EXPERIMENTAL STUDY AND ANALYSIS OF POLYPROPYLENE FIBER IN CONCRETE: A REVIEW

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Abstract: Nowadays, the advancement in technology increasing day by day, but also increasing environmental challenges. Due to the large amount of manufacturing, industry services, and municipal solid waste. The concrete now become an integral part of modern life. Plastic is an non biodegradable product that takes hundred of years to degrade. This plastic waste, used as a fine aggregate in concrete with 2,4,6,8%in proportion can be cost effective but also helps with the disposal of plastic waste. The reuse of recycled plastic waste in concrete is the best solution for the disposal of problem. Every year the demand of concrete is increasing. This increasing demand will disturb the availability and the need for the material. The concrete is prepared with a 2,4,6,8 percentage of fine aggregate plastic. As per IS 10262 2009 mix design code.

KEYWORDS*:* Shredded plastic, Recycle plastic, Comprehensive strength, Tensile strength.

1.INTRODUCTION: The rapid growth of urbanization and industrialization all over the world has had an impact on environmental problems. Concrete is the second most man-made material used in the construction industry after water. Today, sustainability is the most important factor at the top of the of the priority in the construction industry.

The increasing population of India has a significant impact on the increasing consumption of plastic polymer products, which is one of the most important challenges in environmental protection. Large amount of consumption of plastic waste and low amount of disposal or biodegradable in this manner have a harsh effect on the environment.

Solid waste management by landfilling has a significant impact on nature. Out of this, plastic waste is a significant part of solid waste management and is recycled, but the majority of post-consumer plastic waste, like shampoo shaches, carry bags, nicotine packs,milk packets, bottles, etc., is difficult to separate from household garbage. The disposal of waste plastic by landfilling in this manner has resulted in environmental hazards such as soil fertility, resulting in less water percolation emissions of toxic gases, poor drainage due to landfilling, pollution of groundwater, etc

2.RESEARCH SIGNIFICANCE : Plastic has become an integral part of today's life. It is a non- biodegradable material that takes thousands of years to degrade. The increasing amounts of plastic consumption and decreasing amounts of disposal quantities are impacting the environment. The large amount of plastic recycling and reusing required large quantities of manpower and cost. One of the new techniques for solid waste management disposal is to use concrete as a fine aggregate, which is the best way to disposal of plastic waste. The 3R method of disposing of plastic includes reduction, reusing, recycling, etc

3.OBJECTIVES OF STUDY

- To identify that plastic waste can be disposed of by using them as construction material.
- To compare of plastic fiber and their impact on workability, compressive strength, splitting tensile strength, and flexural strength of concrete.
- To examines the impact of replacing sand with plastic fiber in concrete.
- To analysis the plastic fiber in concrete with conventional concrete

4. LITERATURE REVIEW

4.1 Charudatta P. Thosar, Dr.M.Husain(2017)

The study investigated using recycled plastic waste to partially replace natural river sand in M20 grade concrete. After 28 days, the results showed that the partial replacement could be done up to 20%-40%, which is acceptable for civil industry construction purposes.

4.2 Shyam, Drishya (2018)

The study investigates the use of plastic waste as a construction material in concrete, comparing its strength and durability. Results show that the use of HDPE powder can reduce workability and increase compressive strength, flexural strength, and split tensile strength. The optimal percentage of HDPE powder replacement is 5%.

4.3 M.Guendouz, Farid Debieb (2016)

The study explores the use of PET and LDPE waste plastic as plastic waste and fine aggregates in sand concrete. The results show that plastic waste reduces bulk density, air content, and increases compressive and flexural strength, especially for 10% and 20% of replacement. This approach reduces materials costs and addresses environmental issues.

4.4 Saikia and Brito (2014)

The study examined the impact of recycled polyethylene terephthalate (PET) aggregate on concrete properties. The researchers replaced natural aggregate in concrete mixes with PET aggregates of different sizes and shapes. The results showed a decrease in concrete density and compressive strength. The interfacial transition zone in PET-containing concrete was weaker than in the reference concrete, resulting in a lower compressive strength.

4.5 RaghatateAtul M(2012)

In 2012, a study examined the use of plastic bags as fiber in concrete, adding fiber in various proportions. Results showed a reduction in compressive strength with increased plastic content, but increased tensile strength.He adds fiber in proportionof 0.2%, 0.4%, 0.6%, 0.8% and 1% by weight of concrete.

4.6 Elango A and Ashok Kumar(2018)

In 2018, a study conducte.d by r A found that using plastic fine aggregates in concrete, with proportions of 10%, 20%, and 30%, can improve mechanical and durability properties. Although the strength of the concrete decreased, it showed good resistance to acid attacks and increased elasticity. The study concluded that plastic aggregate concrete can be used for applications requiring less compressive strength but more durability.

5. PROBLEM STATEMENT

Now India has the largest population in the world, above 150 million. With this population, the country faces environmental problems such as managing solid waste. The country generates over 32 million tons of plastic solid waste per year. The waste can be disposed of in open areas, road sides, building sides, etc. Separation and utilization of this solid waste in the construction industry can become the best technique for solid waste disposal in concrete as a replacement of fine aggregate with plastic aggregate.

6. MATERIAL REQUIRED FOR EXPERIMENT WORK

6.1 AGGREGATE (fine and course)

Sand and coarse aggregate are two types of aggregate that are essential to the strength of concrete. River fine aggregate, which has particles no larger than 600 micrometers, is utilized, and testing uses maximum size of aggregate 10 mm and 20 mm coarse aggregate in accordance with IS: 383-1970

6.2 WATER

Water is most important component in the chemical reaction with cement and contributes to the strength development of concrete. It should be clean and free from undesirable organic and inorganic substances. In construction work, water plays a vital role in mixing and curing concrete, as per IS: 456-2000.

6.3 RECYCLED PLASTIC FIBER

This substance is strong, clear, hard, and water-absorbent, used in various construction materials like concrete, clay brick, soil-cement block, asphalt-concrete mixture, and mortar.

6.4 CEMENT

The project uses Cement as binding material, with OPC cement being suitable for normal concrete. The 53 grade OPC cement meets IS: 12269-1987 requirements, with a 3% fineness, 3.12 specific gravity, 31% standard consistency, and initial and final setting times of 60 and 250 minutes respectively.

7. METHODOLOGY

The research focuses on the use of recycled concrete as a coarse aggregate for concrete production. The study aims to determine the acceptable replacement of Plastic Aggregate (PA) in concrete. The project uses 20mm coarse aggregate, natural river sand, and plastic aggregate from tested cubes. Tests are conducted on aggregate specific gravity, bulk density, and sieve analysis. A mix design is produced based on these properties, with concrete produced with different percentages of PA.

Tests include slump of fresh concrete, compressive strength for hardened concrete, and testing at 7 and 28 days. Results are reported as an average. The engineering properties of PA were also compared to those of the reference concrete.It is casted in iron mould (150X150X150) mm.

The project uses natural river sand for concrete production, and plastic aggregate is used in crushed concrete from the tested cubes. The mix design is then produced based on the properties obtained from the tests. The slump of fresh concrete is also tested, and the compressive strength of hardened concrete is determined.

1.A literature study was conducted on the available data on the use of plastic fiber in concrete.

2.The collection of materials.

3.Test perform on material of concrete.

4. Selection of concrete grade.

5.Test samples are prepared by adding 0%,3%,4%,5%,6% of polypropylene fiber in concrete.

6. Compressive test, slump test, were conducted on concrete.

7. The proper proportion of fiber addition to concrete was identified

8. CONCLUSION

It was noted that plastic waste in concrete as a fine aggregate with 2%,4%,6%,8% had not minor effect on concrete on comprehensive strength and split tensile strength of the concrete. The maximum obtained at 4% of replacement of fine aggregate in concrete. The 2 to 4 Percentage of plastic aggregate replacement in concrete does not significantly changes the properties of concrete.

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