USE OF PET FIBRE AS CONSTITUENT OF CONCRETE

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ABSTRACT

A fibre reinforced concrete is a mixture having the ingredient cement,sand,aggregate with PET Fibre. As we know that the fibercan not be decomposed.Development in the technology of preparing of concrete mix is necessary.So we are using the fibre as constituent of the concrete The concrete mix which is made with the use of fibre have high cement quantity and low water quantityThe fibre reinforced concrete carry more load as compare to the plain concrete. The concrete without fibre fail suddenly one the ultimate flexural strength exceed as compare to the fibre mixed concreteToday we requiredthe cost effective material which increase the concrete strength . Hence we are trying and doing research by addition of waste material like fibre. This paper gives the results of various strength of concreteKey Words: PET Fibres, workability, compressive strength, flexural strength, split tensile strength, bond strength

Keywords:-Concrete, Compressive, Cement-

1. INTRODUCTION

Concrete is a versatile material for construction. All ingredients of concrete are natural origin. India is developing country and needs high infrastructures such as air ports, dams, bridges highways etc. Concrete is the backbone for infrastructural development of whole world. The large amount of concrete is being utilized in constructing civil engineering structures.

2.POLYETHYLENE TEREPHTHALATE

Polyethylene terephthalate (sometimes written poly(ethylene terephthalate)), commonly abbreviated **PET**, **PETE**, or the obsolete PETP or PET-P), is a thermoplastic polymer resin of the polyester family and is used in synthetic fibers; beverage, food and other liquid containers; thermoforming applications; and engineering resins often in combination with glass fiber(1).

Depending on its processing and thermal history, polyethylene terephthalate may exist both as an amorphous (transparent) and as a semi-crystalline material. The semicrystalline material might appear transparent (particle size < 500 nm) or opaque and white (particle size up to a few microns) depending on its crystal structure and particle size. Its monomer (bis-ß-hydroxyterephthalate) can be synthesized by the esterification reaction between terephthalic acid and ethylene glycol with water as a byproduct, or by transesterification reaction between ethylene glycol and dimethyl terephthalate with methanol as a byproduct. Polymerization is through a polycondensation reactionof the monomers (done immediately after esterification/transesterification) with ethylene glycol as the byproduct (the ethylene glycol is directly recycled in production).(2)

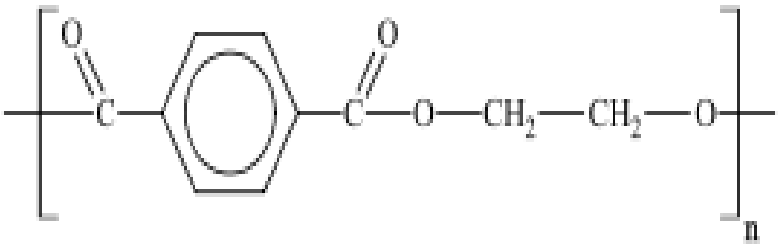

FIG1-CHEMICAL STRUCTURE OF POLYETHYLENE TEREPHTHALATE

PET consists of polymerized units of the monomer ethylene terephthalate, with repeating $C_{10}H_8O_4$ units. PET is commonly recycled, and has the number "1" as its recycling symbol

Density -1.38 g/cm^3

Young's modulus (E)- 2800–3100MPa

Tensile strength(σ_t)- 55–75 MPa

Molecular formula-$(C_{10}H_8O_4)_n$ [1](3)

3.Polyester Fiber Characteristics

- Strong
- Resistant to stretching and shrinking
- Resistant to most chemicals
- Quick drying
- Crisp and resilient when wet or dry
- Wrinkle resistant
- Mildew resistant
- Abrasion resistant
- Retains heat-set pleats and crease
- Easily washed(4)

4. Advantages of using plastics in concrete

The growth in the use of plastic is due to its beneficial properties, which include:

- Extreme versatility and ability to be tailored to meet specific technical needs.(6)
- Lighter weight than competing materials
- Transportation.
- Durability and longevity.
- Resistance to chemicals, water and impact.
- Excellent thermal and electrical insulation properties.
- Comparatively lesser production cost.

5. **Disadvantages of plastics**

The followings are the main disadvantages of using the plastics in concrete are as follows:-

- Plastics are having low bonding properties.
- Its melting point is low so that it cannot be used in furnaces because it gets melt as its comes in contact with the heat at high temperature.
- Construction cost is increased due to addition of fibers
- Skilled labour are required

It may block the pipe at time of pumping of concrete

6. PET FIBRES IN CONCRETE BLOCK PRODUCTION

Shredded PET were used as aggregate to produce concrete building blocks and with the alteration of mix ratios, compressive strengths varying from 6.89 N/mm2 to 26.05N/mm 2 were[4] achieved for the blocks, which were moist cured for 7, 14 and 28 days. These values indicated that the blocks are useful for moderate (6.89-8.27 N/mm2) and structural light weight concrete (>17.23 N/mm2)[4] usage such as floors in high–rise buildings (to reduce support load requirements), and as thermal and sound insulation in walls and roof panels (Kosmatka/PCA). The blocks were produced utilizing stones, shredded Polyethylene terephthalate (PET), sand and Portland cement and of course water. During the research, the unit weight and durability of the lightweight aggregate blocks were compared against that of the normal aggregate blocks containing gravel. The 101.6cm (four inch) thick specimens were moist cured for 7, 14 and 28 days. The unit weight and failure load measured for each block, were used to calculate density and compressive strength, respectively

to sum up, Blocks with PET replacement have following features as compared to conventional blocks:

1. Greater weather resistant due to chemically inert PET and HDPE;

2. Less stress or load on foundation (due to lighter blocks);

3. Economical foundation (since the stress on foundation is less)

4. Less manual labour in making blocks (mixture is lighter);

5. Less cost of transportation (due to lighter blocks);

6. Good sound insulation;

7. Variable strengths (dependent on size and nature of plastic aggregate);

8. Better shock absorption; and

9. Deduction in the dead load of concrete structure which allows the contractor to reduce the dimension of columns, footings and other load bearing elements

7. MATERIAL PROPERTIES

7.1 Cement

Cement is a fine, grey powder. It is mixed with water and materials such as sand, gravel, and crushed stone to make concrete. The cement and water form a paste that binds the other materials together as the concrete hardens. The ordinary cement contains two basic ingredients namely argillaceous and calcareous. In argillaceous materials clay predominates and in calcareous materials calcium carbonate predominates.

Grade 43 Ultra Tech cement conforming to IS 1489 (Part 1) – 1991 was used for casting specimen for all concrete mixes. The cement was of uniform colour i.e. grey with a light greenish shade and was free from any hard lumps

7.2 Fine Aggregates

The sand used for the experimental programme was locally procured and conformed to Indian Standard Specifications IS: 383-1970. The sand was first sieved through 4.75 mm sieve to remove any particles greater than 4.75 mm and then was washed to remove the dust

7.3 Coarse aggregates

The broken stone is generally used as a coarse aggregate. The nature of work decides the maximum size of the coarse aggregate. Locally available two sizes of coarse aggregate having the maximum size of 25 mm (A1) and 12.5 mm (A2) were used in our work. The aggregates were tested as per Indian Standard Specifications IS: 383-1970.

7.4 PET bottles in fiber form

PET bottles fiber were used for reinforcing concrete specimens. The waste PET bottles were made available from local area of Nashik city. These bottles were shredded into fiber form with the help of scissors. The sizes of fibers were fixed to 1 mm wide and 15 mm long

7.5 Water

Generally, water that is suitable for drinking is satisfactory for use in concrete. Water from lakes and streams that contain marine life is also suitable. When water is obtained from sources mentioned above, no sampling is necessary. When it is suspected that water may contain sewage, mine water, or wastes from industrial plants or canneries, it should not be used in concrete unless tests indicate that it is satisfactory. Water from such sources should be avoided since the quality of the water could change due to low water or by intermittent discharge of harmful wastes into the stream. In the present experimental programme, potable laboratory tap water is used for casting specimens.

8. EXPECTED CONCLUSIONS

1. Plastics can be used in a concrete mix. This contributes to reducing the unit weight of the concrete. This is useful in applications requiring nonbearing lightweight concrete, such as concrete panels
2. When the polyethylene terephthalate (PET) bottle fibers mixed in concrete, the slump and compaction factor should reduced at higher percentages of fibers.
3. The shear strength at 28 days should be increased continuously with increase in fibre content
4. The bond strength at 28 days should be increased continuously with increase in fibre content
5. As we introduce PET bottle fibers in concrete, they should help to hold concrete ingredients united.

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