Experimental Investigation of Properties of Concrete Cast in Magnetised Water

Siddharth Pednekar  
PG Student  
Department of Civil Engineering  
MIT Pune-411038, Maharashtra, India

Nutan. J. Pathak  
Associate Professor  
Department of Civil Engineering  
MIT Pune-411038, Maharashtra, India

Dr. S C Potnis  
Professor  
Department of Civil Engineering  
MIT Pune-411038, Maharashtra, India

Abstract

Magnetic water has been used in different fields like agriculture, health care, dairy production, and oil industries. Recent research exhibits that Magnetised Water can be used in concrete to improve the properties of concrete like Compressive strength, workability, tensile strength etc. In the present study effect of Magnetised Water on Strain of Concrete of different grades is studied experimentally. Compressive strength tests carried out on Cubes & Cylinders cast with Normal Water & Magnetised Water Based on the experimental results conclusion is drawn. Conducting tests on Concrete specimens cast in M20, M25 & M30 grades of concrete Strength tests conducted on this magnetic water concrete (MWC) showed encouraging results and one can easily replace normal water with magnetic water for mixing of concrete.

Keywords: Compressive Strength, Concrete, Magnetised Water, Strain, Workability

I. INTRODUCTION

Magnetic water has been used in different fields like agriculture, health care, dairy production, and oil industries. Recent research exhibits that Magnetised Water can be used in concrete to improve the properties of concrete like Compressive strength, workability, tensile strength etc. In the present study effect of Magnetised Water on Strain of Concrete of different grades is studied experimentally. Compressive strength tests carried out on Cubes & Cylinders cast with Normal Water & Magnetised Water Based on the experimental results conclusion is drawn. Conducting tests on Concrete specimens cast in M20, M25 & M30 grades of concrete Strength tests conducted on this magnetic water concrete (MWC) showed encouraging results and one can easily replace normal water with magnetic water for mixing of concrete. Cement concrete produced using magnetic water provides one more alternative towards this objective.

Up till now research on use of magnetic water has been been mostly on the Compressive & flexural tests but in this research, we are using the compression tests to find strain in the concrete specimens & it’s impact of magnetised water on it.

II. LITERATURE survey

A. Saddam M. Ahmed Assistant Lecturer College of Engineering / Water Resources Department University of Mosul / Iraq “Effect of Magnetic Water on Engineering Properties of Concrete”

– The use of magnetic water increased workability and strength.
– The strength of concrete prepared with magnetized water increased by 10 to 20.

B. Hassan Karam and Osama Al-Shamali Research Associate, Kuwait Institute for Scientific Research, Kuwait “Effect of Using Magnetized Water on Concrete Properties”

– The strength of concrete prepared with MW increased by 10 to 15 %.
– Other mechanical properties such as tensile strength and flexural increased by 7 to 28 % for concrete prepared using magnetic water.
– The use of MW increased the workability of concrete that eventually led to enhanced quality of concrete without adding water.

C. B. Siva Konda Reddy-“Influence of Magnetic Water on Strength Properties of Concrete”

– Workability results of (N+S) Magnetic water slump were higher.
Due to increases in hydration compressive strength of concrete is increases.
Split tensile test of (N+S) Magnetic water is higher and also due to use of Magnetic water flexure strength is increase.
Concrete made with Magnetic water have more density and less water absorption.

D. M Gholizadeh - “The effect of magnetic water on strength parameters of Concrete”
- Efficiency of concrete is increases.
- Compressive strength of Magnetic water cubes increases by 23% more than Normal water cubes.
- Plasticity, efficiency and resistant in comparison increases due to use of Magnetic water.

E. H. Afshin- “Improving Mechanical Properties of High Strength Concrete by Magnetic Water Technology”
- Rate of Lubrication of Magnetic water concrete is higher.
- The pressure strength of concrete produced with Mechanical Properties of High Strength Concrete a superplasticizer is higher than that of ordinary concrete and lower than that of Magnetic concrete.
- Considerable saving in rate of consumed cement.

F. Masoud Rasoolian,Etc- “Evaluation of magnetic field on water hardness and some characteristics of concrete”
- The introduction of MW to concrete was found to increase its ability to resist flexural strength (10 to 22 %).

III. OBJECTIVE OF THE PRESENT STUDY

The objective of dissertation is to study how much the increase in strength has had an effect on the Strain in concrete. To check the effect of magnetised water on the effects of strain in concrete. Viz
To find the Ultimate Compressive Strain in Concrete $\varepsilon_u$ and compare it with $\varepsilon_u=0.0035$ that of conventional Concrete.
- To plot Stress vs Strain curve for Magnetised water. The objective of this research is tried to achieve through the available literature survey related to the project area and by performing the actual experiments.
- To plot Stress vs Strain curve for Magnetised water.
The objective of this research is tried to achieve through the available literature survey related to the project area and by performing the actual experiments.

IV. MATERIALS & METHODOLOGY

Materials used are Cement, Sand (F.A), Coarse aggregate & the Tap Water/Magnetised Water. Cement used in this investigation is Ordinary Portland Cement of 43 grade with a Specific gravity of 3.15 confirming to IS 8112. Fine aggregate of Specific gravity 2.65 & Coarse aggregate of Zone I confirming to IS 383.
- Methodology- As per estimates, A total of 3 Cubes & 3 Cylinders each were prepared using Normal Water with M20, M25 and M30 grade concrete. Compressive Strength test was done on these specimens and also Strain was measured using a deflection gauge. These Specimens cast using Normal Water are compared against 9 Cubes and 9 Cylinders of M20, M25 and M30 grade specimens respectively. Thus, after the measurement of strain in these specimens these results are compared with the Ultimate Strain in concrete i.e. 0.0035.
- Estimation-As per mix design, the proportion of Cement: Sand: Aggregate for M20, M25 & M30 are
  1) M20 -1:2.4:4.9
  2) M25 -1:2.34:4.23
  3) M30 -1:1.7:2.7

Fig. 1: (a) & (b) showing setup of Strain Measurement using a Deflection gauge.
As the load was applied the deformations were recorded as the dial gauge showed the deformation in the specimens. These readings were recorded at an interval a 500 Kg & the graphs of Load Vs Deflection and Stress Vs Strain were then drawn.

Strain = Change in length/Original length i.e. \( \frac{\Delta L}{L} \)

From the recorded values & by calculation

1) **Average Compressive Strength**

a) Cubes

<table>
<thead>
<tr>
<th>Grade</th>
<th>With MW</th>
<th>Without MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20</td>
<td>20.245</td>
<td>19.237</td>
</tr>
<tr>
<td>M25</td>
<td>26.66</td>
<td>24.67</td>
</tr>
<tr>
<td>M30</td>
<td>32.708</td>
<td>30.068</td>
</tr>
</tbody>
</table>

b) Cylinders

<table>
<thead>
<tr>
<th>Grade</th>
<th>With MW</th>
<th>Without MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20</td>
<td>17.245</td>
<td>16.55</td>
</tr>
<tr>
<td>M25</td>
<td>22.966</td>
<td>20.96</td>
</tr>
<tr>
<td>M30</td>
<td>27.708</td>
<td>26.33</td>
</tr>
</tbody>
</table>

2) **Average Ultimate Strain**

a) Cubes

<table>
<thead>
<tr>
<th>Grade</th>
<th>With MW</th>
<th>Without MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20</td>
<td>0.0064</td>
<td>0.0072</td>
</tr>
<tr>
<td>M25</td>
<td>0.0058</td>
<td>0.0067</td>
</tr>
<tr>
<td>M30</td>
<td>0.0042</td>
<td>0.0055</td>
</tr>
</tbody>
</table>

b) Cylinders

<table>
<thead>
<tr>
<th>Grade</th>
<th>With MW</th>
<th>Without MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20</td>
<td>0.0054</td>
<td>0.0067</td>
</tr>
<tr>
<td>M25</td>
<td>0.0043</td>
<td>0.0053</td>
</tr>
<tr>
<td>M30</td>
<td>0.0037</td>
<td>0.0042</td>
</tr>
</tbody>
</table>
V. CONCLUSION

The conclusions that we draw from this experiment are,

- That Strain decreases with increase in grade of Concrete.
- Reduction in Strain is observed when it is cast in Magnetised Water in comparison with that of specimens cast in Normal Water.
- Percentage increase of Compressive Strength of specimens cast in MW ranges from 5.24% to 8.07% for Cubes & for Cylinders it ranges from 5.23% to 9.57%.
- Percentage decrease of Strain in concrete of specimens cast in MW ranges from 11.11 to 23.66% for Cubes & 11.90% to 19.40% for Cylinders.
- Ratio of Compressive Strength of Cylinder to Cube is 0.85, 0.86 & 0.84 for MW Specimens for M20, M25 & M30 respectively & Ratio of Compressive Strength of Cylinder to Cube is 0.85, 0.86 & 0.84 for MW Specimens for M20, M25 & M30 respectively.

REFERENCES

[12] M Gholizadeh Chemistry Department, Ferdowsi University of Mashhad, Mashhad, Iran.;
[14] Masoud Rasoolian, Reza Takhsia, Omid sarani, Yahya Saravani Department of Civil Engineering, Zahedan Branch, Islamic Azad University, Zahedan, Iran.
[21] waterforlife.net.au
[22] permagconditioner.com
[23] www.ihome.cuhk.edu.hk