"AN EXPERIMENTAL STUDY ON USE OF MAGNETIZED WATER IN CONCRETE"

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Abstract: The strength and adaptability of concrete are significantly impacted by water during preparation. It the past investigated to increase the efficiency and strength of concrete by using magnetised water, a novel technique with potential in a variety of industries, including agriculture and health care. This study uses M sand as the fine aggregate to examine how magnetised water affects the quality, power, and suitability for M30 grade concrete. normal tap water is transformed into magnetised water by being exposed an electromagnetic field,changing some of the water's physical characteristics. Water activity is increased when water clusters are broken up by an electric field.
Magnetised water was used in this investigation for both mixing and curing concrete. Four mixtures were evaluated, and the findings show that the mixture

Keywords: Magnetized water, water activity, compressive strength, tensile strength.

1. INTRODUCTION

A composite material is concrete which composed of coarse aggregate bonded together with cement paste that hardens over time. When aggregate is mixed with dry Portland cement and water the mixture forms fluid slurry which can be easily poured and molded into shape. The cement reacts chemically with the water and other ingredients andform a hard matrix which binds the materials together. Sometimes additives like pozzolans or super plasticizers are added in the mixture to improve the physical properties of the finished material.

Water is the key ingredient in concrete for the different process including hydration process, proper curing etc. When water mixed with cement which forms a paste which binds the aggregate. Water causes the hardening of concrete by the process known as hydration. water consumption is increasing as the global population grows and human needs expand. Water consumption in agricultural sector is around 70% and in industrial sectorit is 20%.

Over one billion metric tonnes of water are required yearly for the manufacturing of concrete, which is a large quantity. Utilising magnetised concrete with water mixes is one new technique that has arisen to enhance the compressive strength and workability of concrete. By encouraging less porosity and more density, this creative technique has shown that it enhances compressive strength of concrete.

The introducing magnetised water technology has witnessed a rapid increase, particularly in the 1980s and 1990s, to the development of magnetic devices and their influence on concrete properties. The characteristics of magnetised water's mechanics concrete have found applications in various civil and military construction projects, including airports and jetties. Researchers have focused on producing cost-effective concrete with improved strength by incorporating magnetic water treatment into the design process.

When normal water pass through a magnetic field, certain physical attributes of the water are altered .The quantity of molecules in the water clusters decreases, typically decreasing to 6 or 5 molecules per cluster. In surface tension, lowered as a result of this reduction, and the percentage of molecules that contribute to the hydration process.

In magnetically treated water, the water molecules lose their attractive and repulsive forces and become oriented towards a magnetic pole or electric charge. Neutralized water molecules are easily attracted to the numerous electrostatic fields naturally present in cement grains. As a result, the hydration of cement occurs more rapidly and thoroughly when magnetically treated it uses water.

concrete made with magnetised water production offers the potential for faster and more complete hydration of cement. This can lead to enhanced concrete properties and improved performance. The development of economical concrete with higher strength has been a focus of research efforts, and the employing of magnetically treated water has emerged as a promising approach in achieving this objective.

MAGNETIZED WATER

Water becomes magnetised as it passes through a magnetic field. The technique and water quality employed determine the level of magnetization. After magnetization, the structure of water aligns in one direction, and changes in bond angles cause the sizes of water molecules to vary. This causes a rise in viscosity and surface area, which speeds up the hydration process.

When water is subjected to a static magnetic field, the hydrogen bonds within the water molecules are broken, leading to the formation of stronger hydrogen bonds and higher viscosity. Figure 1.1 illustrates the arrangement of water molecules at normal temperature, where they tend to form clusters through hydrogen bonds. However, when a magnetic field is applied (as depicted in Figure 1.2), these clusters are disrupted, increasing the water activity.

Magnetized the molecules of water smaller in size, which means that the water layer surrounding cement particles is thinner compared to normal water molecules. As a result, magnetized water requires less water content in concrete mixes, leading to positive effects of the attributes of hard concrete

Fig no. 1-Water molecules arrangement after & before magnetization

OBJECTIVES

- To produce economical concrete of required strength.
- To eliminate the plasticizers.
- To understand the magnetic water concrete (MWC) & its characteristics in form of workability & strength aspects.
- To compare the tensile and compressive strength of normal water concrete (NWC) & magnetized water concrete (MWC) for required grade that is concrete mix.

2. METHODOLOGY & MATERIALS

It seems like you have provided a description of a setup for magnetizing water for the preparation of concrete. The setup includes a submersible pump, magnets, and PVC pipes. The process involves recirculating the water by means of the magnetic field created by the magnets.

Here's a summary of the setup and process you've described:

Setup: The setup consists of a submersible pump with a capacity of 1000 liters per hour, magnets, and PVC pipes. The magnets are placed at both the inlet and outlet of the PVC pipe to create an electric current. The magnets are arranged to form an electric field with north and south poles. The length of each magnet used is 5cm, and there are the sum of 10 magnets.

Water circulation: The submersible pump is used to recirculate the water through the magnetic field. The water is pumped from a tank or source and flows through the PVC pipe, traversing the magnetic field created by the magnets. The recirculation of water is done for a specific duration.

Magnetizing process: The purpose of recirculating the water by means of the magnetic field s to magnetize it. The field of magnetism generated by the magnets interacts with the water molecules, potentially altering their properties. This magnetized water is then used in the preparation of concrete.

Recirculation duration: You mentioned that the circulation of water is done for 2 and 4 hours alternately. It suggests that there are water recalculated by means of the magnetic field for a certain duration, and this process is repeated alternately for 2 hours and 4 hours.

Remember that the effectiveness and benefits of magnetized water for concrete preparation may vary, and there might be different opinions and research findings on this topic.

For blending, magnetised water is utilised. of concrete. Following tests are conducted onMagnetized water.

- PH of water
- Alkalinity test
- Viscosity test

Experimental program

The experimental procedure consist method putting fundamental materials through scientific testing the design mix is worked out by IS code method using basic materials test results, & then the developed ratio is taken as a mix ratio. All the mixers developed are studied & tested for both fresh & harden properties.

Mix design

Design of concrete mix id procedure of selecting the suitable ingredients of concrete & their relatives proportion with an objective to prepare concrete of certain minimum strength , desired workability & durability as economically as possible.

Specimen preparation

For experimental research cubes of size 150x150x150 mm is used for compression test. Cylinder of 150x300mm used for tensile test. The specimen are prepared & cured in normal water.

Materials requirement

1. **Cement :-** Ordinary Portland Cement of 43 grade Ultra tech brand as used during the study.

Fig no. 2 – cement

2. **Fine Aggregate:** The M sand is after traversing the 4.75mm IS sieve is used during the study.

Fig no. 3 – fine aggregate

3. **Coarse Aggregate:** The consider of coarse aggregate Throughout the study is 20mm down size crushed granite stone which is obtained from the locally available quarry.

Fig no.4 – coarse aggregate

4. **Water: -** using of normal water & magnetize water.

5. **Magnetized water: -** When The magnetic field is passed through by the water the water gets demagnetizingproperty called magnetized water.

Fig no. 5 – magnetized water

Mix proportion.

- M25:1:1.68:2.28
- WATER CEMENT RATIO : 0.45

Cement	Fine aggregate	Coarse aggregate	w/c ratio
437.7kg	737.79kg	996.68kg	0.45
1	1.68	2.28	0.45

3. RESULTS & DISCUSSION

Features of water

Water properties @ 2 hrs of magnetization

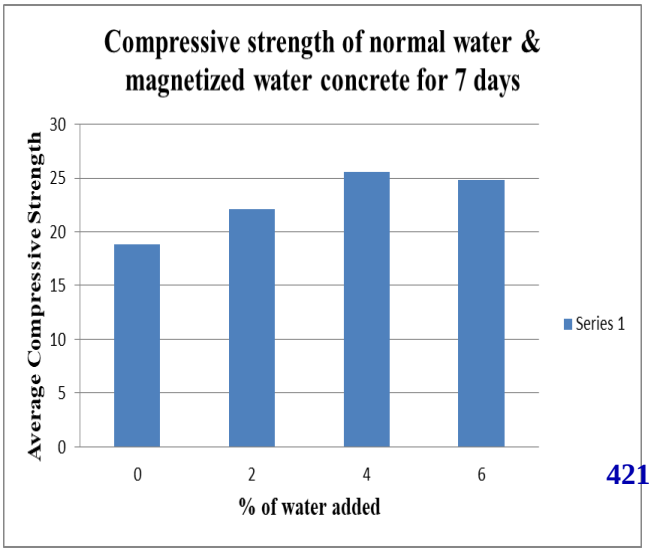
Parameters (mg/lit)	Tap water	Magnetic water	Permissible value as per code IS 3025
pH	6.93	7.88	9
Alkalinity (ppm)	200	300	
Acidity (ppm)	147	84	1500 to 2000
Viscosity (poise)	0.378	0.628	-

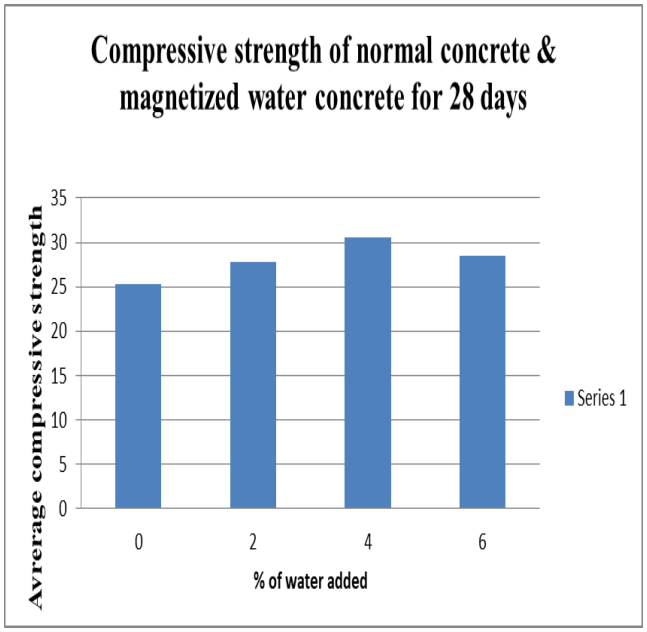
Compressive test results

Table 1:- Test result

Sl.No.	Percentage of magnetized water added	Compressive strength test results(7 days)	Compressive strength test results(28 days)
1	0% (normal water)	18.82	25.29
2	2 %	22.11	27.84
3	4 %	25.55	30.51
4	6 %	24.77	28.53

Graph 1; - for 7 & 28 days of compressive test





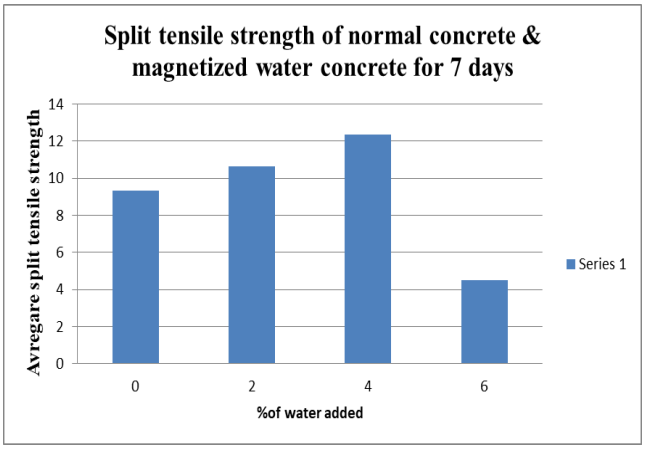
1) The test results have indicated that use of magnetized water in concrete has led to the strength of compression increasing compare to normal water.
2) Concrete samples that utilized magnetized water for a duration of 4 hours exhibited high compressive strength values compare to those using normal water.
3) Based on the aforementioned findings, the average compressive strength value for concrete utilizing magnetized water, with a concentration of 4%, after 7 days of curing was measured at 25.55 N/mm2.
4) The study's overall findings indicated that using a concentration of 4% magnetised water increased concrete's compressive strength by a considerable 19% after 28 days of curing.

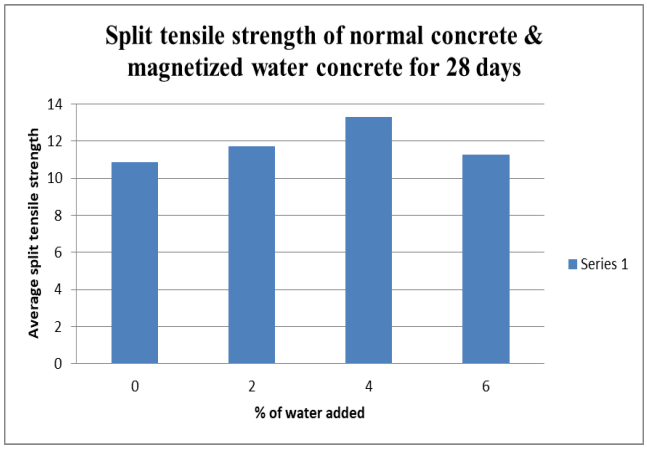
Split tensile test results

Table 2:- Test result

Sl.No.	Percentage of magnetized water added	Split tensile test results(7 days)	Split tensile test results (28 days)
1	0% (normal water)	9.33	10.88
2	2 %	10.66	11.73
3	4 %	12.35	13.32
4	6 %	9.98	11.28

Graph 1; - for 7 & 28 days of split tensile test





1) According to test results, using magnetised water in concrete increased the material's tensile strength in comparison to using regular water.
2) Concrete samples that utilized magnetized water for duration of 4 hours exhibited a higher value of tensile strength compared to those using normal water.
3) The obtained results, the average value of tensile strength for concrete utilizing magnetized water, with concentration of 4%, curing after 28 days measured at 13.28 N/mm2.
4) Overall, the study demonstrated an 8.6% increment in tensile strength of the concrete 28 days after the cure when utilizing a concentration of 4% magnetized water.

CONCLUSION

When preparing concrete, magnetised water can be used in place of regular water to produce concrete that is stronger. When compared to regular concrete, the use of magnetised water has demonstrated benefits in both compressive and tensile strength.

1. The material properties were thoroughly tested, and the results obtained supported the positive effects of using concrete filled with magnetised water.
2. The rules indicated by the applicable Indian Standard (IS) were followed in the mix design for the concrete. M sand, a fine aggregate, was utilised in the mix design.
3. The workability of the concrete mix was improved by the addition of magnetised water. The concrete is easier to mix, place, and compact during construction because to the improvement in workability.
4. In comparison to conventionally compacting concrete, concrete mixes that contain magnetised water have higher compressive and tensile strengths. This suggests that the concrete's overall strength and durability were enhanced by the magnetised water.
5. Compressive strength significantly increased in specimens combined and cured with magnetised water, with a 19% improvement seen after 28 days of curing. This demonstrates that magnetised water promotes long-term strength increase in addition to early strength development.
6. The use of magnetized water in concrete mixing also led to an increase in tensile strength after 28 days. This suggests that the concrete mixed with magnetized water has improved resistance to cracking under tension, enhancing its overall durability.
7. The optimum proportion of the concrete mix contains magnetised water. was determined to be 4%. This proportion resulted in the highest performance in terms of both compressive and tensile strength. It is recommended to use this proportion for the best results.

These conclusions highlight the potential benefits of incorporating concrete with magnetic water preparation, including increased strength, improved workability, and enhanced durability. However, it's important to note that further research and testing may be required to validate these findings in different contexts and applications.

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