"A STUDY ON USE OF POLYMERIC WASTE MATERIALS IN CONCRETE FOR RIGID PAVEMENTS"

Submitted in partial fulfilment of the requirements

for the degree of

Bachelor of Engineering

By

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CERTIFICATE

This is to certify that the project entitled **"A STUDY ON USE OF POLYMERIC WASTE MATERIALS IN CONCRETE FOR RIGID PAVEMENTS"** is a bonafide work **Saifuddin Mohiuddin Ansari (16DCE61), Shrvan Naresh Salge (16DCE81), and Mohammad Danish Mohd. Yusuf (13CE34)** submitted to the University of Mumbai in partial fulfilment of the requirement for the award of the degree of "Undergraduate" in "Civil Engineering.

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This dissertation report entitled "A STUDY ON USE OF POLYMERIC WASTE MATERIALS IN CONCRETE FOR RIGID PAVEMENTS" by **Saifuddin Mohiuddin Ansari (16DCE61), Shrvan Naresh Salge (16DCE81) and Mohammad Danish Mohd. Yusuf (13CE34)** is approved for the degree of "Civil Engineering"

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Place: Panvel

DECLARATION

I declare that this written submission represents our ideas in our own words and where other ideas or words have been included, I have adequately cited and referred the original sources. I also declare that we have adhered to all principles of academic honesty and have not misinterpreted or fabricated or falsified any idea/data/fact/source in our submission. I understand that any violation of the above will cause for disciplinary action by the institute and can also invoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

Concrete is strong in compression but weak in tension and brittle also. Cracks also start forming as soon as the concrete is placed. These 3 drawbacks don't permit the use normal concrete in pavements as they lead to lack of ductility along with fracture and failure. These weaknesses in concrete can be mitigated by using fibers as reinforcement in the concrete mix. Waste materials in the form of polypropylene cause environmental pollution which leads to various health problems. Polypropylene can be recycled and used effectively in the concrete as reinforcement in the fiber form.

Polypropylene is a synthetic hydrocarbon polymer which can improve the ductility, strength, shrinkage characteristics etc. This paper deals with the effects of addition of polypropylenefiber on the properties of concrete. Polypropylene is used 1.5% and 3% by volume. Grade of concrete used were M25. IRC 44:2008 was followed for the design of concrete mix. In this study, the results of the Strength properties of polypropylene fiber reinforced concrete have been presented by various tests.

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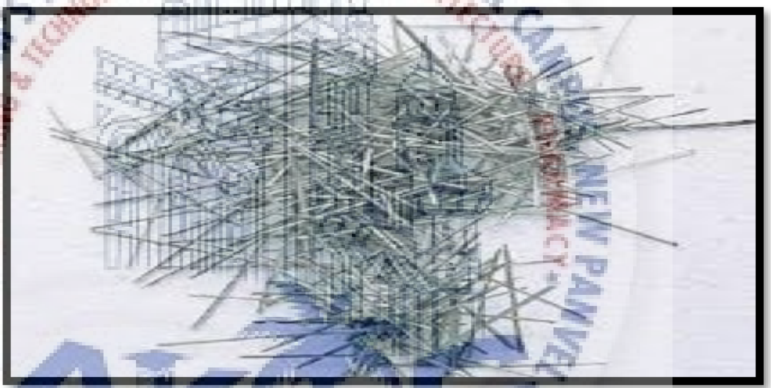
Chapter 1

Introduction

1.1 General

For a developing nation such as India, road networks play a crucial role in providing a durable and comfortable surface for vehicles. Pavements are mostly made using bitumen. However, in certain situations concrete pavements are also preferred. Many additives have been explored for beneficial use of concrete as a paving material. A recent research has shown that fibre reinforced concrete (FRC) can be used for the construction of pavements as it is found to be very good in strength and it also exhibits other desirable properties. The definition of FRC given by ACI Committee 544 is “fibre reinforced concrete is a concrete which is made of cements containing fine and coarse aggregates along with water for obtaining cementious properties and discontinuous fibres”. The fibres used are of various types such as steel fibres, polymer or natural fibres etc. As said earlier, fibre reinforced concrete is that form of concrete where fibres are put into the concrete as reinforcement in order to increase the strength characteristics and other mechanical properties of the concrete. Fibre reinforced concrete is not just provided for local strengthening in tensile region but it is provided for obtaining a gain in compression and tension along with reduced deflections and shrinkage and increased ductile property. Apart from the above mentioned properties, polymeric fibres also help in corrosion reduction. Commonly polyester and polypropylene have been used for the purpose of FRC. Recently, other forms of recycled fibres like plastic, disposed tires, carpet waste and wastes textile industry are also being adopted for the same purpose.



Steel fibre (Source: Google images)

Basic function of these fibres is to act as crack arresters. Fibres help in resisting the minor cracks and would not let them grow into macro cracks. Hence, the material transforms into a material with improved ductility and toughness to failure Since it has been established that fiber introduced concrete has the property of obtaining extra strength in flexure, compression, fatigue and impact, it can successfully be reinforced in concrete to get more strength as a whole and use it for pavements as concrete in itself is weak in tension and impact. Fibers in combination with concrete also results in a mix with improved early resistance to plastic shrinkage cracking, reduced water absorption, greater impact resistance, enhanced flexural strength and tensile strength of concrete and thereby protects the concrete from drying shrinkage cracks.

1.2 Use of Waste polypropylene

Plastics are very strong and non-biodegradable in nature. The chemical bonds in plastics make it extremely sturdy and impervious to ordinary common techniques of degradation. The daily use of plastics has increased very rapidly and it has become a common habit of people to just throw out the plastic and causing environmental pollution. Over 1 billion tons of plastic have been produced since 1950s, and the same is likely to remain as such for many years. These wastes get mixed with MSW or they are simply thrown causing nuisance to the society. There is a big need of recycling of the plastics as well waste tires because we don't have any other option of disposing them without securing environment from pollution. For example, there are two processes for the disposal of wastes: land filling and incineration. If the wastes are simply dumped, they cause soil and water pollution and if they are incinerated, they cause air pollution. Hence, there is a need to recycle the wastes into something useful which will not hamper the environment and the process in which it is used.

1.3 Objectives

The present work is aimed at using polymeric waste materials, such as polypropylene Fibres in reinforcement in concrete pavement. The basic objective of this work is to assess the advantages of using such waste materials such as to increase in compressive, flexure and shear strength and decrease in deflection characteristics of the resultant concrete and also the determination of the deflection in the laboratory testing then its comparison to the theoretical deflection and check whether the errors are in the permissible limits of 20%.

The main goal of the study is to utilize waste materials polypropylene to achieve greater concrete strength properties in order to recycle them into something very useful and helping in reducing the environmental impact that the both of them have.

1.4 Polypropylene Fiber:

Polypropylene is a polymer. Many no. of ethylene monomers join with each in the synthesis of polypropylene polymer. Polypropylene mono filaments were produced commercially on a small scale by conventional melt extrusion and drawing of polymers made by the high-pressure type of polymerisation process, starting during World War II. Polypropylene is a hard, stiff, strong and a dimensionally stable material that absorbs very little water. It has good gas barrier properties and good chemical resistance against acids, greases and oils. It can be highly transparent and colourless but thicker sections are usually opaque and off-white. Polypropylene also has good self extinguishing properties and resistance against ultra violet. Polypropylene is obtained by the polymerization of ethane. Cationic coordination polymerization, anionic addition polymerization, radical polymerization and ion polymerization are the different methods by which polypropylene can be produced. Every method gives different types of polypropylene. Mechanical properties of Polypropylene depend on the molecular weight, crystal

It’s a manufactured fiber made of polymerized polypropylene units. It is often a monofilament, but is also available as continuous filament yarns and as staple fiber. Polypropylene yarn cannot be dyed. It is colored by the addition of pigments and dyes to the melt at extrusion. Polypropylene can be created in several different forms. The structure is determined by the amount of branching of ethylene polymer units on the main chain. The less branching the higher the density and stronger the fiber. Typical nomenclature for polypropylene (PE) includes low density PE (LDPE), medium density PE (MDPE), high density PE (HDPE), and ultra high molecular weight PE (UHMWPE).

1.4.1 Properties:

1. Low specific gravity (floats on water): Polypropylene fibre has a round cross section and has a smooth surface. Fibres made from low molecular weight polypropylene have a grease like handle.

2. Extremely low moisture regain: The moisture regain of polypropylene is practically nil and hence moisture does not affect the mechanical properties of the fibres

3. Quick drying: Higher energy is needed to break because of specific modulus and high specific strength

4. Mildew and insect resistant: Polypropylene is insoluble in most of the common organic solvents at room temperature.

5. Chemical resistant: Polypropylene fibres have a high degree of resistance to acids and alkalis at all concentrations even at high temperature.

6. Abrasion resistant: Very good abrasion resistance.

Other Properties

- Specific Gravity- 0.92

- Tenacity - 1.0-1.5 gpd
- Elongation at Break %- 45-50
- Tensile Strength psi - 15000
- Softening Range: deg C- 85-90

1.4.2 Applications

1. Medical implants
2. Cable and marine ropes
3. Sail cloth
4. Composites like Pressure vessel boat hulls, sports equipment, impact shields
5. Fish netting
6. Concrete reinforcement
7. Protective clothing
8. Can be used in radar protective cover because of its low dielectric constant
9. Can be used as a lining material of a pond which collects evaporation of water and containment from industrial plants
10. Useful in geotextile applications

1.4.3 Polypropylene Manufacturers:

1. Reliance Industries Ltd.
2. Fiber Group, Inc.
3. Fibra S/A
4. Steen & Co. GmbH

5. Kemex BV

1.4.4 Sample polypropylene applications:

1. Geotextiles
2. Outdoor furniture
3. Industrial
4. Filter fabric

(Source: Google images)

Chapter 2

Literature Review

2.1 General

Fibre reinforced concrete (FRC) is made by mixing polymer fibres into a conventional concrete mix. The definition of FRC given by ACI Committee 544 is "FRC is a concrete which is made of cements containing fine and coarse aggregates along with water for obtaining cementious properties and discontinuous fibres."

2.2 Review of Literature

There is a need of improvement in the quality of the pavements as the steady increase of wheel loads, change in climatic conditions; tire pressure & daily wear and tear adversely affect the performance of vehicles over the pavement. Synthetic polymer fibres can be used to overcome the above mentioned problems which are faced in daily life. Modifying the concrete with the polymers can improve the crack arresting capability, fatigue life and many other mechanical prospects of pavement.

2.3 Types of fiber reinforced concrete

ACI has divided fiber reinforced concrete into 4 categories namely SFRC, GFRC, SNFRC and NFRC. Here SFRC means steel fiber reinforced concrete, GFRC stands for glass fiber reinforced concrete, SNFRC is synthetic fiber reinforced concrete and NFRC is an acronym for natural fiber reinforced concrete. There are also discussed many theoretical and practical insights about different design applications and physical and mechanical properties [1]. Another method of classification was adopted by Cement and Concrete Institute in which fibers are divided into thefollowing types, glass fibers, steel fibers, synthetic fibers and natural fibers.

2.4 Synthetic fibers

Synthetic fibers include polypropylene, polypropylene, acrylic, carbon, aramid, nylon, polyester etc. Synthetic fibers can be further classified into macro-fibers and micro-fibers. Both of these subtypes have different properties with respect to each other. We are using polypropylenefiber.

2.5 Fiber properties

The effect of all types of fibers has been studied by many researchers. They have studied the physical properties along with mechanical properties of concrete. But there hasn't been done much research on polypropylene fiber reinforced concrete and waste tire fiber concrete. The knowledge regarding these fibers as a reinforcement in concrete is limited. The way fibers are distributed in the concrete significantly affects the properties of FRC. It was found out in a study that the fibers which are of higher volume fractions and longer in size showed balling at the time of mixing. This leads to stiffening of the concrete paste. When the volume fractions of fibers are increased, it further leads to a reduction in workability. This will in turn have an impact on the mechanical properties of concrete and its quality. Synthetic fibers are used mainly to control cracking and plastic shrinkage.

2.6 Fracture Toughness

Under a static, dynamic or impact load, the energy absorption capacity of material is measured through fracture toughness. Post-cracking behaviour of concrete beam is checked at mid span by determining the deflection for fracture toughness. There have been made many studies over the effects of toughness on fiber type, dosage, properties, and bonding conditions. These affects can further be found in ACI 544 and other literatures are also available. Conventional reinforcement such as steel is provided in the concrete because it fails in tension. Similarly, due to very good ductile and toughness properties fibers can also be induced into the concrete as reinforcement in order to improve the tensile resisting capacity of the concrete by redistributing the stress concentration. Studies done on concrete to understand this stress redistribution result that crack surface is the surface in the concrete matrix where fibers restrain cracks. There are 3 regions of stress redistribution which are - traction free zone where much larger crack openings are found with respect to the other zones, fiber 6 bridge zone where frictional slip of fiber is responsible for stress transfer and micromacro crack growth zones where interlock between aggregates is found to have transfer the stress.

2.7 Summary

As, the study of various types of fibre Concrete, its gives an idea about use of different types of fibres in concrete and its proportion to give Optimum Results for Achieving Economic Conditions

Chapter 3

Materials and Methodology

3.1 General

The basic materials which compose concrete are:

1. Water
2. Cement
3. Fine aggregate
4. Coarse aggregate
5. Polypropylene Fibre as an Extra material

3.2 Materials

3.2.1 Polypropylene fiber

Polypropylene fiber are light weight and provide strength to concrete it also provide resistance to crack formation on surface it has low specific gravity because of its low specific gravity, polypropylene yields the greatest volume of fiber for a given weight. This high yield means that polypropylene fiber provides good bulk and cover, while being lighter in weight. Polypropylene is the lightest of all fibers and is lighter than water. It is 34% lighter than polyester and 20% lighter than nylon.

3.2.2 Resistant to Bacteria and Micro-organisms

Like other synthetic fibers such as nylon, acrylic and polyester. Polypropylene fibers are not attacked by bacteria or micro-organisms; they are also moth-proof and rot-proof and are inherently resistant to the growth of mildew and mold.

3.3 Methodology

Initially We are testing various ingrediants of concrete To inspect whether it is fit for duing Further Work

3.3.1 Slump cone test

A slump test is a method used to determine the consistency of concrete. The base is placed on a smooth surface and the container is filled with concrete in three layers, whose workability is to be tested. Each layer is temped 25 times with a standard 16 mm (5/8 in) diameter steel rod, rounded at the end. When the mold is completely filled with concrete, the top surface is struck off (levelled with mould top opening) by means of screening and rolling motion of the temping rod. The mould must be firmly held against its base during the entire operation so that it could not move due to the pouring of concrete and this can be done by means of handles or foot - rests brazed to the mold. Immediately after filling is completed and the concrete is levelled, the cone is slowly and carefully lifted vertically, an unsupported concrete will now slump.

The decrease in the height of the center of the slumped concrete is called slump.

The slump is measured by placing the cone just besides the slump concrete and the temping rod is placed over the cone so that it should also come over the area of slumped concrete. The decrease in height of concrete to that of mold is noted with scale. (usually measured to the nearest 5 mm (1/4 in).

The mold for the slump test is a frustum of a cone, 300 mm (12 in) of height. The base is 200 mm (8in) in diameter and it has a smaller opening at the top of 100 mm (4 in).

3.3.2 Specific gravity and water absorption test of Aggregates

(IS : 2386 - PART -3)

Introduction

The specific gravity of an aggregate is considered to be a measure of strength or quality of the material. The specific gravity test helps in the identification of stone. Water absorption gives an idea of strength of aggregate. Aggregates having more water absorption are more porous in nature and are generally considered unsuitable unless they are found to be acceptable based on strength, impact and hardness tests.

Objective

To determine the specific gravity and water absorption of aggregates by perforated basket.

Apparatus

1. A wire basket of not more than 6.3mm mesh or a perforated container of convenient size with thin wire hangers for suspending it from the balance
2. A thermostatically controlled oven to maintain temperature of 1000 to 1 10°C.
3. A container for filling water and suspending the basket.
4. An airtight container of capacity similar to that of the basket
5. A balance of capacity about 5 kg, to weigh accurate to 0.5 g, and of such a type and shape as to pernit weighing of the sample container when suspended in water.
6. Shallow tray and two dry absorbent clothes, each not less than 750 X 450 mm.

Procedure

About 2 kg of the aggregate sample is washed thoroughly to remove fines, drained and then placed in the wire basket and immersed in distilled water at a temperature between 22 to 32°C with a cover of at least 50mm of water above the top of the basket. Immediately after immersion the entrapped air is removed from the sample by lifting the basket containing it 25mm above the base of the tank and allowing it to drop 25 times at the rate of about one drop per second. The basket and the aggregate should remain completely immersed in water for a period of 24 +/- 0.5 hours afterwards.

The basket and the sample are then weighed while suspended in water at a temperature of 22 to 32 C. In case it is necessary to transfer the basket and the sample to a different tank for weighing, they should be jolted 25 times as described above in the new tank to remove air before weighing. This weight is noted while suspended in water W1 g. The basket and the aggregate are then removed from water and allowed to drain for a few minutes, after which the aggregates are transferred to one of the dry absorbent clothes. The empty basket is then returned to the tank of water, jolted 25 times and weight in water W2 g

The aggregates placed on the absorbent clothes are surface dried till no further moisture could be removed by this cloth. Then the aggregates are transferred to the second dry cloth spread in a single layer, covered and allowed to dry for at least 10 minutes until the aggregates are completely surface dry. 10 to 60 minutes drying may be needed. The aggregates should not be exposed to the atmosphere, direct sunlight or any other source of heat while surface drying. A gentle current of unheated air may be used during the first ten minutes to accelerate the drying of aggregate surface. The surface dried aggregate is then weighed W3 g. The aggregate is placed in a shallow tray and kept in an ovein maintained at a temperature of 110°C for 24 hours. It is then removed from the oven, cooled in an airtight container and weighed W4 g. At least two tests should be carried out, but not concurrently.

Specific gravity of material's used are as follow

Coarse aggregate = 2.85

Sand = 2.74

Cement = 3.15

Water absorption of material used are as follow

Coarse aggregate = 2.00 %

Sand = 4.02%

3.3.3 Compressive strength test:

The compressive strength test is the most important test done on the concrete as it determines the characteristic strength of the concrete which represents the resistance of concrete against crushing load. The casted cubes are tested for compressive strength in the compression testing machine.

Procedure

1. The bearing surface of the machine is cleaned.

2. The specimen is placed in the machine in such a manner that the load applied shall be to the opposite sides of the cube face towards the bearing.

3. The specimen is aligned centrally on the base plate of the machine.

4. The removable portion of the machine is rotated so that its bottommost part touches the surface of the cube.

5. The machine is started to apply load on the cube without any shock.

6. The load is applied continuously at a rate of 140Kg/cm2/minute.

7. After the specimen fails, the load at failure is noted down

8. The removable part of machine is rotated in opposite direction and the broken sample is taken out of the machine

.

9. The bearing surface of the machine is again wiped clean. The similar testing is done for both conventional concrete and fiber introduced concrete cube specimens and their 28 days strength was calculated by formula:

$$fck = P/A$$

Where,

P = failure load

A = Surface area onto which load is applied

= 150mm x 150mm

= 22500mm2

Chapter 4

Result

4.1 Slump Cone test

Aim: To determine workability of fresh concrete by using slump cone test apparatus in accordance with IS 1199:1959

Material: Slump cone, cement, water, fine aggregates, coarse aggregates

Apparatus: Mould having dimension bottom diameter=20cm, top diameter= 10cm, height= 30cm, tamping rod=16mm dia and 0.6 long

Procedure:

1. The internal surface of the mould shall be thoroughly clean from super ferrous moisture and any set concrete before commencing the test.
2. The mould shall be placed on smooth, horizontal, rigid and non-absorbant surface such as carefully levelled and metal plate the mould being firmly held in place while filled.
3. The mould shall be filled in 4 layers each approximately one another quarter of the height of the mould.
4. Each layer shall be tamped with 25 strokes of the rounded end of the tamping rod. The strokes shall be distributed in a uniform manner cover the c/s of the mould and subsequent layer penetrate into the underlying soil.

5. After the top layer has been rodded the concrete shall be stuck off level with a towel or the tamping rod so that the mould is filled exactly.
6. The mould shall be removed from the concrete immediately by raising it slowly and carefully in a vertical direction.
7. This allows the concrete to subside and the slump shall be measured immediately by determining the difference between the height of the mould and that of the highest point of the specimen being tested.

Sample no	Grade of mix	Mix proportion	w/c ratio	Slump height (mm)
1	M20	0.46 : 1 : 1.67 : 3.33	0.46	25

Sample Calculations

Volume of frustum (V)=$[R^2 + r^2 + R * r] * \pi/3 * h$

Diameter of large pipe (D)= 0.2m

Small pipe= 0.1m

H= 0.3m

V= $5.498 * 10^{-3}$ m^3

Density of concrete= 2500 kg/m^3

Mass= 2500 * 5.4798 * 10^3 = 13744 kg

Nominal mix proportion for M20

0.46 : 1: 1.67 : 3.33

Mass of cement= 2.294 kg

Mass of water = 1.249 kg

Mass of FA = 3.47 kg

Mass of CA = 6.94 kg

Result:

w/c	Slump height (mm)
0.46	25

4.2 Mix design

The proportion of concrete mix is to be designed to ensure the workability of concrete and to make the concrete possess the required strength, toughness and durability at the hardened condition. The design mixes M25 is carried out in accordance to codes IRC 44:2008.

The specifications of material used are

Cement:- OPC 43 grade

Fine aggregate: - Zone 2

Coarse aggregate:- Crushed rock (10mm and 20mm)

Mix design for m25 grade concrete

According to is 456-2000 and is 10262-2009

Fck 25 mpa

Sigma 4 …. For m25

Fck’ 25 + 1.64 + 4

From table no 5 is 456 2000

Moderate exposer

Max w/c ratio 0.5

Minimum cement content 300 kg

Maximum cement content 450 kg

According to exposer condition selecting w/c ratio 0.46

From is 10262 2009

For 20 mm aggregate maximum water content 186 kg/m^3

Materials Calculation

- Cement calculation 186/0.46 = 404 kg = 400 kg/m^3
- 300<400<450 hence ok
- Volume of concrete 1m^3
- Volume of cement (mass of cement)/(spg.c*1000)
- (400)/(3.15*1000) = 0.127m^3
- Volume of water 0.186 m^3
- Volume of water = (volume of concrete)-(volume of cement + volume of water)
- Yield (400 + 186 + 1174.77 + 752.95) = 2513.7

Mix proportion for m25 grade concrete

Water	Cement	Fine aggregate	Coarse aggregate
0.46	1	1.88	2.936

Mix proportion for m25 with 1.5% fiber by weight of cement

Water	Cement	Fine aggregate	Coarse aggregate	Fiber
0.46	1	1.88	2.936	0.015

Mix proportion for m25 with 3% fiber by weight of cement

Water	Cement	Fine aggregate	Coarse aggregate	Fiber
0.46	1	1.88	2.936	0.030

Materials	Water	Cement	Fine Aggregates	Coarse Aggregates
Ratio	0.46	1	1.88	2.936

Materials By wt

Water (Lit)	Cement (Kgs)	Fine aggregate (Kgs)	Coarse aggregate (Kgs)	Fiber (Kgs)
4.4 lit	9.45	1.88	2.936	0.015

4.3 Casting and curing

Standard sized cubes (150mm x 150mm x 150mm) are casted for compression test of concrete.

Cubes Quantity

2 number of conventional concrete

2 number of 1.5% fiber introduced concrete

2 number of 3% fiber introduced concrete

Total 6 number of cubes are casted. They are allowed to stay in mould for 24 hrs. Then they are immersed in water for curing. After 7days and 28 days 3 cubes are taken out from water, dried and then tested and after 28 days remaining cubes are tested.

4.4 Test of concrete

The Various test that we Performed

Compressive test

Slump Cone test

4.4.1 Compressive strength test

The compressive strength test is the most important test done on the concrete as it determines the characteristic strength of the concrete which represents the resistance of concrete against crushing load. The casted cubes are tested for compressive strength in the compression testing machine.

Procedure

1. The bearing surface of the machine is cleaned.
2. The specimen is placed in the machine in such a manner that the load applied shall be to the opposite sides of the cube face towards the bearing.
3. The specimen is aligned centrally on the base plate of the machine.
4. The removable portion of the machine is rotated so that its bottommost part touches the surface of the cube.
5. The machine is started to apply load on the cube without any shock.
6. The load is applied continuously at a rate of 140Kg/cm2/minute.

7. After the specimen fails, the load at failure is noted down

8. The removable part of machine is rotated in opposite direction and the broken sample is taken out of the machine.

9. The bearing surface of the machine is again wiped clean.

10. The similar testing is done for both conventional concrete and fiber introduced concrete cube specimens and their 28 days strength was calculated by formula:

fck = P/A

Where P = failure load

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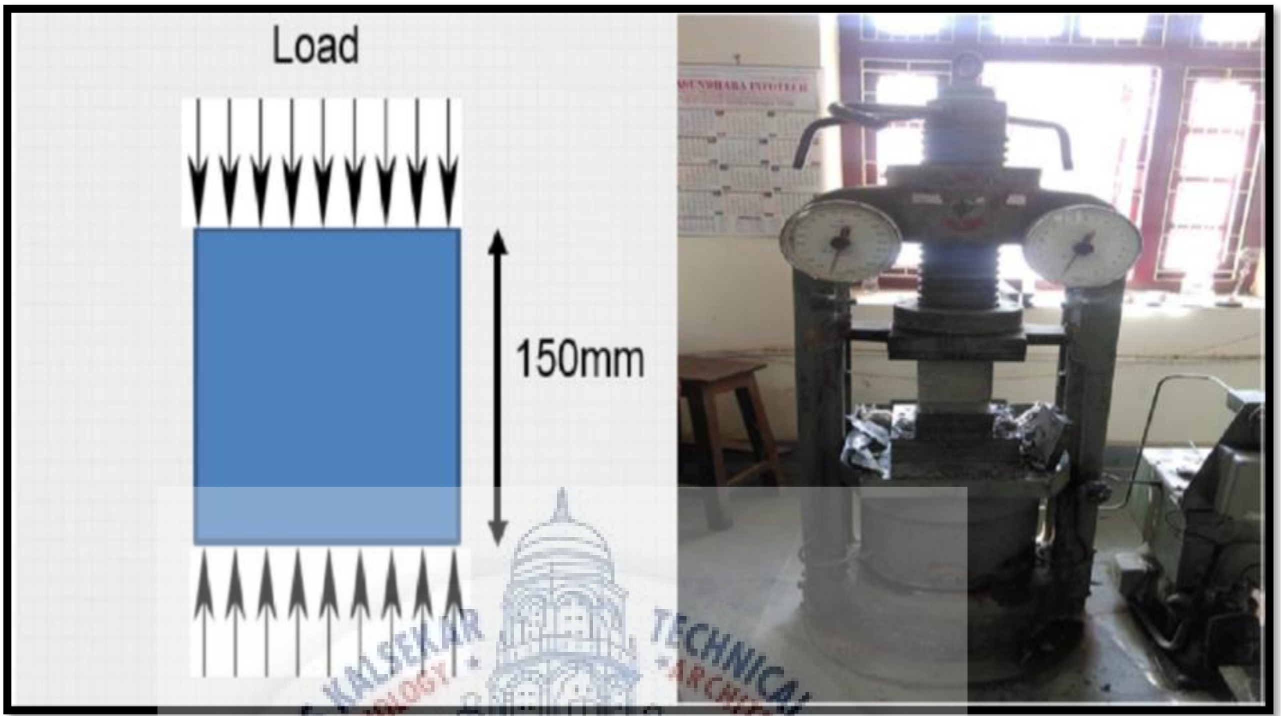
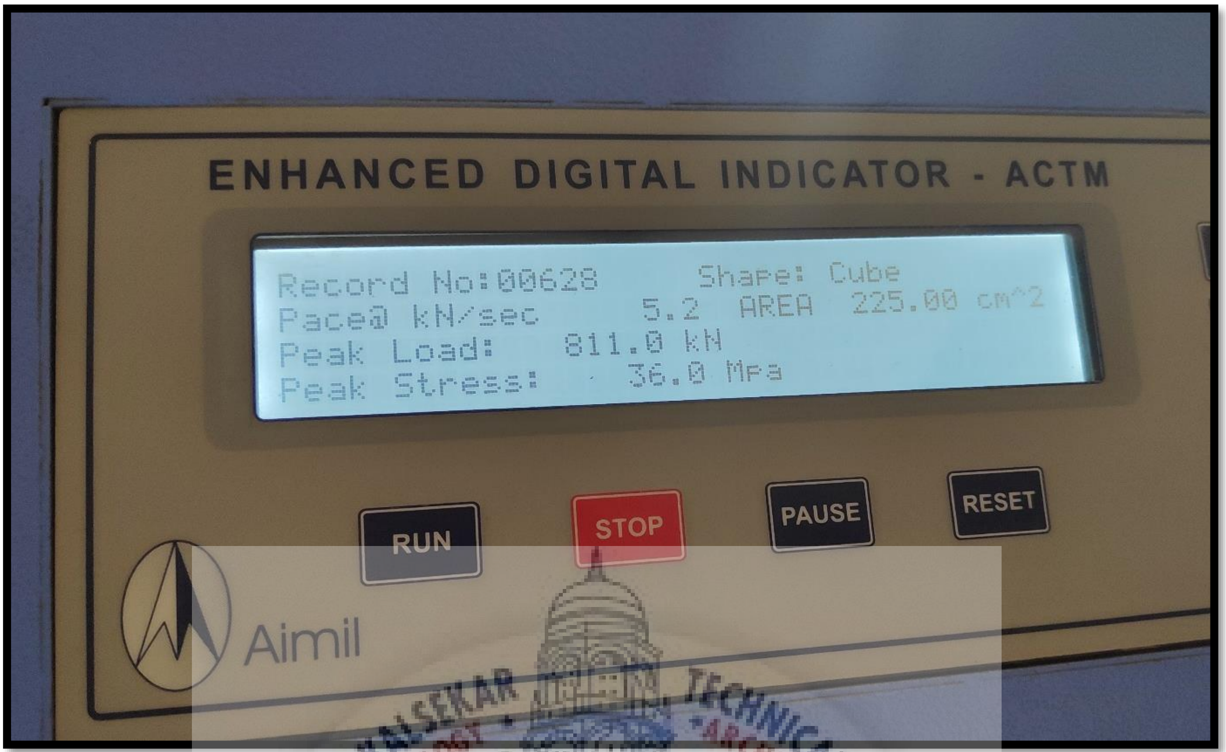
= 150mm x 150mm

= 22500mm2



Pic: Compressive Testing machine

Pic: 1.5% fiber introduced cube



Pic: 3% fiber introduced cube

Pic: Curing tank

Results:

Gradeof Concrete	Specimen	Curing (days)	Compressive strength
M25	Conventional cube	7	31
M25	1.5% fiber introduced cube	7	24 mpa
M25	3% fiber introduced cube	7	24 mpa
M25	Conventional cube	28	31 mpa
M25	1.5% fiber introduced cube	28	37 mpa
M25	3% fiber introduced cube	28	34mpa

Chapter 5

CONCLUSION AND DISCUSSION

Use of non-biodegradable substance like waste polypropylene is an economic and environment friendly approach in the field of transportation. Unlike steel fibers it is non-corrosive, light weight and has less cost. Similarly wasted tire fibers (with steel wires striped out) can be used in concrete effectively.

It can be seen that the FRC made by using wasted materials like polypropylene significantly increase the strength of concrete(By 10%). The fiber introduced concrete exhibited good strength against compression, flexure and shear, three most important properties of concrete. It also made the concrete tougher and significantly reduced the deflection that it undergoes when subjected to any external loads.

The following inferences have been drawn from the experiments done on concrete with polypropylene and tire fibers:

1. There is a gain of 10% in compressive strength of M25 grade concrete With1.5% Of Fibre proportion to the volume of cement.

2. Also, there is a gain of 10% in compressive strength of M25 grade concrete with 3% Of Fibre proportion to the volume of cement.

3. Thus We Can Conclude That 1.5% of polypropylene Fibre is Sufficient to Gain 10% of Compressive strength

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