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Experimental Analysis on Use of Polypropylene in Concrete

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Abstract: ***Polypropylene may be a thermoplastic polymer utilized as a neighborhood of wide assortment of uses including bundling, materials (e.g., ropes, warm clothing and covers). Polymer cement may be a piece of gathering of cements that utilizes polymers to supplement bond as a canopy. Impregnated solid, polymer cement, and Polymer-Portland-bond concrete are the sorts incorporate polymers. To realize maximum strength of concrete by using optimum weight of polypropylene fibers is the aim of the study. Fiber ferroconcrete is employed during a sort of engineering applications due to its satisfactory and outstanding performance within the industry and construction field. Polypropylene fiber in concrete mix design is used for multiple purposes that include rigid pavement, self- compacting concrete and other applications. 40 cylinders of polypropylene concrete were casted and tested for 7 and 28 days' strength for both compressive and split lastingness. It was concluded that the many improvement was observed in ultimate compressive strength after 7 and 28 days. The optimum percentage of Polypropylene fiber was obtained to be 5 percent of cement by volume. The addition of bit of polypropylene improved the mechanical properties of concrete.***

Keywords: Polypropylene, Concrete, Fibers, Compressive Strength, Split Tensile Strength

I. INTRODUCTION

The concrete is one among the foremost widely used construction material in developed and developing countries. The concrete performance depends on its ingredients. It is documented that plain concrete is brittle and weak in tension. One of the objectionable characteristics of the concrete as a brittle material is its low lastingness, and strain capacity. Therefore it requires reinforcement so as to be used because the most generally construction material. For 40 years, steel Fibers are commonly utilized in concrete flatwork and sprayed concrete applications. The emergence of polypropylene Fibers has introduced to the planet the likelihood of getting a high-performance and less expensive product within the market place. Polypropylene fibers also possess better durability as plastic doesn't rust. It also contributes to the convenience in handling because it weight about one-fifth of the same steel fiber. Fiber–reinforced concrete is becoming an increasingly popular construction material thanks to its improved mechanical properties over unreinforced concrete and its ability to reinforce the mechanical performance of conventionally ferroconcrete. Fiber reinforcement is one among the foremost important modification methods to change the brittle nature of plain concrete. As resistance of cracking and strengthening of concrete, Fibers are generally used. In this paper an experimental study is made on the utilization of plastic waste in concrete cubes with addition percentage ranging from 0% to 3%. Polypropylene fiber is a synthetic fiber with low density, fine diameter and low modulus of elasticity. It has some special characteristics like high strength, ductility and sturdiness, abundant resources, low cost, and simply physical and chemical reformations consistent with certain demands. Thus it is often widely utilized within the field of concrete products. In this study, by measuring compressive strength, the influence of different amount of polypropylene fibers content on concrete properties was investigated.

A. Research Objectives

1) To study the resources of waste plastic.
2) To study the properties and behavior of waste plastic.
3) To use NAFTA admixtures to enhance the strength of concrete.
4) To check feasibility of concrete imbedded with waste plastic

B. Scope Of The Work

It has been observed that massive problem of disposal of waste plastic now days .so by using waste plastic as polymer in RCC we can improve quality of concrete. Tensile strength as well. Also reuse of waste plastic can be possible .Now a days due to high global consumption of natural sand and aggregate are being depleted so by using waste plastic we can reduce this consumption by some amount.

II. METHODOLOGY

The paper describes the details of experimental programs for the measurements of fresh properties, strength properties (compressive strength) of self-compacting concrete mixes made with varying percentages of polypropylene fiber. The basic tests carried out on concrete samples are discussed in this paper, followed by a brief description about mix deign and curing procedure adopted. At the end, the varied tests conducted on the specimens are discussed.

A. *Material Used*

The materials that were used for polypropylene fiber reinforced concrete (PFRC) throughout the experimental work are:

1) cement,
2) sand,
3) gravel,
4) water and
5) polypropylene fiber

B. *Mix Design*

The process of choosing suitable ingredients of concrete and determining their relative amounts with the target of manufacturing a concrete of the specified, strength, durability, and workability as economically as possible, is termed the concrete mix design. By the required performance of concrete the proportioning of ingredient of concrete is governed in 2 states, namely the plastic and the hardened states. If the plastic concrete isn't workable, it can't be properly placed and compacted. The property of workability, therefore, becomes of important importance. During the investigations, only cement was replaced by PP fibers keeping other mix design variables, like water–binder ratios, quality of ingredients, mix proportions, including the aggregate–binder and coarse–fine aggregate ratios, dosage of SP, mixing procedures, curing conditions and testing procedures, constant. Prepared by partial replacement of cement by equal weight of PP fibers, the experimental program included six sets of concrete mixes. The fibers dosages were 0%, 0.5%, 1.5%, 2.5%, 3.5% and 4.5% of the total cementations materials. For all the concrete mixes, the mixing procedure and time were kept constant.

C. *Mixing, Casting and Curing*

Before casting, the whole test specimen were cleaned and oiled properly. Before casting these were securely tightened to correct dimensions. Care was taken that there's no gaps left from where there's any possibility of leakage of slurry. Careful procedure was adopted within the batching, mixing and casting operations. With an accuracy of 0.5 grams the coarse aggregates and fine aggregates were weighed first. The concrete mixture was prepared. Initially, by dry mixing the coarse and fine aggregates were mixed thoroughly. To this mixture, the cement was added. These were mixed to uniform colour. Then water was added carefully in order that no water was lost during mixing and admixture was added alongside it. After proper mixing concrete is checked for fresh properties, if concrete mix fulfill the workability requirements then only it are often classified as Self-compacting Concrete and therefore the specimens are casted which consists of cubes (150x150x150) for 7, 14 and 28 days compressive strength.

D. *Tests on Concrete*

1) Compressive Strength test
2) Tensile Strength test
3) Flexural strength test

III. PERFORMANCE ANALYSIS

A. *Compressive Strength results*

Days	7Days	14Days	28Days
1st Case	17	24.65	34.02
2nd Case	15.18	24.98	29
3rd Case	11.92	19.48	24.76

B. Split Tensile test Result

Sample No.	Strength (N/mm2)
1st Case	5.78
2nd Case	4.83
3rd Case	3.81

C. Flexure Test Result

Sample No.	Avg. P (KN)	σ (KN/mm2)
1st Case	37.74	0.0126
2nd Case	39.13	0.0130
3rd Case	37.25	0.0124

IV. CONCLUSION

The use of polypropylene fibers has increased in recent years due to the property of the fibers to eliminate some defects in concrete.

A. The addition of PP fibers to concrete improves its mechanical properties.
B. The high tensile strength as a result of fibers can improve the capacity of the concrete and can control the volume changes with time.
C. From the study it is concluded that inclusion of PP fibers increased the compressive strength in 5% addition of fibers as compared to 7% addition of fibers.
D. Whereas, in split tensile strength after conventional concrete addition of 5% of fiber gives more result.
E. The optimum percentage of PP fibers was obtained both in compressive split tensile strength as 5% of Fiber.

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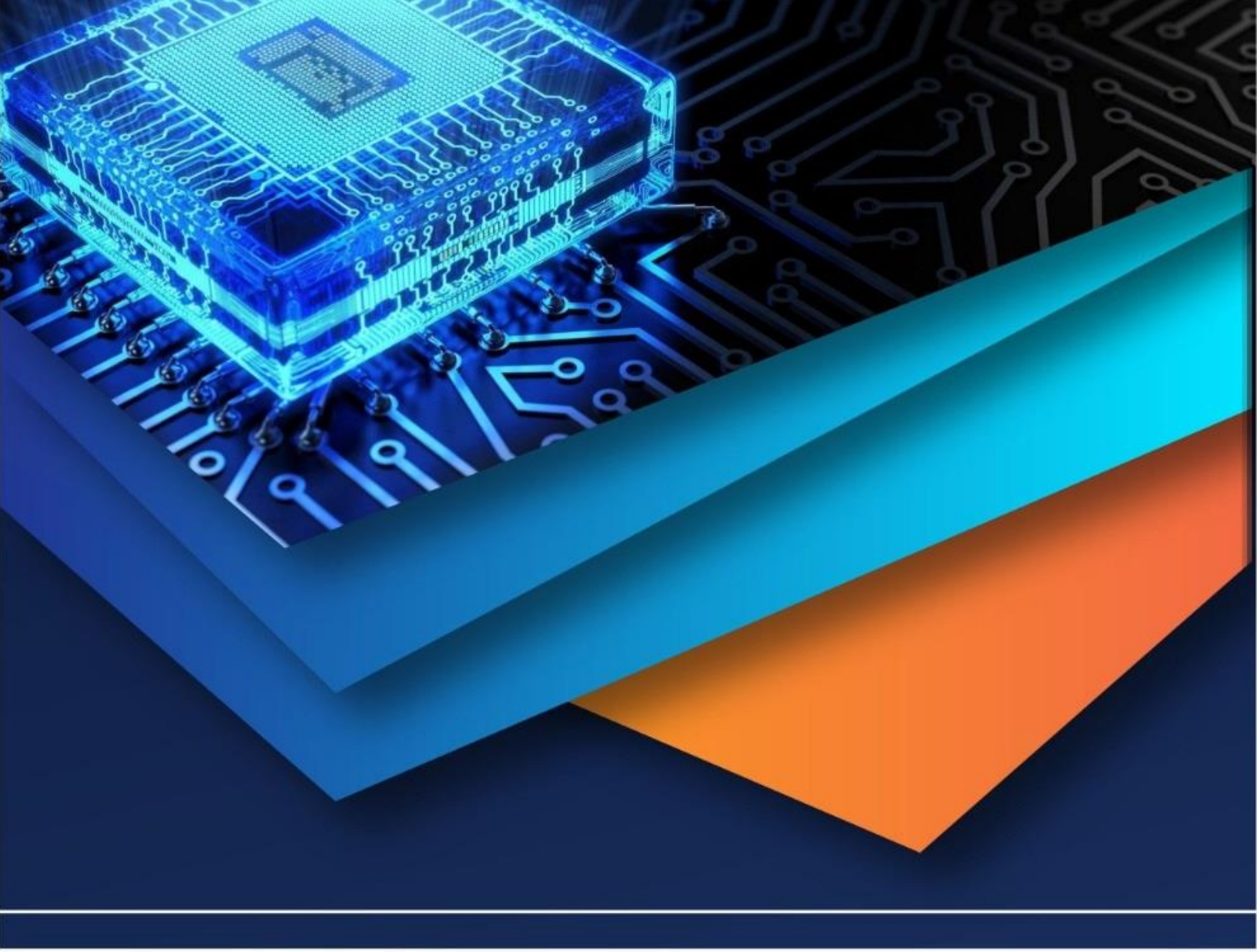

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