UTILIZATION OF BACTERIA CONCRETE WITH LOW CARBON EMISSION MATERIAL TO ENHANCE STRENGTH AND OTHER PROPERTIES OF CONCRETE

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Abstract— Industrial activities in India are associated with significant amounts of non-biodegradable solid waste, waste plastic being among the most prominent. Now a days polymer fiber disposal is an issue of major concern worldwide because plastic does not decay and therefore increasing in volume. A way to tackle this problem is to utilize this waste plastic. This alternative not only reduces the quantity of plastic waste but also conserves both material and energy and provides a comparatively simple way to make a considerable reduction in the overall volume of plastic waste. Disposal of polymer fiber in environment is a big problem due to its very low biodegradability and presence in large quantities. Plastic recycling was taking place on a significant scale in an India. As much as 60 % of both industrial and urban plastic waste is recycled which obtained from various sources. In recent time's use of such, glass fiber were studied as addition of a part of the conventional aggregates of concrete. This study involved experiments and tests to determine the efficiency of additions of waste plastic in the production of concrete. Waste plastic was used as a partial replacement for sand by 0%, 1%, 2%, 3%, and 4% with concrete mixtures. The concrete cubes were tested at room temperature. These tests include performing slump & compressive strength. This study insures that reusing waste plastic as a substitute for fine aggregate in concrete gives a good result to reduce the cost of materials and solve solid waste disposal problem.
Keywords— Concrete, PPC, Glass fiber, Compressive strength, Flexural Strength.

I. INTRODUCTION

Concrete is typically the most massive individual material element in the environment. If the incorporated energy of concrete can be reduced without decreasing the performance or increasing the cost, significant environmental and economic benefits may be realized. Concrete is primarily comprised of portland cement, aggregates and water.

The introduction of nanomaterials in cement mortars and concrete to improve their physical properties has been widely employed in modern concrete technology. The recent studies on nanomaterials and nanotechnologies have highlighted the probable use of these materials in various fields such as medicine, construction, automobile industry, energy, etc., this is due to the special appearances of materials at the Nano scale. Building materials domain can be one of the main beneficiaries of these investigations, with applications that will improve the characteristics of concrete, steel, glass and insulating materials. The use of nanomaterials in the configuration of some materials, such as cement, will result in major reductions of CO2

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pollution and the use of performance thermal insulations will result in efficient use of energy for air conditioning [1]. Presently, the use of nanomaterials in construction is condensed, mainly for the following reasons: the lack of knowledge about the design and implementation of the construction elements using nanomaterials; the reduced proposal of nanoproducts; the deficiency of detailed information concerning the nanoproducts content; great costs; the unknowns of health risks associated with nanomaterials.

II. GLASS FIBER

Glass reinforced cement consists of 4 to 4.5 % by volume of glass fiber mixed into cement or cement sand mortar. This glass reinforced cement mortar is used for fabricating concrete products having section of 3 to 12mm in thickness. Methods of manufacture vary and include spraying, casting, spinning, extruding, and pressing. Each technique imparts different characteristics to the product. Spray deposition constitutes a very appropriate and by far the most developed method of processing. In the simplest form of spray processing, simultaneous sprays of cement sane mortar slurry and chopped glass fiber are deposited from a dual spray gun into, or onto a suitable mould. Mortar slurry is fed to the spray gun from a metering pump unit and it is atomized by compressed air. Glass fiber is fed to a chopper and feeder unit that is mounted on the same gun assembly. The fibers are manufactured from Glass quarry products. The glass quarry products are melted in furnace, and then from the process of bushing, the fiber filaments will be obtained. These are best suited for application as renovating construction material for restoration of old heritage buildings and for architectural applications.

Figure 1: Glass Fibre Polymer grains

III. MATERIALS AND METHODOLOGY

Material Description

Cement, fine aggregate, coarse aggregate, and Glass fiber powder are the materials used in the projects to make concrete mixtures, and they are described in detail below:

3.1. Cement: Cement is the most important part of concrete since it acts as a binding medium for the various components. Natural raw materials are used, and industrial wastes are sometimes combined or ground together. This study made use of Pozzolana Portland cement (PPC).

Table 3.1 lists the properties of the cement used.

Table 3.1: Properties of cement

Properties	Value
Fineness of cement	2%
Specific gravity of cement	2.94
Initial setting time	110 min
Final setting time	180 min
Normal Consistency	32%

3.2. Fine Aggregate: This study proposal made use of fine aggregate from a sand river that was clean of any natural pollutants. The sand was mostly dry, with no additional material and a specific gravity of 2.6. The sand was transferred into a sieve with a mesh size of 4.75 mm. According to the IS criteria, the fine aggregate grading region was zone II. However, the physical, chemical, and thermal properties of aggregates are also being used to further explain the characteristics and performance of concrete.

Table shows the properties of the fine aggregate.

Properties	Value
S.G.	2.6
F.M.	3.75
W.A.	0.60%

3.3. Coarse Aggregate: Ground compounds are used for concrete production. They may be stone or gravel that is naturally present, eroded irregularly. Gross compounds are classified as gross materials to be held at a size of 4.75 mm. Up to 20 mm may be completed.

The properties of coarse aggregate are described in the table below.

Table 3.3: Properties of coarse aggregate

Properties	Values
S.G.	2.94
Size of Aggregates	20mm
F.M.	7.07
W.A.	0.22%

3.4 Water: When water reacts with cement in a chemical reaction, it plays a significant role in the construction of concrete. Because of the existence of water, the gel has a structure that helps to increase concrete quality. Water to mix can be just any regular drinkable water with no discernible taste or odour. Water from lakes and rivers that include aquatic life is often normally appropriate. Water used in the mixing and curing of alkallines, fats, additives, minerals, starch, raw materials, crop formation, or other hazardous substances in bricks, asphalt, and steel must be clean and free of harmful quantities. Drinking water is generally considered to be suitable for blending.

Table: 3.4 Mix Design of M20 Grade of Concrete acc. To IS:10262(2009) & IS 456(2000)

Addition of Glass fiber	Weight of Cement (kg/m^3)	Weight of Water (kg/m^3)	Weight of C.A. (kg/m^3)	Weight of F.A. (kg/m^3)

0%	360	180	1277	693
1 %	360	180	1277	693
2 %	360	180	1277	693
3 %	360	180	1277	693
4 %	360	180	1277	693

IV. RESULTS AND DISCUSSION

In this study, concrete casted cubes are subjected to a variety of tests to estimate their intensity and other properties. The primary goal of the inquiry is to maximize the concrete's proven strength after many research days of curing. In certain cases, proper casting and curing of concrete cubes can increase the strength of the concrete. Separate tests are conducted for three samples for each mix ratio and at the necessary curing days for this experimental investigation. The average values are then included in the study. The results of the experiments are listed in detail below:

4.1. Slump Cone Test

This examination is done to affirm the operability of new cast concrete. This test was done independently on new cast concrete before subbed the concrete with Glass fibers Powder so as to discover the functionality. The droop is exceptionally valuable for recognizing contrasts in the constancy of a mix of determined ostensible extents; it is a trial of the nature of the new concrete. This test is done not long after preparing of the solid. For this task, each test is led with 3 examples for every blend proportion and estimated at the fitting mending time. The composite qualities are then utilized for the requests. The test demonstrations are represented in more detail below:

Table 4.1: Slump value

% Addition of Glass fiber	Slump Value (mm)
0%	29
1%	28
2%	28
3%	27
4%	26

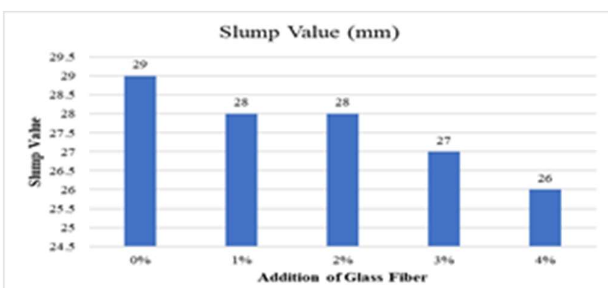

Figure 4.1: Slump Value of concrete mix

4.2. Compressive Strength Test

Compressive quality at first improves as the Glass fiber powder is applied, however it was considerably reduced as the Glass fiber powder is applied further. The impacts of different rates of the compressive force are summed up in Table 6. In this investigation, three-examples were tried for every blend, and the normal power is contrasted and the ostensible M20 blend. The compressive force discoveries in table 4.2 are seen at age 7, day 14 and day 28.

Table 4.2: Compressive Strength of Cubes

% of Addition of Glass fiber	Compressive Strength (N/mm²)		
	7 Days	14 Days	28 Days
0%	13.50	19.9	29.10
1%	15.12	20.21	29.90
2%	15.37	20.77	31.15
3%	16.71	22.83	32.27
4%	14.76	21.24	30.38

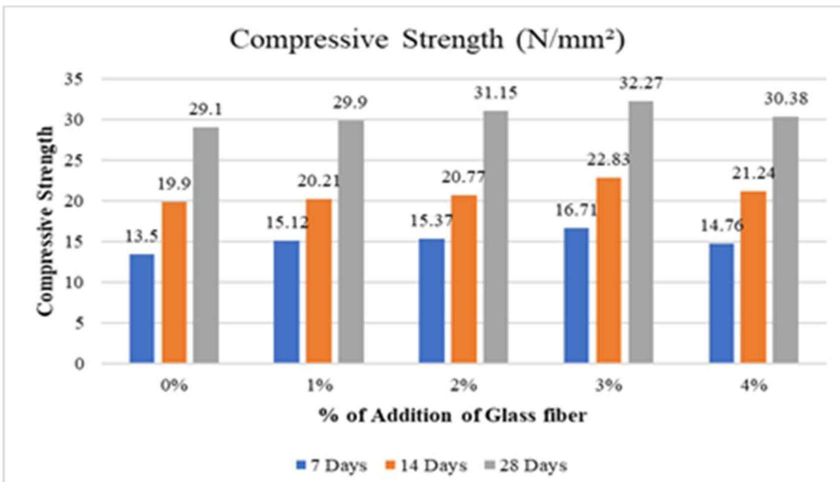

Figure 4.2: Compressive Strength of Concrete M20

4.3. Flexural strength

Up to 10 percent of the Glass fibers expansion was raised at 28th day relieving the flexural power esteems. The flexural quality qualities were decreased further with Glass fibers Material. The droop is valuable to recognize contrasts in the consistency of a mix of determined ostensible extents; it is a marker of the new solid 's quality. This test is done soon after the solid is made.

Table.4.3: Flexural Strength at 28 days

% Addition of Glass fiber	Flexural Strength (N/mm²)
	M-20
0%	7.14
1%	7.44
2%	7.98
3%	8.21
4%	7.76

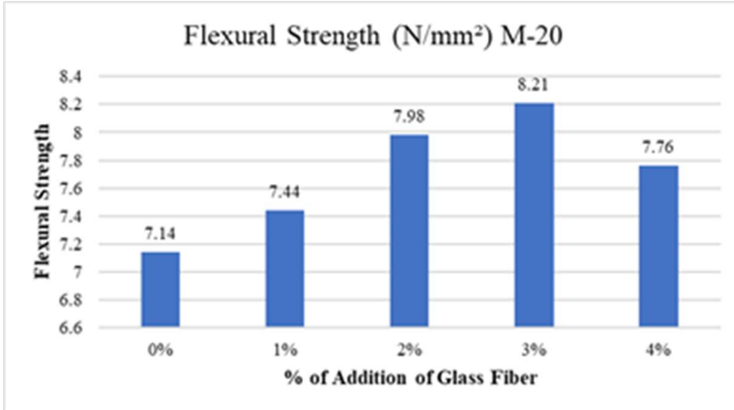

Figure 4.3: Flexural Strength at 28 Days

4.4. Determination of weight loss of treated and normal cube

Table 4.4: Weight loss percentage of cube

Initial weight of concrete in Kg	**Weight after 14 days in Kg**	**Weight after 28 days in Kg**	**% of weight loss in cube measured**	
			14 days	**28 days**
8.1	8	7.95	1.23	1.87
8.1	7.89	7.9	1.483	2.46

4.5.v Waste Management

Glass fibers Powder is used as a substitute for mortar in concrete. It is the waste product of Glass fibers developed in construction buildings or industries by surface finishing or tiling shaping. Safe treatment of this waste requires an expensive process which can add pollutants to the atmosphere. The building area is the only spot where you can conveniently use soil or sand from Glass fibers. Since it is used as a filler part of concrete it reduces noise emissions, space issues and therefore eliminates concrete costs. For this analysis, M20 grade concrete was packed, and tests were performed using waste Glass fiber powder as a addition for cement at 0%, 1%, 2%, 3%, and 4% in concrete ready with cement.

V. CONCLUSIONS

This section will present a conclusion outlining the main findings as well as possible recommendations for further research. This research has helped to identify factor causes of Glass fiber addition with cement in concrete.

- Addition of Glass fiber which is mixed in concrete material for strengthen the concrete.
- The Glass fiber particles from this report are waste of low-cost material that will help address the issue of solid waste disposal and protect the atmosphere from contamination.

- The use of Glass fiber Waste and its use for sustainable building industry growth is the most effective approach and tackles the high value use of such waste.
- The inclusion of Glass fiber Waste increases the concrete density while increasing the Self-weight.
- The compressive power of concrete content with a fractional addition of Glass fiber Waste in concrete up to 4 % can be equivalent to standard concrete.

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