Experimental Investigation on Concrete Using Reclaimed Rubber

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Abstract- *The use of scrap tyre rubber in the preparation of concrete has been thought as an alternative disposal of such waste to protect the environment.In this study an attempt has been made to identify the various properties necessary for the design of concrete mix with the coarse tyre rubber chips as aggregate in a systematic manner.Therefore, it is required to find alternative materials to reduce the cost of concrete. On the other hand, Non-biodegradable waste i.e. water bottles, cool drink bottles and disposable glasses, shredded or crumbed rubber etc., is creating a lot of problems in the environment and its disposal becoming a great difficulty.In the present experimental investigation, the M25 grade concrete has been chosen as the reference concrete specimen. Scrap tyre rubber chips,hasbeen used as coarse aggregate with the replacement of conventional coarse aggregate Concrete is one of the most popular building materials. Therefore, it is required to find alternative materials to reduce the cost of concrete. On the other hand, Non-biodegradable waste i.e. water bottles, cool drink bottles and disposable glasses, shredded or crumbed rubber etc., is creating a lot of problems in the environment and its disposal becoming a great difficulty. 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 30% of normal aggregates. Compressive strength, of concrete is measured and comparative analysis is made. In this project we have used plasticizer to improve workability(conplast P211)*

I. INTRODUCTION

During the last three decades, there have been dramatic changes in the way of thinking about industrial processes and the approach and evaluation of new and innovative materials. Concrete is a substance composed of only a few simple and commonly available ingredients that when properly mixed and cured .

New techniques and methods for selecting the right quantities of those simple components are continually being presented to the design community. New ingredients to include in concrete mixes are also constantly being researched and developed. In general, concrete has low tensile strength, low ductility, and low energy absorption.

Concrete also tends to shrink and crack during the hardening and curing process. These limitations are constantly being tested with hopes of improvement by theintroduction of new admixtures and aggregates used in the mix. One such method may be the introduction of rubber to the concrete mix. Shredded or crumbed rubber is waste being of non-biodegradable and poses severe fire,environmental and health risks.

II. LITERATURE REVIEW

1. Mohammed Mudabheer, Ahmed Siddiqui
" **STUDY OF RUBBER AGGREGATES IN CONCRETE AN EXPERIMENTAL INVESTIGATION"**

2. Zeineddine Boudaoud, Miloud Beddar
" **Effects of Recycled Tires Rubber Aggregates on the Characteristics of Cement Concrete"**

3. André Filipe de Melo Marques
"Fire behaviour of concrete made with recycled rubber aggregates"

III. MATERIALS USED

A. Reclaimed Rubber

Fig 1. RECLAIMED RUBBER USED IN THE PROJECT

B. Cement

Cement used to prepare the specimen was 53 grade Ordinary Portland cement, conforming to IS 12269:2013 with a fineness of 1%, standard consistency of 35% and Initial setting time 28mins.

C.Coarse aggregates

Coarse aggregates of 4.75mm to 12.5mm size aggregates were used

D. Fine aggregates

Fine aggregates are taken for concrete preparation which pass through 2.36mm sieve size.

E. Water

Portable water was used for mixing and curing of concrete specimens.

IV. MIXDESIGN

As per IS 10262-2009 design mix for M25 grade of concrete was prepared by replacing coarse aggregate by 20%, 30%,40% of Rubber.

V. TEST RESULTS

A. Compressive Strength

Compressive strength was tested in compressive testing machine .Cube specimens of size 150mm x 150mm x 150mm were adopted for the test. Compressive strength was tested after 7,14 and 28 days of curing. The results of the tests are

B .Tensile Strength

Tensile strength was tested in compressive testing machine .cylinder specimens of size 150mm x 300mm were adopted for the test. tensile strength was tested after 7,14 and 28 days of curing. The results of the tests are tabulated below.

VI. MATERIALS TEST RESULT

Table-1 Physical properties of cement

Fineness modulus	Normal consistency	Intial time	Final time
4.03%	35%	28 mins	10 Hrs

Table-2 Physical properties of fine aggregates

Specific gravity	Water absorption	Fineness modulus
2.72	1%	2.85

Table-3 Physical properties of Coarse aggregates

Specific gravity	Water absorption	Fineness modulus
2.72	1%	7.73

Table -4 Properties of cement

Sl.No	Properties	Values
1	Density	900kg/m^3
2	Length	12mm
3	Youngs modulus	1300-1800N/mm^2
4	Diameter	25 microns
5	Geometry	Fibrillated

Table -5Properties of Reclaimed Rubber

S.No	Properties	values
1.	Density	2.3 to 4.8kN/cum
2.	Unit weight	1/3 of soil
3.	compressibility	3 times more than soil
4.	Durability	Non - biodegradable
5.	Modulus of Elasticity	1/10 of sand

Table-6 Compressive strength of normal concrete

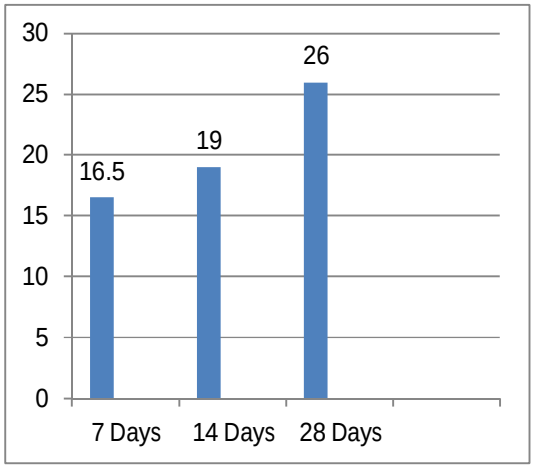
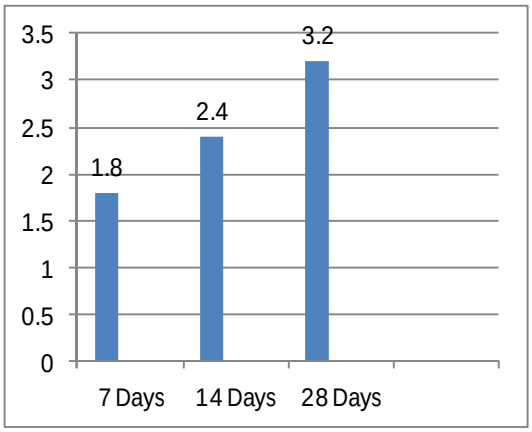
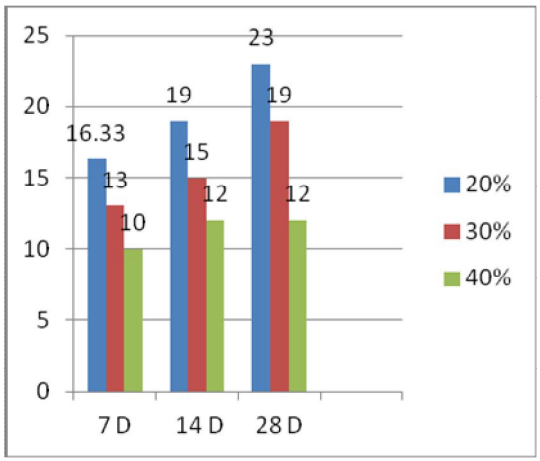


Table-7 tensile strength of normal concrete



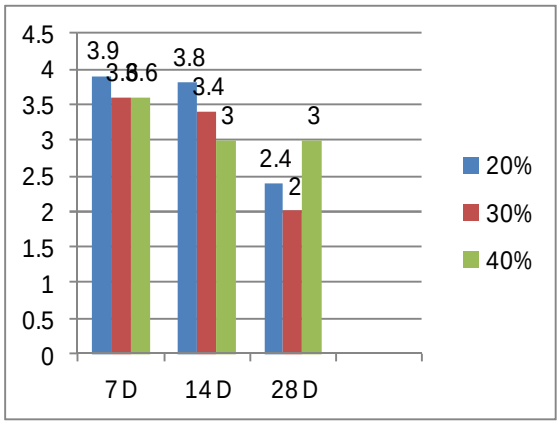
COMPRESSION STRENGTH OF REPLACEMENT OF RUBBER CONCRETE

PERCENTAGE OF RUBBER	Fck	
	7 Days	28 Days
20%	16.33	23
30%	13	19
40%	10	12



TENSILE STRENGTH OF REPLACEMENT OF RUBBER CONCRETE

PERCENTAGE OF RUBBER	Fck
20%	3.9
30%	3.8
40%	2.4



VII. CONCLUSION

The study of the substitution effects of coarse traditional aggregates by rubber aggregates resulting from worn tires showed a decrease in the mechanical characteristics of the tested concretes.

This reduction is proportional to the substitution rate of the aggregates. Nevertheless, the concretes keep a resistance compatible with a possible use in, for example, the road construction industry and offer a substantial economy in the traditional aggregates.

Especially, by knowing that the shrinkages measured of these concretes show that the effects of incorporating rubber aggregates are not negligible and encourage the continuation of research in this field.

In short, the advan-tages of substituting parts of the traditional aggregates by others resulting from worn tires proved to be both eco-nomic and ecological.

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