

Reuse and Application of Scrap Tyres in Civil Engineering

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Abstract

This paper investigates the performance of roads using recycled waste tyre which may be in the form of chips, shreds and crumbs. Traditionally; soil stone aggregate, sand, bitumen and cement are used for the construction of roads which are in limited amount in our nature. The researchers are required to find out an alternative material for road construction because if this material can be suitably utilized in road construction then the pollution and disposal problems may be partly handled.

Keywords: Scrap Tyres, Tyre Shreds, Rw, Reinforcement of Soil

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I. INTRODUCTION

Rapid urbanization, industrialization and infrastructural development at a large scale in the world results a huge scarcity of construction material and tremendous increase in environmental pollution day by day

In India top 7 large tyre companies are responsible for 85% tyre productions. The sale of automobile tyres was 8.8 million units in 1982 which had increased to 17.7 million in the year of 1991, representing the growth rate of more than 100% in ten years. The disposal of these used tyres has become a global problem. Developed and industrialized countries are facing a monumental problem in the disposal of used tyre. Waste tyre creates a suitable breeding place for vermin and insects and thus poses health risk. A more serious problem is that it is combustible. A huge volume of scrap tires has been stockpiled in many countries (Genan Business & Development A/S 2012) causing adverse impact on the environment in figure 1. The volume of waste tyre generated is 1.5 billion peryear owing to the increase in the number of vehicles worldwide (ET RMA 2011).

To find out the alternative solution of geo-materials which have good strength parameters as well as deformation parameters is a burning task for various geo-engineering applications. Several researchers are exploring the possibility of using different by products or waste materials like fly ash, fibre, rice husk ash and recycled tyre materials as geomaterials. Waste tyre have been used for reinforcing soft soil in road construction (in figure 2) (Bosscher et al. 1997) and retaining wall back fill (Humphery et al. 1993)(Lee et al. 1999).



Fig 1: affordability and demand of house

Waste tyre products have helped designers to solve several types of engineering problems. In India there are so many variations in soil state to state. Some soil having very low load bearing capacity like black cotton soil because it absorbs water, swells and lose their strength, so in that areas it is essential to improve the quality of soil by mixing of waste tyre in desired quantity. The use of recycled tyre rubber as an engineering

material has increased significantly in the last decade.

II. OBJECTIVES

The objectives of this project are to characterize the engineering properties of the scrap tires. Relevant to these applications:

- To Study The Elimination of the need for disposal of scrap tyres in landfills.
- For The Mitigation of the problems of fill settlement and instability due to the lighter weight of tyre chips.
- To Study Reduction of the use of valuable natural aggregates.

SCOPE OF STUDY

The waste tyres can be used in the form of aggregate which on mixing with various bitumen in suitable size. This reduces the pollution occurred due to waste tyres as well as minimizes the use of natural aggregate, which help in reducing global warming as well as health problems.

The overall aim of this thesis is to: Describe and evaluate tyre shreds as a civil engineering construction material. Describe and evaluate environmental properties of tyres shreds and identify environmental concerns regarding use of tyre shreds as construction material. Identify beneficial use and limitations in applications of the use of tyre shreds.

III. LITERATURE REVIEW

1. Patil Pravin [2017]

Effect Of Replacement Of Course Aggregate By Scrap Tyre Rubber. Solid waste management has most important because tyre rubber waste is increasing at a fast rate. Tyre rubber waste is non- biodegradable nature so that its used as a fuel in many industries which is not environment friendly. Concrete has notice as a alternative source of recycling the tyre rubber waste. Aggregate can replaced by tyre rubber waste. In this study, affects on concrete has been observe by experimental results. In this experimental study M20 grade concrete used as reference point. Tyre rubber waste used as a course aggregate in 5% , 10%, 15% replacement for conventional aggregate. As per this percentage cost benefit and strength ratio also identified

2. Mohammed Mudabheer Ahmed Siddiqui [2020]

The objective of this paper is to investigate the use of rubber pieces as coarse aggregate in the concrete. Concrete tested with varying percentages of rubber from 0 to 15% of normal aggregates. Compressive strength, of concrete is measured and comparative analysis is made

3. Najib N. Gerges ,Camille A.Issa, Samer A.Fawaz [Sep,2020].

Rubber concrete: Mechanical and dynamical properties. Physical properties such as the density, the compressive strength, the fresh concrete properties, the split tension, and the impact load capacity are examined. The results revealed a decrease in the compressive strength Of concrete cylinders containing rubber. The dynamic performance of the rubber concrete is of high importance because of its high resilient nature, as the rubber particles that are included in the concrete have a positive effect on the dynamic Performance

IV. RESEARCH METHODOLOGY

The methodology adopted for gift study is completing survey of enormous scale comes. elaborated study of 3 completely different techniques like standard, formed and aluform is dispensed by analyzing price needed for specific methodology and so comparison it with relevance price and time needed . This study is predicated on works and field survey. The various tests are conducted are as follows:
Durability, Atterberg limits, Permeability, Thermal conductivity,

V. RESULTS AND DISCUSSION

Used recycled tyre shreds in sand-tyre chips (STC) mixtures.

They obtained data with different STC mixtures on 600mm high rigid retaining model which is constructed in a Perspex container.

STC mixtures were prepared with different tyre chips mixtures proportion such as 10, 20, 30, 40, and 50%.

Static surcharge load up-to 10 KPa was applied using concrete blocks.

There results were obtained in the form of wall displacement and reduced lateral earth pressure, they found that displacement and lateral earth pressure are reduced to about 50-60% by using STC mixtures.

VI. CONCLUSION

From above study we conclude that,

- The permeability and chloride ion penetration are reduced; while the impact and crack resistance are

improved.

- Tyre chips are advantageous for use in geotechnical applications because of their low density and high durability, shear strength and thermal insulation
- Rubber tyres, in different shapes and sizes can be used in many civil and noncivil engineering applications
- In conclusion, tyre rubber can be used in a substantial number of civil engineering works. It has good potential for development but this depends largely on the ability of the building and construction designers involved to convince the authorities and the relevant constructors of the advantages of these applications. Although more research needs to be done in all the sectors mentioned above, the addition of even small amounts of tyre rubber in some applications could enable the large volumes of stockpiled tyres to be eliminated, while conserving natural resources
- Tyre chips are advantageous for use in geotechnical applications because of their low density and high durability, shear strength and thermal insulation; in many cases they are also cheaper compared with other fill materials. The use of tyre rubber as a lightweight geomaterial for embankments or as backfill against retaining walls is very promising and should be promoted. Thus, large volumes of waste tyre can be consumed

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