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THE CRITICAL STUDY OF FLEXIBLE ROAD PAVEMENT BY USING WASTE RUBBER TYRE

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Abstract
Now-a-days it is necessary to utilize the wastes effectively with technical development in each field. The old abandoned tyres from cars, trucks, farm and construction equipment and off-road vehicles are stockpiled throughout the country. This leads to various environmental problems which include air pollution associated with open burning of tyres and other harmful contaminants like (polycyclic aromatic hydrocarbon, dioxin, furans and oxides of nitrogen) and aesthetic pollution. They are non-biodegradable; the waste tyre rubber has become a problem of disposal. This paper is intended to study the feasibility of waste tyre rubber as binding material in bitumen, the waste tyre rubber is used with aggregate in different layer and also on the top surface layer mixed with bitumen in percentage (5,10,15) and carried out different test result based on it, finding through it the difference in result by forming normal and rubber pavement and calculate the increase in strength of road pavement and also economically achieve. This is not only minimizes the pollution occurred due to waste tyres but also minimizes the use of conventional aggregate which is available in exhaustible quantity.

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I. INTRODUCTION

Plastic materials have become the corner stone of our lives, so it leads to generation of huge quantity of plastic waste. There is an immediate need to improve the properties of pavement in the present scenario since a steady increase is observed in areas like wheel loads, tyre pressure, change in climatic conditions and daily wear and tear which affect the performance of bituminous mix pavement in a huge amount
[Ref.6]. The amount of plastic waste materials are wither mixed with Municipal solid waste or dumped in an open area leading to increase in the area covered under waste land [Ref. 1]. Plastic waste, if not recycled is either land filled or incinerated, where both of them prove to be a disaster to environment. Incineration leads to air pollution whereas dumping the waste in open areas causes contamination of water bodies and soil. Thus, an alternative for treatment of plastic waste and waste rubber tyres are required as early as possible. The use of bitumen as a binder material for stone and sand in construction of road is given by John Macadam. It has become the need of the hour to think of some new option to alter and develop pavement characteristics both in terms of quantity and quality since there has been a sudden increase in the number of commercial vehicles and considerable difference in daily and seasonal temperature. Today's economy is based on ancient system of stewardship where resources are limited and we need to satisfy all aspects of durability and economy. Thus a judicious and appropriate use of resources is required.

2. LITERATURE REVIEW

Recycled waste tyre rubber is a promising material in the construction industry due to its lightweight, elasticity, energy absorption, sound and heat insulating properties. The Literature available reveals that used rubber tyre can be effectively used in concrete to enhance the various properties of concrete and to protect environment. A mixture composed of ordinary concrete and rubber from the recycled tires has been presented in technical literature under the name of "Rubber Concrete" or "Rubber Modified Concrete". The literatureavailable also shows that workable rubberised concrete can be made with appropriate percentage of rubber tyre aggregates. Classification **of Scrap Rubber Tire** Siddique & Naik (2004) Four type of scrap tire particles have been classified by the study carried out by Siddique & Naik(2004), which were graded according to particle size as follows:-

i) Slit tires
ii) Shredded/ chipped tires (particle size is 30-40cm long by 10-22 mm wide)
iii) Ground rubber (19-0.15mm)
iv) Crumb rubber (4.75- 0.075mm)

Strength Studies

1. Sara Sgobba et al, (2010)

The study explores the ameliorative effects of rubber particles on some properties of concrete. The result presented shows that the incorporation of rubber

aggregates in concrete, obtained from waste tires, is a suitable solution to decrease the weight in some engineering manufactures. Some drawbacks were also reported by her such as the large decrease in compressive strengths, and the increase of water request and air content, the test result demonstrated that rubberised concrete mix possesses interesting properties that can be useful in structural and non-structural applications. The test result also shows that the performance of concrete is significantly affected by the type and content of the rubber particles as well as by cement type and admixture properties.

2. El-Gammalet al, (2010)

The application of recycled waste tire rubber by replacing fine and coarse aggregate in concrete has been performed at different percentages to study the change in compressive strength & density of concrete. Two different forms of waste rubber tier (i.e chipped & crumb) have been used in the study. The result for the concrete casted using chipped rubber as a full replacement to coarse aggregate shows a significant reduction in the density (about 30% reduction) & compressive strength (about 90% reduction) compared to controlled specimen. However significant ductility was observed before failure. The result obtained for the concrete casted using crumb rubber as a full replacement to sand shows significant reduction in compressive strength compared to controlled specimen but shows significant increase in compressive strength compared to the concrete casted using chipped rubber as a full replacement to coarse aggregate.

strength& flexural strength in accordance with ASTM specified procedures. In his analysis he found that crumb rubber content in mix resulted in a decrease in both the slump & unit weight of themixtures. However mix still produced a workable mix in comparison with the control mix.

III. OBJECTIVE

Environment- There is huge problem of disposal waste tyre by using this waste tyre we protect the environment. Strength- By replacing rubber in bitumen it increasing its strength which gives better strength as compare to normal road. Economy- As compare to waste rubber bitumen is costlier by replacing this waste tyre in bitumen we can reduces the cost, hence economy can be achieved. The main property of rubber is reducing noise pollution, friction resistance and also skid resistance. It increases drainage properties of road pavement. It also decreases maintenance cost of road pavement.

IV. METHODOLOGY

Types of Plastics-

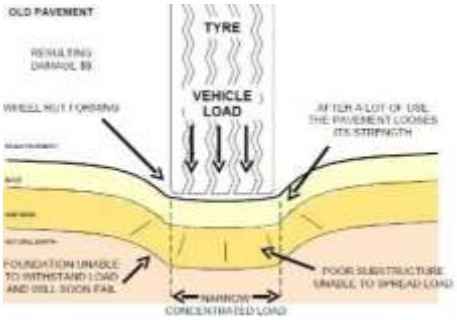
a. PET, polyethylene terephthalate
b. HDPE, high-density polyethylene
c. PVC, polyvinyl chloride
d. LDPE, low-density polyethylene
e. PP, polypropylene
f. PS, polystyrene

RUBBER TYRES There are a large number of ways to manage the waste rubber tyres. It can be in the form of whole tyre or slit tyre, chopped tyre, ground rubber or as a crumb rubber product. The rubber tyre employed in bituminous mix in the form of rubber particles, when subjected to a dual cycle of magnetic separation are then screened and recovered in various sizes, thus giving rise to the product called "Rubber Aggregate"

[Ref. 5]. Various processes like de-dusting and washing are used to clean the waste rubber-tyre. All the rubber pieces are sieved through 22.4 mm sieve and retained through 5.6 mm sieve as per the specifications of mix design. These clear pieces are added in bituminous mix, 10-20% by weight of stone aggregate. Then, these well – sieved and cleaned rubber aggregate is mixed well with stone aggregate and bitumen at temperature of about 160^0C-170^0C for the proper mixing of bituminous mix. The waste rubber tyres are thermodynamically set, thus they are not melted in bitumen at the time of mixing altogether in a mix plant. Large quantities of waste rubber tyres are collected from road sides, dumpsites and waste – buyers. The collected waste tyres are sorted as per the required sizes for the mixing purposes. The waste tyres are cut in the form of aggregate size usually ranging from 22.4mm to

V. CONCLUSION

After carefully performing the above test on aggregate and bitumen it is concluded that as per IRC specification the results of replacing 10% of rubber has gives a better strength and stability also reduces the problem of disposal of waste tyre and help to make a healthy environment.



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