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MAGNETIZED WATER EFFECT ON COMPRESSIVE STRENGTH OF CONCRETE WITH RICE HUSK ASH

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Abstract - *From the development of modern Portland cements, the potential for masonry construction widely increased. Water plays an important role in concrete preparation process. The use of modern technology known as Magnetized water improves compressive strength of concrete. Magnetized water doesn't mean water has acquired magnetic strength but that it has undergone to the magnetic field. The magnetized water technology introduced for agriculture and other medical values in Russia and China, and now increasing its value in the construction industry. Hence an experiment work is taken up to know the effect of magnetic water on concrete which were cast using Rice Husk Ash (RHA). Ash from burning of rice husks (RHA) has already proven that it is one of the most promising supplementary cementing materials (SCM). After carrying detailed experimental program the results shows that the compressive strength of concrete cubes increases due to Magnetized water in addition of RHA. Results show that the compressive strength of samples prepared with magnetic water increases 10-20% compared with normal tap water.*

Key Words: **RHA (Rice husk Ash), Magnetized water, SCM(supplementary cementing materials), Compressive Strength.**

1. INTRODUCTION

Magnetized water doesn't mean water has acquired magnetic strength but that it has been subjected to a magnetic field which is found to change certain properties of water. These anomalous properties of water are unique and may result in many variations of macroscopic properties. Water is not homogeneous at the nanoscale and exists as clusters depending on the temperature, pressure and existing forces. Thus the density of the water may also change depending on the forces that dominate the conditions. The two forces that dominate are hydrogen bond and the vanderwaal's forces.

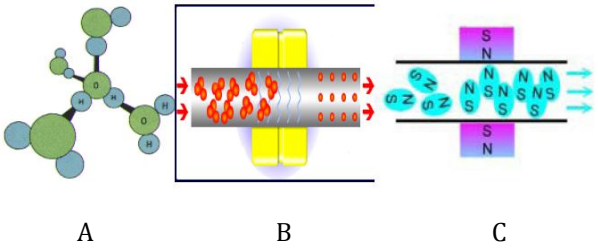


Fig-1: Mechanism of magnetic water: A. Water cluster; B. Breakage of cluster C. orientation.

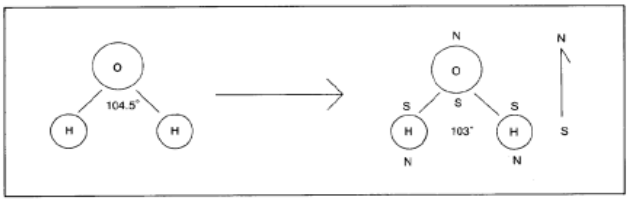


Fig-2: The decrease in bond angle in water molecule exposed to magnetic field.

Objectives of Study

- To study effect of Rice husk ash on strength of concrete in the presence of magnetized water.
- To Compare the Compressive strength of Conventional Concrete and Magnetised water Concrete with Rice husk ash.

2. APPLICATION OF RHA

Application of RHA in high-strength concrete (60MPa) was investigated by H.B.Mahmud. The reported results indicated with 10% of RHA, whether by replacement or incorporation, the compressive strength and the splitting tensile strength were improved at all ages. Compared with the splitting tensile strength, the improved ratio of RHA to the flexure strength was greater. The improved ratio of the static modulus of elasticity was less than that of concrete strength, and was impacted by such factors as mix method, curing regime and age.

3. EXPERIMENTAL PROGRAM

The following materials are used in the present investigation. A brief description is given below regarding the materials used. Cement, Magnets, Fine aggregate, Coarse aggregate, Mineral Admixtures i.e., Rice Husk Ash

Name of the test	Experimental values	Std. values as per IS:12269:1989
Specific gravity	2.90	-
Normal consistency	34%	-
Initial setting time	37 min	Shall not be less than 30 min
Final setting time	480 min	Shall not be less than 30 min
Workability (Slump cone)	36mm (True slump)	Dry slump ranges from 25-50mm

Table-1: Cement properties

Sieve size IS	Weight retained in (grams)		Percentage of Weight retained		Cumulative Percentage of weight retained		Percentage of Passing
	Sample 1	Sample 2	Sample 1	Sample 2	Sample 1	Sample 2	
4.75mm	0	0.01	0	1	0	1	100
2.36mm	0.025	0.040	2.5	4	2.5	5	97.5
1.18mm	0.235	0.280	23.5	28	26	33	74
600 µm	0.110	0.200	11	20	37	53	57
300 µm	0.490	0.430	49	43	86	96	8
90 µm	0.060	0.023	6	2.3	92	98.3	2
					∑=243.5	∑=286.3	

Table-2: Fineness modulus

Fineness modulus for sample1=2.43

Fineness modulus for sample 2 = 2.80

S NO	Property	Normal water	Magnetized water	IS Standards
1	pH	6.2	7.4	IS 456-2000
2	Electro conductivity	200 micro Mhos/cm	250 micro Mhos/cm	IS 613-1984
3	Hardness	16ml	18ml	IS 1500-2005
4	Chloride	120ppm	130ppm	IS 15573-2018
5	Fluoride	0.25ppm	1ppm	IS 6356-2001
6	Nitrite	90ppm	105ppm	IS 2296-1982
7	Orthophosphate	5ppm	0ppm	IS 1514-1990
8	Iron	0ppm	0ppm	IS 210-2009

Table-3: Properties of Water

Magnets

In the present investigation work, the Magnets were obtained from Amazon. The name of the magnets is Ferrite Ring Magnet. The shapes of magnets are circular. We found the strength of magnet by Gauss meter. The average magnetic strength of magnet is 985 gauss.

Fig- 3: Magnets

Preparation of Magnetized Water

Magnetized water is obtained by placing the beaker filled with water over the magnets for a period of 24 hours. During this time magnetic field penetrates through the glass into the water, which absorbs the magnetism and this magnetized water is used for making cement mortar.

Fig-4: Beakers placed over the magnets

Mix Proportion of M20 Concrete

Water - 0.50L 810ml

Cement - 1kg 1.62kg

Fine Aggregate - 1.5kg 2.43kg

Coarse Aggregate - 3kg 4.86kg

Specimen preparation: For the experimental study cubes of size 150 × 150 × 150 mm is used for Compression test.

4. RESULTS AND DISCUSSIONS

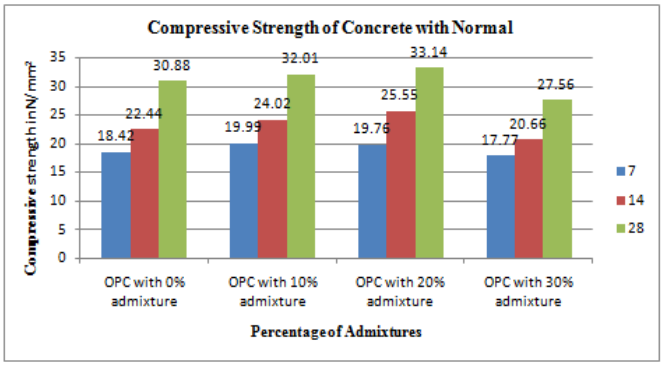
Test performed on compressive testing machine to determine the compressive strength of concrete cube with and without Magnetized water with RHA as admixture.

Fig-5: Compressive testing machine

a) Compressive Strength of concrete with Normal water

Days of testing	Compressive strength of Concrete cubes in N/mm²			
	OPC with 0% admixtures	OPC with % of Rice Husk Ash		
		10%	20%	30%
7	18.42	19.99	19.76	17.77
14	22.44	24.02	25.55	20.66
28	30.88	32.01	33.14	27.56

Table-4: Compressive Strength of Concrete with Normal water

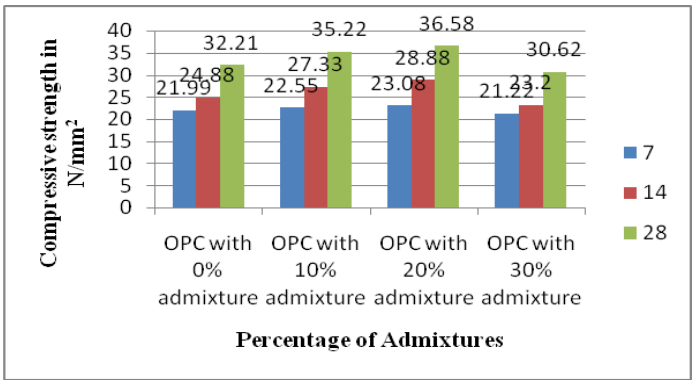


Graph 1: Variation of compressive strength of normal water specimens for various percentage (%)of admixtures

b) Compressive Strength of Concrete with Magnetized Water (24hr Duration):

Days of testing	Compressive strength of Concrete cubes in N/mm²			
	OPC with 0% admixtures	OPC with % of Rice Husk Ash		
		10%	20%	30%
7	21.99	22.55	23.08	21.22
14	24.88	27.33	28.88	23.2
28	32.21	35.22	36.58	30.62

Table-5: Compressive Strength of Concrete with Magnetized Water (24hr Duration)



Graph 2: Variation of Compressive Strength of Magnetized water (24 hr duration) Concrete specimens for various percentage (%)of admixtures

c) The Improvement of Compressive Strength of Concrete with period of curing is presented in Table 6 to 9:

S. NO	Normal water duration in hrs	7 days		14 days		28 days	
		100% cement strength in N/mm²	%of Improvement	100% cement strength in N/mm²	%of Improvement	100% cement strengt h in N/mm²	%of Improvement
1	0	19.42	13.23	22.44	10.87	30.88	4.30
2	24	21.99		24.88		32.21	

Table-6: The Compressive Strength of Concrete cubes cast with 100% cement + 0% RHA for 7days, 14 days & 28 days

S. NO	Normal water duration in hrs	7 days		14 days		28 days	
		90% cement+ 10%RHA strength in N/mm²	%of improveme nt	90% cement+ 10% RHA strength in N/mm²	%of improve ment	90% cement+ 10% RHA strength in N/mm²	%of improve ment
1	0	19.99	12.8	24.02	13.7	32.01	10.1
2	24	22.55		27.33		35.22	

Table-7:The Compressive Strength of Concrete cubes cast with 90% cement+ 10% RHA for 7days, 14 days & 28 days

S NO	Normal water duration in hrs	7 days		14 days		28 days	
		80% cement+ 20% RHA strength in N/mm²	% of Improve ment	80% cement + 20% RHA strength in N/mm²	% of Improvem ent	80% cement+ 20% RHA strength in N/mm²	% of Improve ment
1	0	19.76	16.8	25.55	13.03	33.14	10.25
2	24	23.08		28.88		36.58	

Table-8:The Compressive Strength of Concrete cubes cast with 80% cement + 20% RHA for 7days, 14 days & 28 days

S. NO	Normal water duration in hrs	7 days		14 days		28 days	
		70% cement+ 30% RHA strength in N/mm²	% of Improve ment	70% cement + 30% RHA strength in N/mm²	% of Improve ment	70% cement+ 30% RHA strength in N/mm²	% of Improve ment
1	0	17.77	19.41	20.66	12.29	27.56	11.1
2	24	21.22		23.2		30.62	

Table-9:The Compressive Strength of Concrete cubes cast with 70% cement+ 30% RHA for 7days, 14 days & 28 days

5. CONCLUSION

The conclusion is drawn from the experimental work carried in this project is, generally water is used in construction for concrete preparation and curing. Since concrete preparation and curing plays a key role in the construction of structure. If water increases the compressive strength of the concrete then it is more beneficial in construction world. So the latest technology "Magnetized Water" is used in preparation of concrete mix to improve the compressive strength of concrete and the residue of the industry, Rice husk Ash (RHA) is used as the Supplementary Cementing Material (SCM). Compressive strength of concrete using RHA increases till optimal dosage. After carrying detailed experimental program concrete by using Magnetized water and RHA as SCM of 10%, 20% and 30% the compressive strength of concrete for 7, 14 and 28 days of curing has been increased by 10-20%.Since the time required to prepare Magnetized water is taking more time, which is time consuming for major projects construction, so the recent technology implemented in Russia to prepare magnetized water in less time.

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