

# Effect of Magnetic Field Treated Water on Compressive Strength of Concrete

Aakash Laad<sup>1</sup> Arihant Jain<sup>2</sup> Kirti Chitrarth Singh<sup>3</sup>

<sup>1,2,3</sup>U.G Student

<sup>1,2,3</sup>Department of Civil Engineering

<sup>1,2,3</sup>Jaypee University of Engineering & Technology, A.B. Road, Guna, Madhya Pradesh, India

**Abstract**— This project investigates on compressive strength of unconventional concrete prepared with magnetic field treated water (MFTW). MFTW was prepared by passing water through magnetic field generated using electromagnets. The main objective of this research is to reduce the cement content in concrete. The test are conducted on samples prepared with different magnetic strength of treated water. Results show that the compressive strength of prepared samples with MFTW is higher than those prepared with normal tap water. The significant increase in compressive strength is observed in early days.

**Key words:** Compressive Strength, Magnetic Field Treated Water, Concrete Mix

## I. INTRODUCTION

This research investigates the compressive strength of unconventional concrete mix design where normal tap water is replaced by magnetic field treated water (MFTW). The aim of this paper is to prepare higher strength concrete in an economical way.

Water after passing through magnetic field of certain strength is called magnetic field treated water. Similar research were also conducted in Taiwan conforming that MFTW could improve compressive strength, also increase its workability, accelerate the hydration reaction and improve its impermeability and freeze-thaw resistance[1, 2]. There are some other advantages of preparing concrete with MFTW. First, it reduce the amount of cement used. Moreover, it does not require any chemical admixture. Thus, it avoid any environmental pollution. The reason why the MFTW can increase the compressive strength of concrete can be explained by molecular structure of water. Water is a polar substance which tends to be attracted to each other by hydrogen bonding and form clusters. In magnetic field, magnetic force can break apart water clusters into smaller ones. Therefore, the activity of water is improved. Hence, the hydration can be done more efficiently which in turn improve concrete strength. As magnetised water molecules are rather dispersed or small clusters, they can easily penetrate the hydration layer and rate is increased and more complete.

## II. MATERIAL USED

### A. Cement

For this present investigation 43 Grade Ordinary Portland cement of specific gravity 3.15 and manufactured by ACC Cement Company is used.

### B. Coarse Aggregate

Crushed granite stone aggregate of maximum size 20 mm conforming to IS 383-1970 was used in this investigation.

The specific gravity was found to be 2.65 for 20 mm size of particles.

### C. Fine Aggregate (Sand)

The fine aggregate used in this investigation was obtained by passing it through 4.75mm sieve with has specific gravity of 2.63. The grading zone of fine aggregate was zone II as per Indian standard specification.

### D. Water

Ordinary clean portable water free from suspended particles and chemical substances was used for both preparation of MFTW and curing of cube was done with fresh water.

## III. METHODOLOGY

### A. Preparation of Magnetic Water

Water is a polar substance which tends to be attracted to each other by hydrogen bonding and form clusters. In general, these clusters contain about 100 water molecules at room temperature. In a magnetic field, magnetic force can break apart water clusters into single molecules or smaller ones. Therefore, the activity of water is improved and this water is known as magnetic water. Magnetic water was prepared by passing it through magnetic field of strength of 0.8Tesla, 0.9Tesla and 1.0Tesla. Water is circulated in the plastic straws through magnetic field generated by electromagnets in the laboratory. Other parts used in building up the setup were 9V toy motor, propeller, connecting wires, plastic straws.



Fig. 1: Electromagnets

### B. Mix Composition

In the present investigation work on M30 Grade of concrete mix trials were done on material. The Indian standard mix design procedure is adopted conforming to IS 10262:2009 to arrive the mix proportion for M30 Grade of concrete. The detailed mix design procedure of M30 Grade of concrete is given Table 1.

Material	Quantity in Kg
Cement	413.33
Sand	664.67
20mm Aggregates	684.15

10mm Aggregates	456.1
Water	186

Table 1: Trial mix proportion for 1m<sup>3</sup> of concrete

C. Preparation of Test Specimen

To investigate the effect of magnetic water on the compressive strength of the concrete cubes of size 150x150x150 mm was used. When the concrete was properly mixed using the magnetic water, the concrete cubes mould were filled to one third of their height and compacted 25 times. The cube mould were later filled by one third of their height and finally filled completely.

D. Experimental Variables

- 1) Magnetic field strength: Tap water is magnetized by flowing through the magnetic field of 0.8 Tesla, 0.9 Tesla, and 1 Tesla, while 0Tesla denotes tap water.
- 2) Age: All samples are cured under water for 7 and 28 days respectively before the test are perform.

IV. RESULTS

A. Compressive Strength

Magnetic Strength of Treated water	Compressive Strength (MPa)	
	7 Days	28 Days
0 Tesla	18.67	33.16
0.8 Tesla	20.1	34.20
0.9 Tesla	22.05	34.43
1.0 Tesla	22.23	35.91

Table 2: Compressive strength of concrete

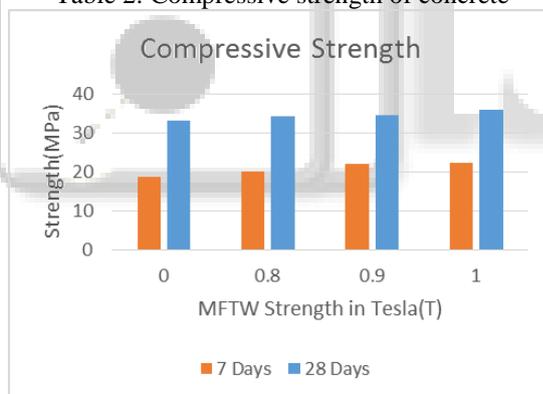


Fig. 2: Strength variation of sample with strength of MFTW

V. CONCLUSION

The results show that the compressive strength of concrete increase with the use of MFTW in preparation of concrete as compared to normal tap water because the hydration rate increases as more water molecule are available for the reaction with cement particles due to the breaking of bigger water clusters into smaller ones. This increase of strength helps in reducing the dosage of cement in concrete.

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