

# Effect of Magnetic Water in Strength of Concrete

N. Muthu Prakash<sup>1</sup>, S.Aravindhan<sup>2</sup>, G.Dinesh<sup>3</sup>, P.Sachithanathan<sup>4</sup>, R.Kalaimani<sup>5</sup>  
<sup>1,2,3,4</sup> Final Year Students & <sup>5</sup>Assistant Professor

Department of civil Engineering, Ramco Institute of Technology , Rajapalyam, T.N , India

## Abstract

Concrete is the most widely used man-made building material on the planet. The reaction of OPC with water results in hydration process, which glue the reacting cement particles together to form a hardened cement paste. When cement & water are mixed with sand and coarse aggregate the resulting product is called concrete. Till now potable water is used for mixing different ingredients of concrete. Here we involves the investigation of influence of magnetic water on the workability and compressive strength of concrete. The water is initially magnetized with the help of magnet and also we magnetize the primary treated dye waste water. Both the physical and chemical properties of water is to be studied. The main scope of the study is to improve the qualities of water as per standards and reduce the water cement ratio thereby reducing the consumption of cement conten . Results show that the compressive strength of concrete samples mixed with magnetic water is higher than those prepared with normal tap water.

**Keywords** - Hydration process, magnetic water, treated dye waste water, workability and compressive strength.

## I. INTRODUCTION

Construction field became the second large user of portable water next to agriculture. Water consumption is raising as the population and human needs grows. In construction field the portable water is used in concrete for mixing, curing and highly helpful in the hydration process. Hence the portable water become scarce for the human's basic needs. By making use of treated industrial waste water (dye industry) we can save the ordinary portable water for casting concrete. By treating the primarily treated industrial waste water in the magnetic field, the waste water came in the standard limit of water used for concrete. By treating the water in the magnetic field, the water clusters will break apart into single molecules or smaller ones by the magnetic force. Thus the magnetically treated water will effectively participate in the hydration process than the normal water. Due to effective hydration process, the compressive strength of the cube using magnetic water shows greater value than the nominal cube.it also shows good workability than the nominal water

when checked using their slump cone. Reduction of cement content can also be possible by using the magnetic water. By using the magnetized water there is a promising potential in saving water amount used in concrete construction. Thus it will helpful in environmental issue also.

## II. EXPERIMENTAL STUDY

### A. Overview

For the investigation of magnetic water on concrete strength, M30 concrete is casted in the ratio of 1:1.5:2.79. The water cement ratio is taken as 0.45 which is recommended by IS 10262-2009. This paper is mainly focused on the compressive strength of the concrete when magnetized water and magnetized treated industrial waste water are used.

### B. Materials

The cement used is Portland pozzolana cement produced by Ramco cements. Crushed locally available hard basalt stone of maximum size of 20mm is used as coarse aggregate. The fine aggregate used is manufactured sand which passes through the 4.75mm. The grading zone of fine aggregate was zone III as per Indian standard .

### C. Preparation of Magnetic Water

The Magnetic water means the water which is treated in the magnetic field. Here, the magnetic water is prepared by placing 1 litre of water in a glass beaker above 1T magnet for a period of 24 hours. While placing the water over magnet, magnetic field passes through the water and it gets magnetized.



Figure1. Magnetizing Normal Water

**D. Preparation of magnetized treated industrial waste water**

The industrial waste water (dye industry) is primarily treated using the activated carbon (rice husk). The activated carbon (rice husk) is prepared by heating the rice husk at high temperature. The industrial waste water is filtered using this activated carbon. Then the treated industrial water is magnetized using the 1T magnet for the period of 24 hours.



Figure 2. Filtration of Industrial Waste Water

**E. Mix Proportion**

For the study, the concrete of grade M30 is used. The detailed mix design procedure M30 grade of concrete is given in Table 1

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

Material	Quantity in kg
Cement	425.73
Fine aggregate	693
Coarse aggregate	1186
Water	198.58

**III. RESULTS AND DISCUSSIONS**

**A. chemical properties of water**

The pH value of the various water sample is tested in the chemistry laboratory and the results are shown in table 2

Table 2. pH value of the various sample

Sample	Before magnetize	After magnetize
Normal water	9.23	7.94
10% replacement*	9.23	8.2
20% replacement*	9.23	8.54
30% replacement*	9.23	8.82
Treated dye water	9.43	8.3

\*- replacement of magnetic water with the normal tap water.

**B. Slump**

Figure 3 shows the workability of the concrete mixed with the various water sample. From the result it is concluded that magnetized water achieved the slump value of the nominal concrete in the reduced W/C ratio itself. By we can also reduce the cement content when magnetized water is used.

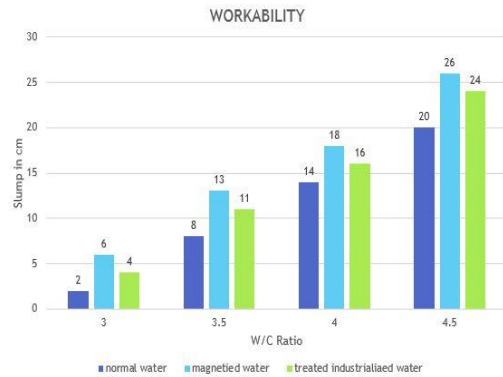


Figure 3. Slump Value of Various Water Sample

**C. Compressive Strength of Concrete**

The various concrete cubes are casted with different water samples for the different days (7 days, 14 days, 28 days). The compressive strength of the cubes are tested at the particular period of time and it is displayed in table 3. The compressive strength of cube with various proportion of replacement magnetic water with normal water is shown in the table 4. Three cubes are casted for the testing and the average value of all the three cubes is noted in the table

Table 3. Average compressive strength of cubes mixed with various water samples

Samples Mixed With	7 days (N/mm <sup>2</sup> )	14 days (N/mm <sup>2</sup> )	28 days (N/mm <sup>2</sup> )
Normal Water	18.32	25.12	33.23
Magnetized Water	24.34	30.98	37.53
Magnetized Industrial Waste Water	22.18	27.26	35.55

Table 4. Average compressive strength of cubes mixed with various proportion of replacement

replacement*	7 days (N/mm <sup>2</sup> )	14 days (N/mm <sup>2</sup> )	28 days (N/mm <sup>2</sup> )
10 %	21.09	28.95	36.12
20 %	19.22	26.78	34.67
30 %	18.02	24.96	32.87

\*- replacement of magnetic water with normal water

#### **IV. CONCLUSIONS**

Based on the experimental work the compressive strength of the concrete cube is increased by 15% when the concrete is mixed with magnetic water than the nominal concrete. The water cement ratio of the magnetic water is reduced when compared to nominal concrete by slump values, the water content can be reduced. By reducing the water content also the binding of the material will be equal to greater normal water W/C ratio. The industrialised waste water (Dye waste water ) can also be effectively used for the concrete casting, that to will give the same strength attained by the normal water. By using the industrial waste water the environmental issue can also be solved, the material used for primary treatment is also the waste product hence this also helpful in solving the environmental issue. By using the normal water portable water can be saved for the human need and also for the future generation.

#### **REFERENCES**

- [1] Arihant Jain, Aakash Laad, KirtiChittrarth, Singh and Krishna Murai “Effect of Magnetic Water on Properties of Concrete” in International Journal of Engineering Science And Computing, May 2017, Volume 7, Issue No.5, pg. 11864-11866.
- [2] Taghried Isam Mohammed Abdel Magid, Rabab Mohammed Hamdan, Abeer Abdelrahman Bukhari Abdelgader, Mohammed Emadeldin Attaelmnan Omer and Najla'a Mohammed Rizg-Allah Ahmedin, “Effect of Magnetized Water on Workability And Compressive Strength of Concrete” Procedia Engineering 193(2017), pg. 494-500.
- [3] B.Siva Kon da Reddy, Dr. Vaishali G Ghorpade, Dr. H. Sundarsana Rao, “Use of magnetic water for mixing and curing of concrete” International Journal Of Advanced Engineering Research And Studies, October-December 2014,pg.93-95
- [4] R.Malathy, N.Karuppasamy, S.Baranidharan,International Journal of ChemTech Research, 2017 vol.10 no.11, pg. 131-139.
- [5] Afshin H.Gholizadeh M. and Khorshidi.N., Improving Mechanical Properties of hogh Strength Concrete by Magnetic Water Technology, Archieve of SID, 2010,17:74-79