and 28-days compressive strength of 54.7 N/mm2.

Fine Aggregate: Sand collect from nearby local supplier is used as a fine aggregate is passed through the sieve of 4.75 mm. IS: 383(1970) is followed for fine aggregate.

Coarse Aggregate: Crushed coarse aggregates with nominal sizes of 10mm and 20mm maximum size obtained from the local crushing plants.

Table -1: The physical properties of aggregate were tested in accordance with IS:2386.

Test	Fine Agg.	Coarse Agg. (10mm)	Coarse Agg. (20mm)
Specific Gravity	2.72	2.94	2.94
%Water absorption	3.23	1.08	1.05

Mixing Proportion: The mix design was completes following 10262:2009. It is recommended that concrete of M30 grade has a mean strength of 38.25 N/mm^2. The water cement ratio is 0.45.

Table-2: Concrete mixing proportion for $1m^3$

Materials	Cement	Fine Agg.	Coarse Agg. (10mm)	Coarse Agg. (20mm)	Water
Quantity (Kg/m^3)	380	855	571	571	164

3. METHODOLOGY

For preparation of model: we made such an arrangement so that water can be recalculated which is used for casting and curing process. We have used a high-power circular magnet that can produce the magnetic field for around 12000 Gauss. This high-power magnet is fitted in cylindrical pipe with half inch's diameter inlet and outlet facility. Magnets are placed in such a way that to form a magnetic field with north and south pole.[10]

For the preparation of magnetic water: we have fitted the inlet of electromagnet magnet instrument to the outlet of matter motor. Motor pump is used to recirculate the water through the magnetic field. 1 HP motor pump is used for pumping the water with the velocity of 0.7 m/s throughout the pipe. The magnetized water will be used for mixing. For curing, the inlet of water motor and outlet of model is made to receive and collect magnetized water in curing tank respectively, the process of recirculation of water through model is opting for two hours each day.[10]

For Hardness Test: Primarily we conducted hardness test on normal water sample. Then the same test was conducted on magnetized water sample for the comparison between both samples.

For workability of concrete: we conducted slump cone test and compaction factor test on concrete mix using normal water, then the same test was conducted on concrete mixes using magnetized water for finding the difference between workability of both concrete mixes.

For Compressive strength test: To test the compressive strength and to compare the effect of magnetized water on compressive strength of concrete. The casting and curing of concrete cube are done in 4 different conditions and the cubes were taken to compression test for 7,14 and 28 days.

1) 9 cubes Cast in Normal water and cured in normal water (NWNW).
2) 9cubes cast in normal water and cured in magnetic water (NWMW).
3) 9cubes in magnetic water and cure in normal water (MWNW).
4) 9 cubes cast in magnetized water and cure in magnetized water (MWMW).

4. TEST OBSERVATIONS:

i. Hardness Test:

a) Sample (A) =Total Hardness of Normal Water is 182.78 mg/l as CaCo3.
b) Sample (B)= Total Hardness of Magnetic Water is 144.54 mg/l as CaCo3.

ii. Workability Test:

a) Slump Cone Test:

1) Sample(A) The Slump cone mix prepared by Normal Water =1.7cm
2) Sample (B) The Slump cone mix prepared by Magnetic Water =2.3cm

b) Compacting Factor Test:

1) The compacting factor of Mix prepared by Normal Water =93%.
2) The compacting factor of Mix prepared by Magnetic Water =93.28%.

iii. Compressive Strength Test

The average compressive strength of concrete cube under following different condition is us follows and also shown in table no.6

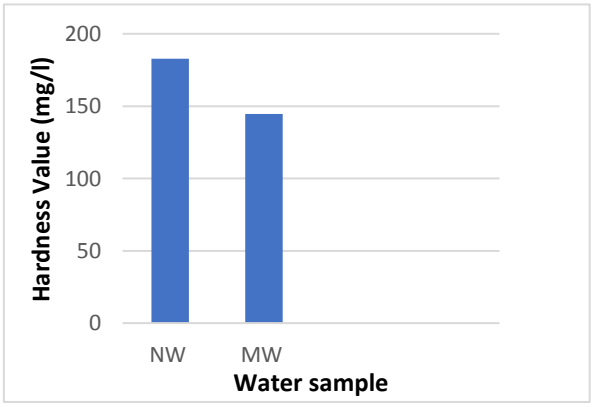
(A) Cast in Normal water and cured in Normal water = 38.95 N/mm^2
(B) Cast in Normal water and cured in Magnetic water= 41.25 N/mm^2
(C) Cast in Magnetic water and cured in Normal water= 43.07 N/mm^2
(D) Cast in Magnetic water and cured in Magnetic water = 44.69 N/mm^2

5. RESULT

i. Hardness Test:

Table -3: Observation table for Normal Water & Magnetic Water

Sample	Description of sample	X ml	Y ml	Z ml	Total Hardness(mg/l)
A	Normal Water	6.8	3.1	11.2	182.78
B	Magnetic Water	7.8	3.5	15.4	144.51



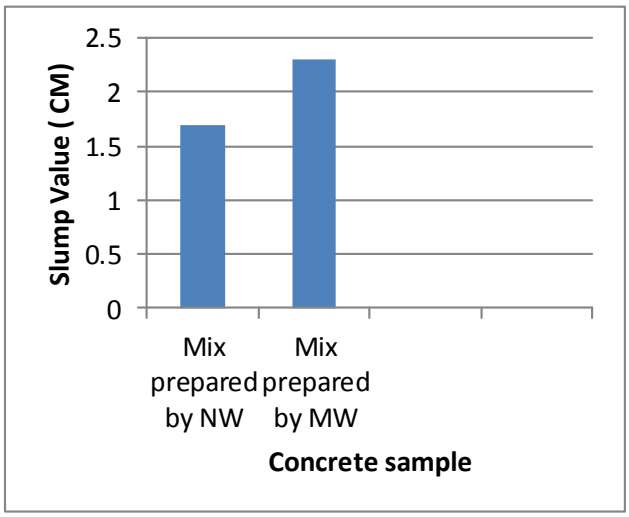
Graph-1: Variation in Hardness value for Normal water sample and Magnetic water sample

ii. WARKABILITY TEST:

a) SLUMP CONE TEST

Table-4 Test results of slump cone in cm.

Concrete mix	Normal Water	Magnetic Water
Slump Cone	1.7 cm	2.3 cm

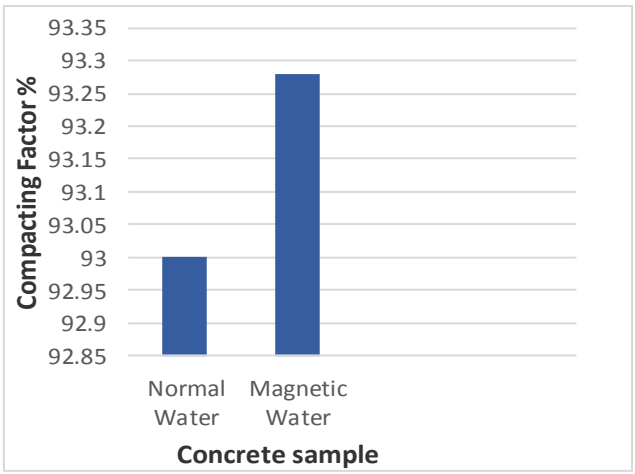


Graph -2 Variation in slump cone for mix with magnetic water and normal water.

a) COMPACTING FACTOR TEST:

Table-5 Test result of Compacting Factor Test

Concrete mix	Normal Water	Magnetic Water
Compacting Factor	93.%	93.28%

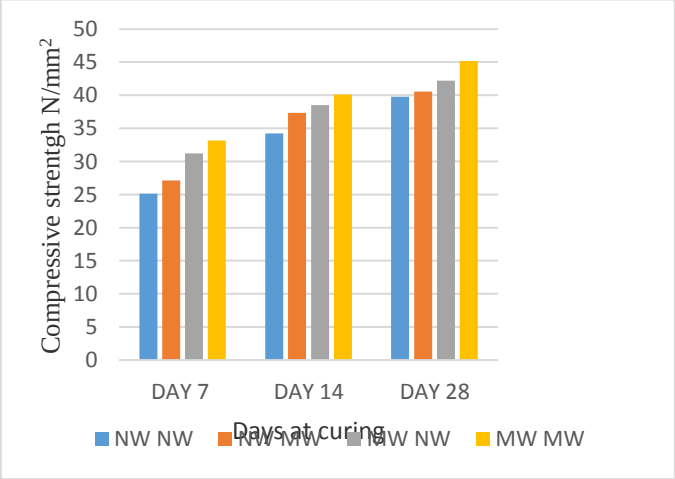


Graph -3 Variation in compacting factor for mix with magnetic water and normal water.

iii. COMPRESSIVE STRENGTH TEST:

Table-6 Test result of compressive strength of concrete cube at 7,14 & 28 days.

Casting	Normal Water	Normal Water	Magnetic water	Magnetic water
Curing	Normal Water	Magnetic water	Normal Water	Magnetic water
Days	Strength N/mm2	Strength N/mm2	Strength N/mm2	Strength N/mm2
7	25.14	27.15	31.2	33.16
14	34.22	37.33	38.5	40.11
28	39.77	40.55	42.19	45.19
Total	99.13	105.03	111.89	118.46
Average	33.02	35.01	37.29	39.48



Graph-7 Combine result of Compressive Strength at 7,14 & 28 days.

6. ADVANTAGES:

i. Magnetized water helps in curing of concrete at early age

ii. Magnetic water reduces hardness of water.

iii. Increases compressive strength and workability of concrete.

iv. Heat of hydration increases in concrete. Increases in amount of slump in concrete.

v. Initial and Final setting time of concrete decreases.

7. APPLICATIONS:

i. Magnetized water can be used for agriculture purpose.

ii. Use in fish farming worldwide.

iii. Magnetized water helps in improvement of soil in geo-industry.

iv. Magnetized water can be used in construction.

Magnetized water is even used in pharmaceutical industry

8. CONCLUSION:

Magnetized water has less hardness as compared to normal water sample.

As the slump concrete mix is prepared by magnetic water increase as compare to concrete mix prepared by normal water with same water content in both mixes, we can conclude that the workability of concrete going to be improved by approximately 22%.

In comparison with concrete cast in normal and cured in normal water sufficient increases the compressive strength of concrete is observed when magnetic water is used in either in casting or curing or for both. Increase in compressive strength when

1.Cast in Normal water and cured in Magnetized water is 5.73%.

2.Cast in Magnetized water and cured in Normal water is 10.04%.

3.Cast in Magnetized water and cured in Magnetized water is 13.72%.

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