Comparative Study Of E-Glass Fiber And Oyster Shell Powder For Increasing Of The Compressive Strength

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Abstract- *This Project Explores the potential of integrating Natural Oyster Shell Powder with high strength E-Glass Fiber to fabricate a novel composite material. The motive behind this research is to reduce the mining for manufacturing of the cement. It is a biodegradable waste material abundant in coastal region and leveraging the superior mechanical characteristics of E-glass fiber. This combination of composition of materials yields to be lightweight, durable environmentally sustainable for wide range of application for hydraulic structure.This depletion of traditional construction materials and growing concern for environmental sustainability have led to the explosion of alternative materials in construction industries.*

Keywords- Oyster shell powder, E-glass fiber, Noval material, Calcium Carbonate microstructure,

I. INTRODUCTION

Oyster shell powder is the natural byproduct to mitigate environmental concerns in composite production. It isa special materialwhich hidden in the sea and a special creature. They are the carbon-foot print in the environment and using of this in the part of cement can enhance the deduction of the mining in ecosystem. Utilizing the coral shell, an abundant coastal waste material and it is a novel composite material with enhanced properties.

Glass fiber is the super tough and threads which enclosed the concrete to be stronger. It indicates the strong interfacial bonding with the material. It is superior mechanical characteristics of glass fibers. Its application is to adequate thermal stability for a range of temperature.

II. MATERIAL USED

2.1Cement:

The Pozzolana Portland cement 53 grade from Aditiya Birla cement is used in the study of investigation.

Fig -1: Cement

2.2 Coarse aggregate:

The coarse aggregate is used in the size 20mm.

Fig -2: Coarse aggregate

2.3 Fine aggregate;

The fine aggregate is used from the zone III.The river sand is used from the nearby location and sieved to remove the unwanted particles from them.

Fig – 3: Fine aggregate

2.4 Oyster shell powder:

The Oyster shell powder is used from the lion brand pH stabilizer Kerala agro care company.

Fig –4: Oyster shell powder

2.5 E-glass fiber:

The E- glass fiber is used from the local shop of Puducherry.

Fig -5: E-glass fiber

2.6 Water:

The water is used from the tap water as per the IS:456.-2000.

III. PROPERTY TEST OF MATERIAL USED

Table -1: Property test on cement

S.no.	Property	Value
1.	Specific gravity	2.45
2.	Consistency test	34
3.	Soundness test	3.26mm
4.	Fineness test	3.21%

Table -2: Initial test on coarse aggregate

S.no	Properties	Value
1.	Crushing value test	5.95%
2.	Impact value test	15.72
3.	Flakiness &elongation index test	28.14%
4.	Water absorption test	0.39%
5.	Specific gravity	2.76

Table-3: Initial test on fine aggregate

S.no.	Properties	Value
1.	Water absorption	0.80%
2.	Specific gravity	2.64%

Table-4: Initial test on E-glass fiber

S.no	Properties	Value
1.	Specific gravity	2.52

Table-5: Initial test on shell powder

S.no.	Properties	Value
1.	Specific gravity	2.53

IV. TRIAL MIX DESIGN FOR GRADE -35:

The mix design is referred from the Indian standard code books i.e., IS: 456 -2000 &10262 -2019.The trial mix of the concrete is to enhance and check the strength, workability and other properties of the mixes. It undertaken the result with adding the admixture in the concrete to increase the compressive strength.

It is the mix design based on the strength requirement of the concrete.
The M35 is the compressive strength for the 28days as 35 N\mm^2.
Normal mix design-1:0.5:1
Trial mix design -1:1.32:1.92

Table -6: Mix design specification

Material	2%mix	4%mix	6%mix
Cement	1.770kg	1.770kg	1.770kg
Sand	1.100kg	1.100kg	1.100kg
Aggregate	2.178kg	2.178kg	2.178kg
Coral powder	0.085kg	0.085kg	0.085kg
Admixture	0.100kg	0.195kg	0.292kg
W\Cratio	0.45%	0.45%	0.45%

V. FRESH CONCRETE TEST

5.1Compaction factor test;

The compaction factor test is conducted for the fresh concrete to determine the workability. A low compaction factor determines the better workability.

Compaction factor=weight of partially compacted factor\weight of fully concrete.

Table -7: Compaction value

Concrete mix	Compacted value
Normal mix	0.95(high)
2% E- glass fiber	0.80(low)
4% E- glass fiber	0.82(low)
6% E- glass fiber	0.85(low)

5.2Slump cone test;

The slump cone test is determined to identify the consistency of the concrete mix. In this process after each layer is compacted with a stand rod or tamping for proper settlement of the fresh concrete.

Table -8: Slump cone value

Concrete mix	Slump value	Slump shape
Normal mix	25cm	True slump
2% E-glass fiber	15cm	Shear slump
4% E-glass fiber	11cm	Collapse slump
6% E- glass fiber	10cm	Collapse slump

VI. CASTING

The casting involves the creating of the mold by using concrete and metal. This process involves the pouring of the materials in the mold in the cube.

This process is done for the overall for the 12-cube mix concrete.

VII. CURING

Curing is the period in which cube are get in constant temperature in the tank such as 20degree to 30degree. After 24 hours the mold is removed carefully without damaging the cube. Curing concrete cube for the 7days, 14 days & 28 days.

Table -9: Curing period

Concrete mix	Days	Curing date	Testing date
Normal Cube	7	19/3/24	26/3/24
	14	14/3/24	28/3/24
	28	13/3/24	26/3/24
2% admixture	7	17/3/24	24/3/24
	14	17/3/24	31/3/24
	28	17/3/24	14/4/24
4% admixture	7	22/3/24	29/3/24
	14	22/3/24	5/4/24
	28	22/3/24	19/4/24
6% admixture	7	24/3/24	31/3/24
	14	24/3/24	4/4/24
	28	25/3/24	21/4/24

VIII. HARDEN CONCRETE TEST

CTM stands for the compressive testing machine. It is used to determine the compressive strength of the cube concrete.

Compressive strength =load in Newton\Area of cube.

Table-10: Compressive strength of 7 days

Concrete mix	Compressive strength of 7days (N\mm^2)
Normal	22.33
2 % admixture	23.77
4 % admixture	25.86
6% admixture	**31.86**

Table -11: Compressive strength of 14 days

Concrete mix	Compressive strength of 14 days (N\mm^2)
Normal	28.66
2 % admixture	25.86
4 % admixture	30.53
6% admixture	**33.33**

Table -12: Compressive strength of 28 days

Concrete mix	Compressive strength of 28 days (N\mm^2)
Normal	34.96
2 % admixture	26.86
4 % admixture	31.97
6% admixture	**37.89**

Fig -6: Normal cube 28 days

Fig -7: Normal cube 28 days

Fig -8: 2% admixture &5% coral shell powder 28 days

Fig -9:2% admixture &5% coral shell powder 28 days

Fig -10: 4% admixture &5% coral shell powder 28 days

Fig -11: 4% admixture & 5% coral shell powder 28 days

Fig -12: 6%admixture &5% coral shell powder 28days

Fig -13: 6%admixture &5% coral shell powder 28days

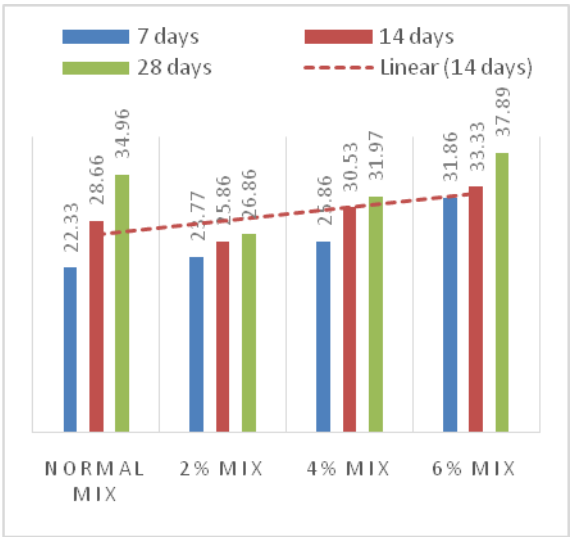

Chart -1: Comparative between compressive strength

IX. RESULT

The compressive strength for 28 days is increased by adding admixtures as 2%,4% &6% as 26.86 N\mm^2, 31.97N\mm^2, 37.89N\mm^2.

X. CONCLUSION

In conclusion, this project has demonstrated the potential incorporating oyster shells as a 5% replacement for cement and utilizing admixture as 2%, 4% & 6% to enhance concrete properties.

This study results highlight the increasing in the compressive strength in 28days and reveals the strength, workability and durability.

This project analyses the long-term economic benefits.

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