

TO ANALYZE COST ASPECT BY USING MAGNETIZED WATER IN CONCRETING FOR CONSTRUCTION PROJECTS

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Abstract – Concrete is most widely used man-made building material on the planet. When cement and 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. In this study, a new method of using this potable water by magnetizing it has been implemented. The magnetic water has been used in different fields like agriculture, health care, construction, dairy production, oil industries, etc. In present study the aim is to improve the quality of water as per standards reducing the water/cement ratio there by reducing the consumption of cement content. Properties of water are to be studied for pH, Total hardness, and Total dissolved solids (TDS). Test to be conducted on concrete are workability and compressive strength while imposing different variations in cement reduction and carrying out their cost analysis

Key Words: magnetic water, pH, total hardness, total dissolved solids, cement reduction.

1. INTRODUCTION

Concrete has been used in construction since ancient Rome. Over thousands of years, concrete has been developed for the purpose of construction. Nowadays, concrete is the single most widely used construction material in the world and is used in the construction of buildings, bridges, and mega-structures such as dams, pavements, etc. The reason for this is because the materials used to make concrete are so diverse and readily available; another reason for this is that concrete can be precast or poured into any shape:

1.1 Cost benefit of reduction of cement

Concrete construction cost is one of the crucial and major components of total cost of a project. It greatly influences the total cost, so it is required to be estimated accurately. There are several parameters that influence the cost of concrete construction for instance grade of concrete, cost of materials like formworks, reinforcement steel, labors, finishing etc.

The costs of these parameters are not constant but rather vary from one location to another one, in addition to the material quality which also affects concrete construction cost. Moreover, if concrete construction cost is overestimated, it leads to overestimation in the total project cost and the owner would have to spend more money, or he/she probably makes a decision not to proceed with the project.

1.2 Impact of using concrete on environment

The cement industry is one of the main producers of carbon dioxide, a potent greenhouse gas. Concrete causes damage to the most fertile layer of the earth, the topsoil. Concrete is used to create hard surfaces which contribute to surface runoff that may cause soil erosion, water pollution and flooding

- Making cement results in high levels of CO₂ output.
- Cement production is the third ranking producer of man-made CO₂ in the world after transport and energy generation.
- 4 - 5% of the worldwide total of CO₂ emissions is caused by cement production.
- Production of one ton of cement results in 780 kg of CO₂
- Important to realize is that although 5% of the worldwide generation of CO₂ is due to cement production, that level of output also reflects the unique and universal importance of concrete throughout the construction industry.

GHG Emission By Industries

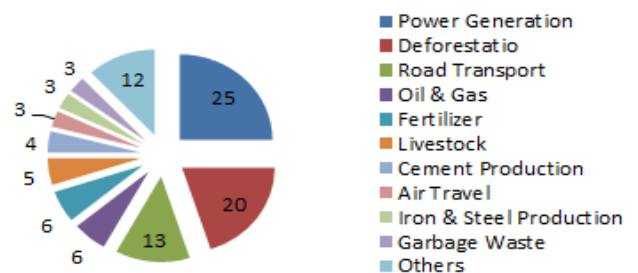


Figure -1: GHG Emission by Industries (Source: Google)

1.3 Research Concept

In this research the main concept is to identify the optimum amount of cement replaced with respect to the additional strength achieved due to the magnetization of water without adding any admixtures. Also, the cost analysis is done based on the cement reduction to find the decrease in cost and material saving. This technique is beneficial for magnetization of water for relatively large volume. MWT can break up water clusters into smaller clusters which allow the water to penetrate the core region of the cement particles more easily. Hence, hydration can be done more efficiently, which in turn improves concrete strength.

2. MAGNETIZED WATER

Magnetized water is water passed through a magnetic field. It is an inexpensive, environmentally friendly water treatment that has small installation fees and no energy requirements. Many claim magnetized water gives increased performance in regards to scale reduction, increased crop yields, health benefits, change in pH, water tension reduction and increased cement compressive and tensile strength to name a few.

2.1 Magnetic Filter

The filter consists of the assembly of six neodymium (N42) magnets. Each magnet comprises strength more than 5000 gauss when measured with the help of gauss meter. The assembly of magnets was placed on an iron plate and was welded on stainless steel pipe with argon welding. The diameter of stainless steel pipe was 25mm (approx. 1 inch). Argon welding was done to support the iron bar on both the sides. The SS pipe was connected with PVC pipe at both ends and the PVC pipes were connected with a domestic water pump of 0.5 hp general motor and the whole network was completed. The water in the bucket is recirculated for the desired time duration and the results are compared.

2.2 Applications of Magnetized Water

- Magnetic treatment of saline irrigation water is used as an effective method for soil desalinization.
- The magnetic water is used to increase crop yield, this induced growth in is attributed to an increase in photosynthetic pigments, where the magnetic water increases the cell metabolism and mitosis.

- The application of magnetic water on seeds increases the germination and a percentage increase in the germinated seeds.
- Dairy cows that drink magnetized water have shown an increase in milk production with the same quantity and quality of milk fat as present in cows drinking ordinary water.
- Magnetized structured water carries more oxygen and other essential minerals in to the human blood/organs alter rates of cellular, enzymatic or organic processes, thus magnetic water is used to cure/treat ill effects or diseases in human body.

2.3 Advantages and Disadvantages

2.3.1 Advantages

- It supposedly reduces the effects of hard water by passing it through a magnetic field.
- It is meant to be a non-chemical and inexpensive alternative to soften water; its chief advantages.
- It uses the magnets to restrain ions and hard water particulars from bonding and forming scale.
- It increases workability of concrete
- It increases compressive strength of concrete.
- Cement content can be reduced resulting in cost and material saving.

2.3.2 Disadvantages

- Not Available through general retailers.
- The magnetized water loses its properties after 48-72 hours when exposed to atmospheric conditions.
- Preparation of magnetized water is time consuming due to recirculation of water.

3. COMPARATIVE ANALYSIS

Table -2: Compressive Strength

Mix Proportion	7 Days Compressive Strength	14 Days Compressive Strength	28 Days Compressive Strength
NWC	23	26.5	33
MWC	29.5	34	40
MWC - 5% CR	28	32	38
MWC - 10% CR	24	28	34
MWC - 15% CR	22	23	31

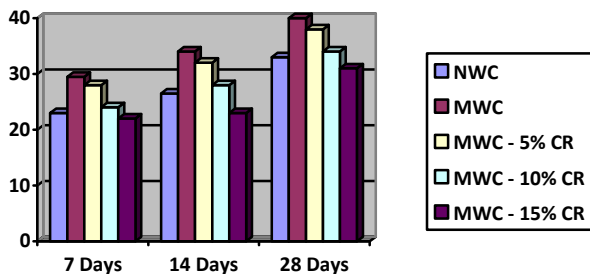


Figure -2: Graphical Representation of Compressive strength

Table -2: Cost Analysis

Sr. No.	Materials	Quantity/ Number	Rate (Rs)	Per	Amount (Rs)
1	Cement	8 Bags	370	Bag	2960
2	Sand	0.4716 m ³	800	m ³	380
3	Aggregate	0.786 m ³	1000	m ³	786
4	Sundries	-	-	-	50
5	Total Material Cost				4176 Rs

Table -3: Cement Reduction

Sr. No.	Proportions	Cement (m ³)	Quantity (Bags)	Amount (Rs)
1	NWC	0.262	7.48=8	2960
2	MWC	0.262	7.48=8	2960

3	MWC-5% CR	0.2489	7.11=8	2960
4	MWC-10% CR	0.2358	6.73=7	2590
5	MWC-15% CR	0.2227	6.36=7	2590

4. CONCLUSIONS

This research investigated a novel approach of reducing the cement content resulting in cost saving and material saving, also performance of concrete by using magnetized water in mixing different ingredients of concrete. This research also provides a better understanding of the mechanism of Magnetic structured water in using mixing water very efficiently in hydration for improving properties of concrete.

It was concluded that for 10% and further cement reduction, and by using magnetized water for concreting we can save up to 50 kgs of cement (1 Bag) and an amount of almost 370 Rs. This material and cost saving can be further increased when used for more large quantity of concreting.

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