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AN REVIEW STUDY ON RICE HUSK ASH AND GLASS FIBERREINFORCED CONCRETE

Divya Sahu[1], Mr Ashish chandra[2]
Mtechscholer[1], Assistant Professor[2]
Dept of Civil Engineering, MM college of technology, Raipur[1,2]

Abstract— *Concrete is a key component of the construction material used in a sizable amount of our country's infrastructural system, and its use is expected to increase as the country's infrastructure needs grow. Strength and longevity must be incorporated into its design to make it more useful. In addition, it makes sense to utilise admixtures such Rice Husk ash, fly ash, silica fume, etc. as partial replacements for cement in concrete, which compensates for the material's inferior performance and reduces its overall cost. Cement, Rice Husk ash, aggregates, and fibres are mixed together to form "Rice Husk ash Fiber reinforced concrete," a composite matrix. As crack-arresters, the fibres in the cement Rice Husk ash based matrix inhibit tiny fractures from expanding when subjected to stress. Researchers replaced 5%, 10%, and 15% of cement with rice husk ash and added 0.5%, 1%, and 1.5% glass fibre composite to see how those variables affected the final product. The w/c of the M30 Grade control mixture that was created was 0.50, and the proportions were 1:1.91:3. The effects of Glass fibre and Rice Husk ash content on mechanical parameters including compressive strength, split tensile strength, and flexural strength testing are reported..*

Keywords- *Concrete, Glass Fiber, Rice Husk Ash.*

I. INTRODUCTION

Concrete is a man-made material which is used for various construction works such as house construction, bridge building, paving, and roadwork. Concrete, in its most basic form, is made by combining cement paste and particles. Concrete plays a crucial role in the support system of modern society. A mixture of coarse aggregate (usually gravel or sand), fine aggregate (usually sand or gravel), and hydraulic cement, concrete is a composite material. Cement and water undergo a chemical reaction that produces a substance with a stone-like structure. Advanced uses, designs, and building methods are all possible with concrete. When high levels of strength, impermeability, durability, performance, fire resistance, and abrasion resistance are required, this is the material of choice. Because of its great compressive strength and its ability to be moulded, it has found widespread application. Its brittleness and tensional weakness are severe drawbacks.

Even now, there is no substitute for concrete as a building material. Reinforced cement concrete (R.C.C.) and fibre reinforced concrete (F.R.C.) are two examples of cutting-edge concrete technologies that add strength and longevity to conventional concrete by resisting such destructive forces as sliding, cracking, buckling, and overturning. To put it simply, these are micro-cracks. Over time, these fissures become wider and wider, causing the concrete to crumble. The main cause of the concrete's demise is the appearance of cracks. There have been numerous attempts to improve the tensile strength of concrete.

Utilizing byproducts from other industries, such as fly ash, rice husk ash, blast furnace slag, timber ash, steel fibre, glass fibre, and plastic waste, can enhance the qualities of concrete. Natural resources, by-products, and industrial trash all fall under this category. Pollution of the environment is being caused by dumping these wastes on the surface of the earth. The burning of rice husk results in a waste substance known as rice husk ash (RHA). The pozzolonic and reactive properties are very high. Use of industrial and biogenic wastes as alternative cementing materials has increased in popularity as a means of conserving resources in the concrete industry. Due to industrialization, there is now a substantial amount of plastic trash lying about. It's a waste of resources because it won't break down naturally. Fibers made from plastic trash can be added to concrete to make it stronger. Studies were done to see if industrial by-products and wastes like rice husk ash and plastic trash could be put to good use .[1]

Silicon oxide, along with trace amounts of other oxides, is the primary component of glass fibres. Glass fibres are notable for their low cost, durability, and resilience to high temperatures and corrosion. Fig.1 shows the alkali-resistant E-glass fibres that were used; these were 12mm in length, 0.014mm in nominal diameter, had a specific gravity of 1.9, and a density of 2650 kg/m3.

Products made with the original form of glass fibres quickly degraded when exposed to alkaline conditions. Formed successfully in the 1960s, commercial production of alkali-resistant glass containing 16% zirconia began in the UK in 1971. In the 1970s and 1980s, researchers in different regions of the world developed sources of alkali-resistant glass with higher zirconia percentages. Glass-reinforced cement (GRC) products, with their diverse variety of uses, are made with fibres of glass that can withstand alkalis.

Both uncut and fragmented lengths of glass fibre are commercially accessible. In spray applications, fibres up to 35 mm in length are employed, while in premix applications, fibres up to 25 mm in length are typically used.

Despite its high tensile strength (2–4 GPa) and elastic modulus (70–80 GPa), glass fibre exhibits brittle stress-strain properties (2.5–4.8% elongation at break) and low creep at ambient temperature. Glass fibre up to 5% by volume has allegedly been utilised successfully in a sand-cement mortar without any balling occurring. Products made of glass fibre have been demonstrated to lose strength and ductility when left exposed to the elements. Alkali attack and fibre embrittlement are hypothesised to be contributing factors, however these theories have not been confirmed. Until there is more information available on its long-term durability, GRC will only be used for non-structural purposes, despite the fact that these are many. It has been utilised as a replacement for asbestos fibre in flat sheet, pipes, and other precast goods, and it may be applied using direct spray techniques and premix processes. Large quantities of GRC cladding, components, and containers are utilised in agriculture.

Fig. 1 Types of Fibers

If you burn rice husk, you'll get ash that has the right chemical and physical makeup to be used as a mineral additive. The silica content, crystallization phase of the silica, particle size, and surface area all play a role in the pozzolanic activity of rice husk ash (RHA). Rice husk ash (RHA) can be made by burning rice husk at a carefully managed temperature; it has a high amorphous silica content and a wide surface area. Good quality ash can only be obtained by burning and grinding rice husk in an appropriate incinerator/furnace using an appropriate grinding process. Few literatures address rice husk combustion and grinding techniques despite the abundance of research on the pozzolanic activity of RHA, its usage as a supplementary cementitious material, and its environmental and economic benefits**.** [12]

II. LITERATURE REVIEW

1. ANKUR, VARINDER SINGH, RAVI KANT PAREEK "EFFECT OF RICE HUSK ASH AND PLASTIC FIBERS ON CONCRETE STRENGTH" International Journal of Civil And Structural Engineering Volume 6, No 1, 2015.

Effect of Rice Husk Ash and Plastic Fibers on Concrete Strength, Ankur, Varinder Singh, and Ravi Kant Pareek. Different mixtures of rice husk ash (RHA) and plastic fibre were tested for their compressive strength and split tensile strength, and the results are detailed in this work. An experimental sample of M-20 grade concrete was used.
As an alternative to using O.P.C., a range of RHA contents between 5% and 15% was used, and plastic fibres were used between 1% and 3% in the same range to replace the coarse aggregate. The polythene bags were sliced up into tiny bits and the resulting fibres were collected. After 7 and 28 days of curing, the concrete's compressive strength and split tensile strength were measured. There was a noticeable increase in strength between RHA and plastic fiber-infused concrete and control concrete.
Cement concrete cubes and cylinders of varying lengths and diameters were cast for the experiment to determine the material's compressive and split tensile strengths. A 7-day curing duration and a 28-day curing period were used in the tests. The information about the cast samples used in the experiment is shown in Table-**1.**.

Table 1: Details of Specimens

Sr.	TEST	Specimen	RHA Added(%)	Plastic Fiber Added (%)	No. of Specimens	
					For7 days	For 28days
1	Compressive Strength Test	Cube	0	0	2	2
			5	1	2	2
			10	2	2	2
			15	3	2	2
2	Split Tensile Strength Test	Cylinder	0	0	2	2
			5	1	2	2
			10	2	2	2
			15	3	2	2

Tables 2 and 3 display the results of compressive strength tests performed on concrete after 7 and 28 days. When 5% RHA and 1% plastic fibres were added to the mix, the average compressive strength of the concrete increased to 22.67 MPa and 7.01 MPa after 7 days. With 10% RHA replacement and 2% plastic fibres, the average compressive strength of concrete increased by 1.20% and 1.22%, respectively, from 16.56 MPa at 7 days to 25.67 MPa at 28 days. The average compressive strength of concrete was 13.67 MPa and 20.78 MPa with the replacement of 15% RHA and 3% plastic fibres, respectively, showing a drop in compressive strength of 0.99% and 0.98% at 7 and 28 days. Tables 4 and 5 display the results of split tensile strength tests conducted on fibre reinforced concrete that included or excluded RHA and plastic fibres, respectively. It was shown that the average tensile strength of spilt concrete was 2.09 MPa after 7 days, and 4.42 MPa after 28 days, when 5% RHA and 1% plastic fibres were used to replace some of the cement. The addition of 10% RHA and 2% plastic fibres increased the tensile strength of the concrete by 1.26% and 1.21%, respectively, after 7 and 28 days. The average tensile strength of the concrete was 2.4 MPa. We found that the average tensile strength of broken concrete was 1.88 MPa after 7 days, and 4.06 MPa after 28 days, with 15% RHA replacement and 3% plastic fibres.

Table 2: Compressive strength data at the age of 7 days for M20 concrete

Sr. No	mple	HA Used(%)	Plastic Fibers Used (%)	Compressive Strength (MPa)	Average Compressive Strength (MPa)
1	1	0	0	13.55	13.78
	2			14.00	
	1			15.56	
2	2	5	1	14.89	15.23
3	1	10	2	16.00	16.56
	2			17.11	
4	1	15	3	13.78	13.67
	2			13.55	

Table 3: Compressive Strength Data at the Age of 28 Days for M20 Concrete

Sr.	mple	HA Used(%)	Plastic Fibers Used(%)	Compressive Strength (MPa)	Average Compressive Strength (MPa)
1	1	0	0	22.22	21
	2			19.78	
2	1	5	1	21.78	22.67
	2			23.56	
3	1	10	2	25.78	25.67
	2			25.56	
4	1	15	3	21.11	20.78
	2			20.44	

Table 4: Split Tensile Strength Data at the Age of 7 Days for M20 Concrete

Sr.	mple	HA Used(%)	Plastic Fibers Used	Split Tensile Strength (MPa)	Split Tensile Strength (MPa)
1	1	0	0	1.70	1.91
	2			2.12	
2	1	5	1	1.98	2.09
	2			2.19	
3		10	2		2.4
	2			2.33	
4	1	15	3	1.77	1.88
	2			1.98	

Table 5: Split Tensile Strength Data at the Age of 28 Days for M20 Concrete

Sr. No.	mple	HA Used(%)	Plastic FibersUsed (%)	Split Tensile Strength (MPa)	Average Split Tensile Strength(MPa)
1	1	0	0	4.24	4.14
	2			4.03	
2	1	5	1	4.24	4.42
	2			4.60	
3		10	2		4.99
	2			5.09	

4	1	15	3	4.31	4.06
	2			3.81	

Conclusions were reached based on the experimental study using various concrete samples and varying amounts of rice husk ash (RHA) and plastic fibre.
1. Compressive strength of concrete cubes are improved both at 7 days and 28 days when RHA is used at 5% and 10% and plastic fibres are used at 1% and 2%.
2. Split tensile strength of concrete cylinders increases at 7 and 28 days when RHA and plastic fibres are used to replace 5% and 10%, respectively.
3. Compressive strength of concrete cubes decreases after 7 and 28 days when 15% RHA and 3% plastic fibres are used as replacements.
4. The split tensile strength of concrete cubes decreases after 7 and 28 days when 15% RHA and 3% plastic fibres are used as replacement.
5. Concrete reinforced with RHA and plastic fibre was found to be resistant to catastrophic failure.

2. **P.PADMA RAO, A.PRADHAN KUMAR, 3B.BHASKAR SINGH, "A STUDY ON USE OF RICE HUSK ASH IN CONCRETE", IJEAR Vol. 4, Issue Spl-2, Jan - June 2014**

P.Padma Rao, A.Pradhan Kumar, 3b.Bhaskar Singh, The current analysis aims to determine the viability of replacing some of the cement in concrete with fly ash (Portland Pozzolana Cement), and it also makes an attempt to determine how this replacement affects the concrete's strength metrics (Compressive and Flexural). Mix designs for both the control and replacement concrete methods are based on the IS method, which is used to create the control concrete. In this research, we focus on replacement at five different levels: 5%, 7.5%, 10%, 12.5%, and 15%. The present investigation takes into account a wide variety of curing times, from 3 days to 7 days to 28 days to 56 days..

3. **OBILADE, I.O, "USE OF RICE HUSK ASH AS PARTIAL REPLACEMENT FOR CEMENT IN CONCRETE", International Journal of Engineering and Applied Sciences Sept. 2014. Vol.5. No. 04**

Obilade, I.O,– Incorporating Rice Husk Ash into Concrete as a Cement Substitute This paper provides a brief overview of the studies conducted on the characteristics of concrete made with Rice Husk Ash (RHA) as a partial replacement for Ordinary Portland Cement (OPC). OPC was swapped out for RHA at varying weights of 0%, 5%, 10%, 15%, 20%, and 25%. The baseline was 100% retention. The compressive strength of 150mm cubes of fresh and cured concrete was tested at 7, 14, and 28 days after curing in water. As the amount of OPC replaced by RHA rose, the results showed that the Compacting factor decreased. In addition, after replacing more and more of the OPC with RHA, the cured concrete's compressive strength dropped. The feasibility of OPC partial replacement with RHA in concrete warrants additional research.

4. **VAISHALI G GHORPADE ,"AN EXPERIMENTAL INVESTIGATION ON GLASS FIBER REINFORCED HIGH PERFORMANCE CONCRETE WITH SILICA FUME AS ADMIXTURE", 35th Conference On Our World In Concrete & Structures.Vaishali G Ghorpade,**

Vaishali G Ghorpade, –An Experimental Investigation On Glass Fiber Reinforced High Performance Concrete With Silica Fume As Admixture‖ In the present investigation to explore the behaviour of Glass fibre in High Performance Concrete. To reach the set stated objectives of the present experiment, an aggregate binder ratio of 2.0 has been chosen and cement has been replaced Performance Concrete. Hardened Glass fibre Reinforced High Performance Concrete (GFRHPC) is evaluated for Compression, split tension and flexural strengths. The findings are very promising for the usage of Glass fibre in making High Performance Concrete..

5. **RAMA MOHAN RAO.P, SUDARSANA RAO.H, SEKAR.S.K, "EFFECT OF GLASS FIBER ON FLY ASH BASE CONCRETE", International Journal Of Civil And Structural Engineering Volume 1, No 3, 2010.Rama Mohan Rao.P,Sudarsana Rao.H, Sekar.S.K,**

Rama Mohan Rao.P, Sudarsana Rao.H, Sekar.S.K, –Glass fibre in varied volume fractions with 25% and 40% replacement of cement by fly ash has been employed to explore the effect on compressive strength, split tensile strength, and flexural strength of concrete in the present experimental examination. For each mixture, cubes, cylinders, and prisms of standard Indian sizes were cast and evaluated for compressive strength, split tensile strength, and flexural strength at ages 7, 28, and 56 days standardised to Indian requirements

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CONCLUSION

Based on the aforementioned research, we may deduce the following:

1. Fibre reinforcement improves the concrete's tensile and flexural strength.

2. we put in some 12 mm long AR-type (G1) glass fibre at a 0.5% addition. we put in some 12 mm long AR-type (G1) glass fibre at a 0.5% addition. It delivers 2.19% reduced strength comparison to control mix and 9.60% higher strength compared to other fibres.

3. The compacting factor values of the concrete fell as the percentage of RHA rose.

4. Compressive strength of concrete cubes is increased both at 7 days and 28 days when RHA (at 5% and 10%) or plastic fibres (at 1% and 2%) are used as 4. Compressive strength of concrete cubes is increased both at 7 days and 28 days when RHA (at 5% and 10%) or plastic fibres (at 1% and 2%) are used as replacements.

5.An increase in split tensile strength of concrete cylinders is observed after 7 and 28 days when 5% and 10% RHA or 1% and 2% plastic fibres are used as replacement.

6. The replacement of 15 % RHA and 3% plastic fibres reveals decrease in the compressive strength of concrete cubes at 7 days as well as at 28 days.

7. The splittensile strength of concrete cubes decreases both after 7 days and after 28 days when 15% RHA and 3% plastic fibres are substituted for the voids in the mix.

8. It was noted that concrete combining RHA and plastic fibre does not display rapid failure..

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