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# USE OF GEOSYNTHETIC MATERIAL IN CONCRETE FOR CONSTRUCTION

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**Abstract -** *For polypropylene - The capability of durable structure to resist weathering action, chemical attack, abrasion and other degradation processes during its service life with the minimal maintenance is equally important as the capacity of a structure to resist the loads applied on it. Although concrete offers many advantages regarding mechanical characteristics and economic aspects of the construction, the brittle behavior of the material remains a larger handicap for the seismic and other applications where flexible behavior is essentially required.*

*For polyester-*

*The importance of concrete in modern society cannot be overestimated. Look around you and you will find concrete structures everywhere such as buildings, roads, bridges, and dams and it is very difficult to find another material of construction as versatile as concrete. Concrete also has its some drawbacks, to overcome these deficiencies fibers can be used as secondary reinforcement. The present work deals with results of experimental investigation of effect of use of Recron 3S polyester fiber on compressive strength of concrete. This has resulted into casting, curing and testing of 27 cube specimen of size (150 X 150 X 150) mm*

*The results has been obtain as the is strength of polyester and polypropylene as compare to concrete is more. Also in this the compressive strength as polypropylene is more than polyester and split strength of polyester is more than polypropylene in duration of 7 and 28 days.*

***Key Words* - Concrete; aggregate; recron 3Sfibers**

## 1. INTRODUCTION

Plain concrete possess a very low tensile strength, limited ductility, and little resistance to cracking. Internal micro cracks are inherently present in the concrete and its poor tensile strength is due to the propagation of such micro cracks, eventually leading to brittle failure of the concrete.

The most widely accepted remedy to this flexural weakness of concrete is the conventional reinforcement with high strength steel. Restraining techniques are also used to. Although these methods provide tensile strength to members, they however do not increase the inherent tensile strength of concrete itself. Also the reinforcement placing and efficient compaction of RCC is very difficult if the concrete is of low workable especially in the case of heavy concrete. In plain concrete and similar brittle materials, structural cracks (micro-cracks) develop even before loading, particularly due to drying shrinkage or other causes of volume change. The width of these cracks seldom exceeds a few microns, but their two dimensions may be of higher magnitude.

When loaded, the micro cracks propagate and open up, and owing to the effects of stress concentration, additional cracks form in places of minor defects. The development of such micro crack is the main cause of inelastic deformation in concrete.

It has been recognized that the addition of small, closely spaced and uniformly dispersed geo-fibres to concrete would act as crack arrester and would substantially improve its and dynamic properties. This type of concrete is known as fibre reinforced concrete. Polypropylene fiber's do the same effect and perform better than any other fiber's.

Polypropylene Reinforced Concrete can be define as a composite material consisting of mixtures of cement, mortar or concrete and discontinuous, discrete, uniformly dispersed geo-fibres. Fiber reinforced concrete is concrete containing fibrous material which increases its structural integrity. It contains short discrete fibers that are uniformly distributed and randomly oriented. Fibres include steel fibres, glass fibres, synthetic fibres and natural fibres. Within these different fibres that character of fibre reinforced concrete changes with varying concretes fiber materials, geometries, distribution, orientation and densities. It is true that plain cement concrete possess a very low tensile strength.

## 1.1 POLYMER FIBER REINFORCED CONCRETE

Polymeric fibers are being used now because of their no risk of corrosion and also being cost effective (Sikdar et al, 2005). Polymeric fibers normally used are either of polyester or polypropylene. Polymer fiber reinforced concrete (PFRC) was used on two sites with ready mix concrete and vacuum dewatering process. When dewatered concrete it has no problem of water being coming out on surface during compaction process but when it is done over WBM, a lot of concrete water is soaked by WBM and thus the concrete loses the water to WBM and the water which comes out during dewatering/compaction process is not in same quantity as in case of lean concrete. It appears that it is better to provide base concrete than WBM as the base. The groove was made in one case before setting of concrete and also panels were cast with expansion joints in one direction. No cracks were observed in the direction in which expansion joints were provided assuming this is longitudinal direction. In lateral direction, no joints were provided and the width of such panel was about 12 m. It was later observed that cracks have developed in this direction.

### 1.2 Glass Fiber Reinforced Concrete

Glass fibre reinforced concrete is a type of fibre reinforced concrete. Alkali resistant glass fibers (AR glass) were then produced resulting in long term durability, but other strength loss trends were observed. Better durability result was observed when AR glass is used with a developed low alkaline cement And Glass fiber concretes are mainly used in exterior building façade panels and as architectural precast concrete. This material is very good in making shapes on the front of any building and it is less dense than steel. ''Glass fiber reinforced composite materials consist of high strength glass fiber embedded in a cementations matrix. In this form. Both fibers and matrix retain their physical and chemical identities. They produce a combination of properties that cannot be achieved with either of the components action alone. In general fibers there are the principal of load is carrying a members, while the surrounding matrix keeps them in the desired locations and orientation, acting as a load transfer medium between them, and protects them from environmental damage. In fact, the fibers provide reinforcement for the matrix and other useful functions in fiber reinforced composite materials. The most common form in which fiber reinforced composites are used in structural application is called a laminate. It is obtained by stacking a number of thin layers of fibers and matrix and consolidating them into the desired thickness. The fiber orientation in each layer as well as the stacking sequence of various layers can be controlled to generate a wide range of physical and mechanical properties for the composite laminate and The design of GFRC panels proceeds from a knowledge of its basic properties under tensile, compressive, bending and shear forces, coupled with estimates of behavior under secondary loading effects such as creep, thermal and moisture movement and there are number differences between structural metal and fiber reinforced composites. For example, metals in general exhibit yielding and plastic deformation whereas most fiber reinforced composites are elastic in their tensile stress strain characteristics.

**Table 1: Properties of Coarse Aggregates**

| Fineness modulus | Water absorption | Specific gravity | Impact value | Crushing value |
|---|---|---|---|---|
| 2.56 | 2% | 2.44 | 10% | 20.75% |

**Fig. No. 1 Polypropylene fibre**

**Fig. No. 2 Mesh geometry**

## 2. Strength parameters of concrete

### 2.1 Compressive strength for M20

In this point the comparison of compressive strength of various sets of fibre reinforced concrete were made by the results obtained after the 7 and 28 days curing of cubes in fresh water.

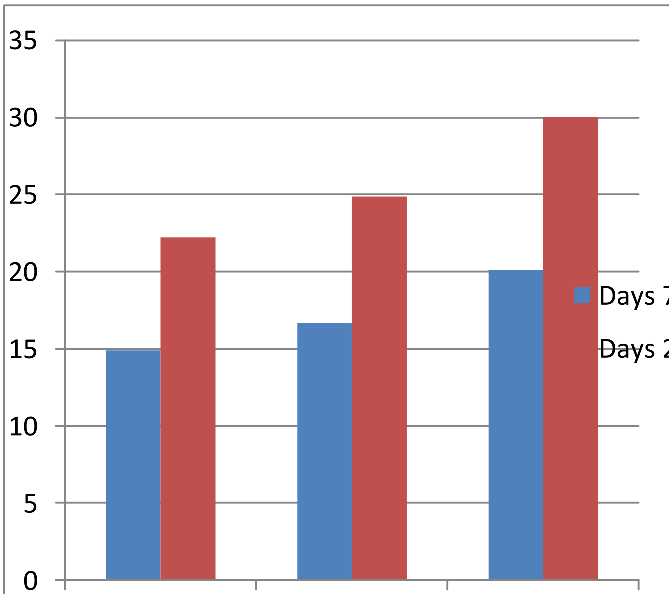
**For Cubes (MPa)**

**Table -2: Compressive strength for M20 (7 Days)**

| Sr.No. | Natural | Polyester | Polypropylene |
|---|---|---|---|
| **1** | 14.50 | 16.02 | 20.45 |
| **2** | 15.98 | 16.55 | 21.11 |
| **3** | 14.21 | 17.44 | 18.83 |
| **MEAN** | 14.9 | 16.67 | 20.13 |

**Table -3**: Compressive strength for M20 (28 Days)

| Sr.No. | Natural | Polyester | Polypropylene |
|---|---|---|---|
| **1** | 21.60 | 23.91 | 30.52 |
| **2** | 23.87 | 24.70 | 31.50 |
| **3** | 21.22 | 26.02 | 28.10 |
| **MEAN** | 22.23 | 24.87 | 30.04 |




**Graph No.1**

Table no. 1 and 2 shows that compressive strength of M20 grade concrete for 7 and 28 days resp. The strength of polyster and polypropylene is increase by 11.87% and 35.10% for 7 days and 28 days resp.

### 2.2 Split Tensile test for M20

In this point the comparison of Split Tensile test of various sets of concrete were made by the results obtained after the 7 and 28 days curing of cubes in fresh water.

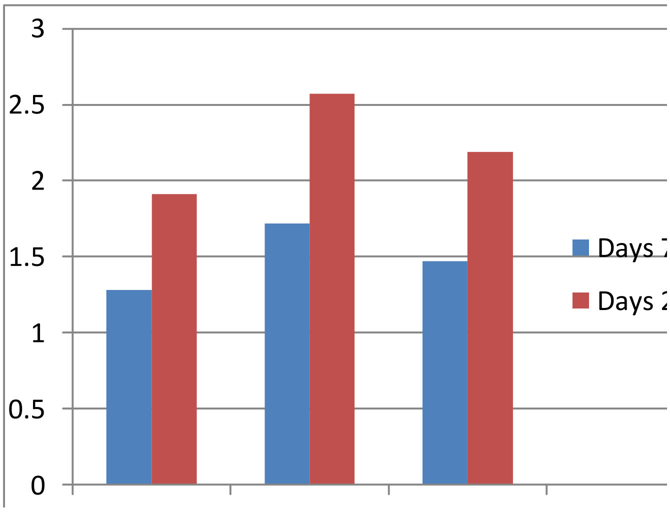
**For Cylinder (MPa)**

**Table -4**: Split Tensile test for M20

| Sr.No. | Natural | Polyester | Polypropylene |
|---|---|---|---|
| **1** | 1.27 | 1.53 | 1.42 |
| **2** | 1.30 | 1.95 | 1.40 |
| **3** | 1.28 | 1.70 | 1.60 |
| **MEAN** | 1.28 | 1.72 | 1.47 |

**Table -5**: Split Tensile test for M20 (28 Days)

| Sr.No. | Natural | Polyester | Polypropylene |
|---|---|---|---|
| **1** | 1.89 | 2.28 | 2.11 |
| **2** | 1.95 | 2.90 | 2.08 |
| **3** | 1.90 | 2.53 | 2.40 |
| **MEAN** | 1.91 | 2.57 | 2.19 |




**Graph No.2**

Table no. 1 and 2 shows that compressive strength of M20 grade concrete for 7 and 28 days resp. The strength of polyester and polypropylene is increase by 34.37% and 14.84% for 7 days and 28 days resp.

**Fig -1**: Split Tensile test on column

**Fig -2**: UTM Test

**Fig -3**: Polymer Fibre

## 3. CONCLUSIONS

1. The use of polypropylene fibres has increased in recent years, because the property of the fibres to reduce some defects in concrete. The addition of Polypropylene fibres use in concrete has improved its mechanical properties.
2. The high tensile strength as a result of fibres can control the volume changes with time. From the study it is concluded that inclusion of PP fibers increased the compressive strength by 11.87% and 35.10% after 7 days and 28 days respectively as compared to controlled samples.
3. Whereas, 34.37% and 14.84% increment was observed in split tensile strength after 7 days and 28 days respectively.
4. Due to increasing performances and effective cost-benefit ratio, the use of polypropylene fibers is recommended for concrete structures. PFRC is easy to place and finish.
5. Being synthetic there is no corrosion risk. The use of PFRC provides a safer working environment and improves abrasion resistance in concrete floors by controlling the bleeding while the concrete is in plastic stage.

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