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# Polymer Fiber Reinforced Concrete Pavements

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**Abstract:** The old method for using the traditional bituminous pavements have to be needs for continuous maintenance and repair work .In India there are several advantages of cement concrete pavements over bituminous pavements because of india has to leading growth country than other. This paper explains on POLYMER FIBRE REINFORCED CONCRETE PAVEMENTS, which is a recent advanced in the field of reinforced concrete pavement in designs. In this project showing that how can Fibers help to improve the ductility performance, pre-crack tensile strength, fatigue strength, impact strength and shrinkage cracks. FRC satisfies two of the much demanded requirements of pavement material in economy and reduced pollution. Fibre reinforcement pavement has to reduce the cost of additional maintenance required on concreted pavement. It is ecofriendly and long life sustainability pavement.

## I. INTRODUCTION

concrete pavements are also called rigid pavements, are made up of Portland cement concrete and may or may not have a base course between the pavement and subgrade .A pavement is the layered structure on which vehicles travel. It serves two purposes, namely, to provide a comfortable, to avoided the maintenance work and durable surface for vehicles, and to reduce stresses on underlying soils. In India, the traditional system of bituminous pavements is widely used.

Concrete has some different properties like as low tensile strength, low post cracking capacity, and low ductility, limited life, low impact strength. Cement concrete is characterized by crack failure, the nearly complete loss of loading capacity, once failure is initiated. Within two to three decades the bituminous pavement would be a useless and required periodical maintenance. Now it is very essential to take an action for using an another material which have been complted the required facilities. In recently micro fibers, such as those used in

traditional composite materials have been introduced into the concrete mixture to increase its life or ability to resist crack growth. In FRC, thousands of small fibers are dispersed and distributed randomly in the concrete during mixing, and thus improve concrete properties in all directions. The plain concrete structure cracks when the structure is subjected to the peak tensile load and cannot withstand further load or deformation. The fibre reinforced concrete structure cracks at the same peak tensile load, but does not separate and can maintain a load to very large deformations.

Fibers help to improve the ductility performance, pre-crack tensile strength, fatigue strength, impact strength and shrinkage cracks. FRC satisfies two of the much demanded requirements of pavement material in economy and reduced pollution. It also has several other advantages like longer life, low maintenance cost, good riding quality, increased load carrying capacity and impermeability to water over flexible pavements.

## II. POLYMER FIBER REINFORCED CONCRETE (PFRC)



Fig. 1. Concrete mixing plant

Polymers fiber are most popular because of its properties like long lasting, durability and cost effectiveness. The Various form of recyclable waste plastic , rubber any many other type of material having included fibre contain. These fibers act as crackfiller, to avoid the developments of growing cracked and thus transforming an brittle material was into a stronger and long lasting with the superior cracked resistance, improves strength, ductility and avoiding the failure of such unwanted cracks.

Concreted pavement may not be sustaining in tension and againstimpacts to sudden failure can be occur after certain days but polymer fiber reinforcement concrete pavement is an suitable material which may be used for long life and may not to be failure in sudden load they can sustain the load not to be affected by any external load . This usage of fibers in combinations with concrete results in a mix with gaining the strength and its is also a crack arresters, restricting the development of cracks.

Bitumen is a by product of petroleum which is depleting day by day therefore The perfect solution would be POLYMER FIBER REINFORCED CONCRETE PAVEMENTS .

### III. MATERIALS

The following material are used for construction of polymer fiber reinforcement concrete pavement .

#### A. Concrete Mix

The cement used for construction of pavement is 43 grade. Coarse sand with the fineness modulus 2.36, aggregate of 10 mm in size with minimum modulus of 5.98 shall be used. In the polymer fiber reinforcement concrete pavement provided the mix design of 1:2:3 grading. The concrete shall have a flexural of 40 kg/m<sup>2</sup> at 28 days. The water cement ratio is shall be as per specification are in the grade of M 30 and M35 required . fly ash can be added for making the strength for prolong the life of pavement.

#### B. Polymer Fibers

For construction of pavement various polymer fiber are use they as follow:

- 1) Fortta econo net
- 2) Poly propylene
- 3) Fortta ferro
- 4) Recron 3S

#### C. Polymer Fibre

Some of the waste material is used as a polymer fiber are also used in construction of polymer reinforced concrete pavement.

- 1) Plastic
- 2) From carpet industry
- 3) From textile industry
- 4) From disposed tires

Polypropylene is simply and easily available material in market . Polypropylene is very cheap material from all of the polymer material . Polypropylene have better resistance properties on chemical attack. Its melting point is high (about 160 degrees centigrade). So that it can with stand a working temperature, as (100 degree centigrade)for short periods without an detrimentto fibers properties.

#### D. Polyester Fibers



Fig. 3. Various polymer fibers used in concrete

#### IV METHODOLOGY

Methodology in this paper is making a paper study and building a concept for concept for engineering. Paper study paper we get a lot of experience. We get knowledge how actually any project is prepared? Every system which we use in our daily life has made from a lot of hard work. For making we have to do a lot of survey. They are not preparing automatically. For preparing them we have to work hard. These will help us in future whenever we join any industry. We have got actual knowledge about how actually it are build. In aspects, to transfer knowledge given is everything outside from content of the paper. These insights are such as daily office work, administration of the paper, communication within the team, and documentation of the paper.

#### V. REQUIREMENTS FOR THE PAVING OPERATION

- 1) The temperature of concrete laying should be less than 35 degree Celsius.
- 2) The DLC layer without wrinkles and holes and it should be clean
- 3) In presence of fly ash – cement savings upto 35%.
- 4) Use of micro films layer of 125 micron in between layer of Polymer fiber reinforcement concrete pavement and DLC layer.

#### VI. ADVANTAGES AND DISADVANTAGES ADVANTAGES

##### A. Advantages

- 1) Maintenance and repair activity due to corroded reinforcement can be avoided by PFRC pavement.
- 2) Reduced water absorption.
- 3) The Greater impact resistance.
- 4) The Implementation of sensors in roads will be easier.
- 5) Impermeable and more durable, skid resistant pavement.
- 6) PFRC also improve the ductile and flexural toughness of this modified concrete.

##### B. Disadvantages

- 1) The PFRC is usually used being an relatively newly construction.
- 2) Rain is might exposes the fibres.
- 3) Fiber-reinforced concrete can improves resistance against freezing and thawing.
- 4) The use of PFRC, being a relatively new technology poses a threat of a high initial cost of construction.

#### VII. CONCLUSION

Polymer fiber reinforcement concrete is advance by using of this normal regular concrete pavements. In this fiber such as polyester or polypropylene are being the cost effective and have containing some large number of good properties like corrosion resistance, crack filling and avoiding the growing of crack and as well as corrosion resistance though steel fiber and also lifelong performance. In PFRC providing with grooves in between the panel of about 4m x 4m to avoiding expansion / contraction cracks. Groove can be made after casting of concrete through cutters and then fill this.

#### REFERENCES

- [1] Dr.K.M Soni, May 2007, "Fiber Reinforced Concrete in Pavements", NBM&CW vol 12, pp 178-181.
- [2] Dr.S.S. Seehra, March 2007, "An Innovative concrete technological development of fully mechanized construction of cement concrete pavement", NBM&BW vol 12 pp 76-93
- [3] B.K. AGRAWAL, "Introduction to Engineering Materials", 4th edition, Tata Mc Grawhill Publishing company Ltd, pp 194-195
- [4] KENNETH G. BUDHINSKI, MICHELK. BUDHINSKI, "Engineering materials-Properties & selection", 8th edition, Prentice Hall India, pp 194-195
- [5] Gopal Krishna, July 2007, "Key role of chemical admixtures for pavement quality concrete", NBM&BW vol 13, pp 166-169.
- [6] J.M.L. Reis, Nov 2006, "Fracture and flexure characterization of natural fibers-reinforced polymer concrete" Construction and Building Materials vol 20 pp 673-678
- [7] Amnon Katz, Nov/Dec 2004, "Environmental impact of steel and FRP reinforced polymer", Journal for composite for construction vol 8 no.6 pp 48-4





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