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Strength Evaluation of Coconut Shell Powder, Fa & Gfr Concrete

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Abstract. *The present day world is witnessing the construction of very challenging and difficult civil engineering structures. Quite often, concrete being the most important and widely used materials is called upon to possess very high strength and sufficient workability properties. Fibre to concrete can improve the tensile strength and ductility.These waste includes lot of materials like Flyash,recycle coconut shell powder to increase the strength Thus, fibre reinforcement concrete have been found to have significantly better crack resistance, ductility, shear strength, and energy absorption capability when compared to non-fibrous concrete. High performance fibre reinforced cementations composites have been engineered to satisfy various field performance requirements such as high durability or impact load resistance. In this research used M40 grade concrete for which Slump test was carried out for each mix in the fresh state. Chemical admixture type's super plasticizer is added along with GFRC in order to increase the tensile strength. The trial tests for concrete with glass fibre and without glass fibre are conducted in order to indicate the differences in compressive strength at 7 and 28days. The optimum mix proportional cast and tests the specimens such as cylinder and R.C.C Beam, Finally the results were compared theoretical as well as Experimental.*
Keywords: *Glass fibre, Compressive strength, Split tensile strength and Flexural Strength*
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1. INTRODUCTION

Glass Fiber Reinforced Concrete (GFRC) is a type of fiber reinforced concrete. Glass fibre reinforced concrete (GFRC) is a material made of a cementatious matrix composed of cement, sand, water and admixtures, in which short length glass fibres are dispersed. It has been widely used in the construction industry for non-structural elements, like façade panels, piping and channels. GFRC offers many advantages, such as being lightweight, fire resistance, good appearance and strengthen. GFRC is strength is derived from a high dosage of AR glass fibre along with a high dosage of acrylic polymer. Due to the low water to cement ratio GFRC compressive strength can be quite high. Tensile and flexible strength make itsuperior to normal concrete. This product will have high load supports while remaining flexible therefore no cracks are prevalent.GFRC derives its strength from a high dosage of E glass fibre. While compressive strength of GFRC can be quite high (due to low water to cement ratios and high cement contents), it is the very high flexural and tensile Strengths that make it superior to normal concrete. Essentially the high dose of fibers carries the tensile loads and the high polymer content makes the concrete flexible without cracking. GlassFibre Reinforced concrete (GFRC) is a recent introduction in the field of concrete technology. It has been extensively used in over 100 countries since its introduction in 1980's. This product is covered by international standards and has been practiced all over the world. GFRC has advantage of being light weight and thereby reducing the overall cost of construction there by bringing economy in construction. This work is only an accumulation of information about GFRC from all over the internet and some text books. GFRC is concrete that uses glass fibres for reinforcement instead of steel. It is typically cast in a thin section of around ½to ¾. Since the fibres cannot rust like steel, there is no need for a protective concrete cover thickness to prevent rusting. With the thin, hollow construction of GFRC products, they can weigh a fraction of weight of traditional precast concrete [1]. Natural and synthetic fibres are combined in the same matrix (unsaturated polyester) to make Sisal/Glass fibre hybrid composites and the compressive and impact properties of these hybrid composites were studied. A significant improvement in compressive and impact properties of Sisal/Glass fibre hybrid composites has been found. The Chalk powder (additive) is also added to the resin (unsaturated polyester) in proportions of 1%, 2%, 3% by weight of resin respectively and Sisal/Glass fibre hybrid composites were prepared by using this resin to study the effect of Chalk powder on compressive and Impact properties of these hybrid composites. mechanical

properties such as density, compressive strength, split tensile strength and flexural strength of Geopolymer Concrete Composites (GPCC) containing 90% Fly ash (FA), 10% Ordinary Portland Cement (OPC), alkaline liquid sand glass fibers. The effect of inclusion of glass fibers on the density, Compressive Strength, Split Tensile strength and Flexural strength of hardened GPCC was studied. Alkaline liquid to fly ash ratio was fixed as 0.4 with 10% of fly ash replaced by OPC in mass basis. Glass fibers were added to the mix in volume fractions of 1%, 2% and 3% by volume of concrete. The influence of fiber content in terms of volume fraction on the compressive strength, split tensile strength and flexural strengths of GPCC is presented. Based on the test results, empirical expressions were developed to predict split tensile strength and flexural strength of glass fiber reinforced GPCC in terms of its compressive strength[3].Fibre reinforced concrete (FRC) is Portland cement concrete reinforced with more or less randomly distributed fibres. FRC is cement- based composite material that has been developed in recent years. It has been successfully used in construction with its excellent flexural-tensile strength, resistance to spitting, impact resistance and excellent permeability and frost resistance. It is an effective way to increase toughness, shock resistance and resistance to plastic shrinkage cracking of the mortar. Fibre is a small piece of reinforcing material possessing certain characteristics properties. They can be circular, triangular or flat in cross-section. The fire is often described by convenient parameter called -aspect ratio. The aspect ratio of the fibre is the ratio of its length to its diameter. For FRC to be a viable construction material it must be able to compete economically with existing reinforcing system FRC composite properties, such as crack resistance, reinforcement and increase in toughness aredependent on the mechanical properties of the fibre, bonding properties of the fibre and matrix, as well as the quantity and distribution within the matrix of the fibres

2. PROPOSEDMETHODOLOGY

Inthisprojectwe are using M40 grade concrete burnt waste ash and coconut shell powder.and glass fibre reinforced concrete.to increase the tensile strength the materials used in the concrete is used to reduce the cracks,and reduce the permeabilityThe test is conducted in cube specimen split tensile strength test 150x150x150xmm and the mould are used for casting the concrete. The curing is done for 7, 14, 28 daysThe temperature of place of storage was within the range of 220 c to 32o c. After a period of 24 hours cubes were marked. After removing from the moulds, cubes were stored in clean potable water at a temperature of 240 c to 300 c until they were transported to the testing laboratoryThe flexural test the beam specimen is placed in the machine in such a manner that the load is applied to the upper most surface as cast in the mould .All beams are tested under two points in Universal testing machine of 60 tones capacity .The load is applied at a rate loading 10cm x10cm x50cm specimens. The load is increased until the specimen failed and the failure load is recorded.

3. EXPERIMENTAL WORK

The properties of fresh and hardened concrete such as workability, strength, youngs modulus andIn order to achieve the objectives set, data was collected from the field practices which are being followed in the building construction and from the factory manufacturing GRC. Data has been collected from different project sites and from different locations.As seen from table 5, the 7 days average compressive strength of concrete is maximum when 1.5 % of glass fibres are used. At lower or higher %, about 15% to 20% reduction in strength is observed nevertheless at 28 days, the reduction in strength reduced by 5% to 10%. 2) According to this result, increasing weight of glass fibre in normal concrete affects the cohesiveness between the particle of concrete and this results in degrading of compressive strength, flexural and tensile strength.Other type of data is related to experimental work at laboratory. Some test research on concrete with Glass fibre are collected so as to gain differences between them, when using different ratios of glass fibre. All materials should be thoroughly mixed, for (2- 3) minutes, before adding the glass fibres.

TABLE 1

WATER(L)	CEMENT(Kg)	FINE AGGREGATE (kg)	COARSE AGGREGATE (kg)
191.6	504.21	705.98	977.18
0.38	1	1.4	1.95

FIGURE1.

3.1 Cube Compressive strength: The cube testing was done by pleasing flat pads both top and bottom in compression testingmachine. The least count of compression testingmachine is 10 KN and its capacity is 200 ton. Ultimate load was noted and compressive strength calculated were presented in table

FIGUR2.

TABLE 2

Sl.No.	Specimens	@ 7 days (N/mm^2)	@ 28 days (N/mm^2)
1	CONTROL CONCRETE	29.92	47.96
2	0.5% Glass Fibre	30.50	52.30
3	1% Glass Fibre	34.56	56.50
4	1.5% Glass Fibre	37.50	61.80
5	2.0% Glass Fibre	35.50	60.40
6	2.5% Glass Fibre	32.45	52.58

FIGURE3.

The flexural strength is calculated from the equation. Fb = PL/bd2 When 'a' is greater than 20cms or Fb = 3Pa/bd2 When 'a' is less than 20cms but greater than 17cmsThe joints between the section of moulds are thinly coated with the mould oil to prevent adhesion of concrete to the mould surface.

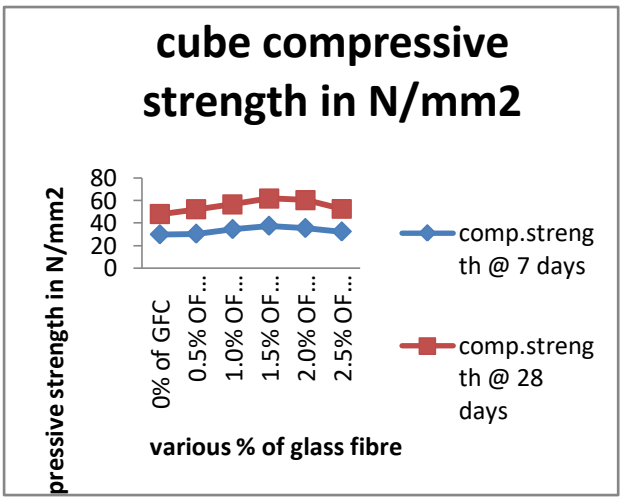

FIGURE4.

TABLE 3 Flexural strength and deflection of R.C.C Beam

Conventional Concrete (C.C)				Glass fibre reinforced concrete (GFRC)			
Ultimate Load KN	Flexural Strength N/mm^2	Deflection mm		Ultimate Load	Flexural strength	Deflection mm	
		experimental	theortical			experimental	Theortical
38	11.259	5.50	0.295	48	14.222	4.40	0.372
42	12.444	6.70	0.325	50	14.815	5.420	0.388
46	13.629	8.80	0.357	58	17.185	5.480	0.449

The least count of universal testing machine is 0.1KN/ division. And its capacity is 40ton

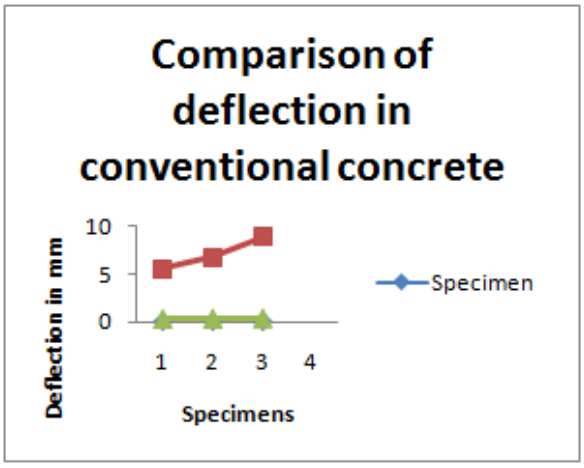

FIGURE5.

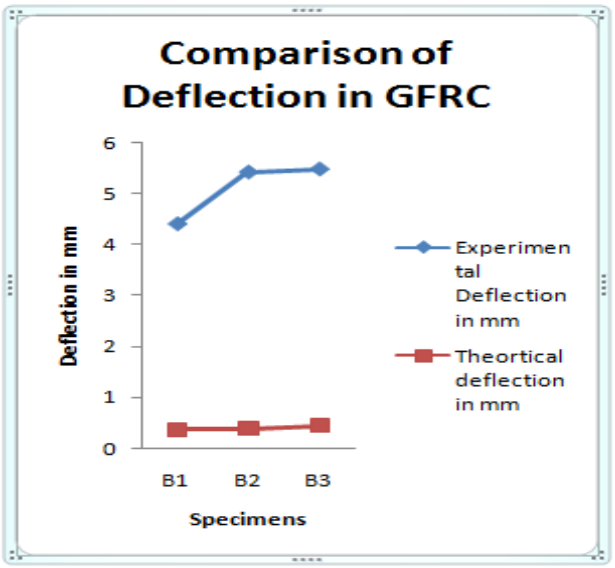

FIGURE6.

TABLE 4 Cylinder Deformation test using compress meter

Specimens	CONVENTIONAL CONCRETE(CC)						GLASS FIBRE REINFORCED CONCRETE					
	Ultimate load (KN)	Change in length (mm)	Avg Ulimate load (mm)	Avg Change in length (mm)	Direct Stress Mpa	Youngs Modulus (E) Mpa	Ultimate load (KN)	Change in length (mm)	Avg Ult Load (KN)	Avg Change in length (mm)	direct stress (Mpa)	E
S1	1800	0.5					1850	0.45				
S2	1750	0.45	1800	0.5	101.859	63.66 x 10^3	1800	0.40	1840	0.44	104.123	65.07 x 10^3
S3	1850	0.55					1870	0.49				

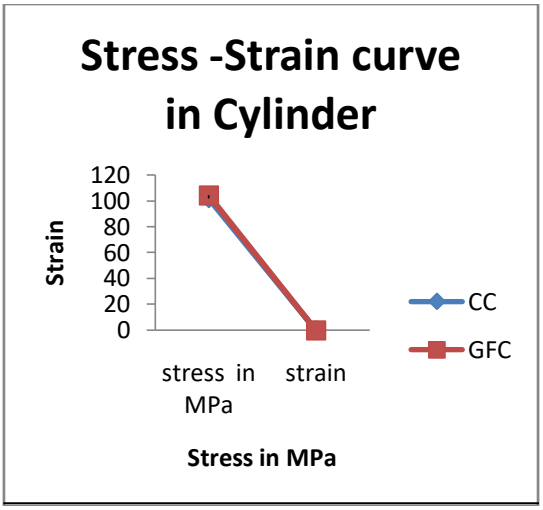

FIGURE 7. Stress-strain curve in cylinder

4. RESULT AND DISCUSSION

Compressive strength of cube specimens were casted at different percentage of glass fibre (0.5, 1.0, 1.5, 2.0, 2.5) and the optimum percentage glass fibre is obtained as 61.80Mpa at 28 days curing. The cube compressive strength of conventional concrete is 47.96 Mpa at 28 days curing. Based on the optimum compressive strength of cube the cylinders were casted and plot a stress-strain curve using compressometer. The stress and strain values for the conventional and the glass fibre reinforced concrete is 101.859 MPa ,0.00167 and 104.123Mpa , 0.00147. The optimum mix proportional the beam was casted and tested and obtained the deflection due to central point load. Finally the results were compared theoretical as well as Experimental.

5. CONCLUSION

The optimum compressive strength of cube is obtained as 61.80 at 28 days, it is 22.4% higher than the conventional concrete. The optimum mix proportional casted and tested the cylinder and then plots the stress-strain curve.The optimum mix proportional casted and tested the R.C.C beam and obtained the flexural strength, deflection due to central point load The deflection of conventional concrete and glass fibre reinforced concrete is 0.67 mm and 0.43 mm it is 35.32% lower than conventional concrete.Finally the results were compared theoretical as well as Experimental. In this research, producing high strength, durability and economical compared to other concrete

REFERENCES

1. Savinashgo rnale, s ibrahimquadri, s mehmoodquadri, syedmdakramali, syedshamsuddinhussaini. strength aspects of glass fibre reinforced concrete international journal of scientific & engineering research, volume3
2. v. nagaprasadnaidu, g.ramachandrareddy, m.ashokkumar, m.mohanreddy, p. noorunnishakhanam, s.venkatanaidu “international journal of fiber and textile research compressive & impact properties of glass fiber reinforced hybrid composites”
3. k.vijaia, r. kumuthaa and b.g.vishnurambasona “properties of glass fibre reinforced geopolymer concrete” asian journal of civil engineering vol. 13, pages 511-520
4. m.s.sheety (2008), ‘concrete technology’, multicolour illustrative edition. a.r. santhanakumar (2000). ‘concrete technology’, fourth edition.
5. m.l. gambhir, ‘concrete technology’, tatamcgraw – hill publishing company ltd, new delhi.
6. p.d. kulkarni, r.k. ghosh. r.phull, ‘concrete technology’,new age international private limited delhi.
7. badorulhisham bin abu baker, ayedamjadabduleazzak and jamehassado (2009), ‘tensile behaviour of steel fibre concrete’ international journal civil engineering.
8. parvizsouroushian. (1991), fibre ‘type effects on the performances of steel fiber reinforced concrete’, acimatrial journal.
9.vengatachalapathy. v, illangovan. r (2010), ‘ a study on steel fibre reinforced concrete beams with and without opening’. international journal of civil and structural engineering vol 2 pp.234