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EXPERIMENTAL INVESTIGATION OF CONCRETE ON PARTIAL REPLACEMENT OF FINE AGGREGATE WITH CRUMB RUBBER

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Abstract: Each year to the Indian roads about 11 Millions all types of new vehicles are added which increases about 3 Millions discarded tyres each year which poses a potential threat to the environment. The best way to use this scrap tyres in the form crumb rubber in partial replacement with fine aggregate. The proposed work presents an experimental study of effect of the used of solid waste material like crumb rubber in concrete by weight variation of crumb rubber. Crumb rubber Usually consist of particals ranging in size from 4.75mm to less than 0.075mm. Recycling tyres is an innovative idea in order to prevent the environmental problem from growing. Recycling tyre is the process of recycling vehicles tyres that are no longer suitable for use on vehicles due to wear or irreparable damage such as punctures. Cracker mill process tears appart or reduces the size of tyre rubber by passing the material between rotating corrugated steel drums, by this process an irregularly shaped torn particals having large surface area are produce and this particals are commonly known as Crumb Rubber

Keywords: *Crumb Rubber, Rubberised Concrete, Scrap tyre aggregate, Waste tyre aggregate*.

I.INTRODUCTION:

In the all over world concrete is one of the most widely used construction material. Aggregate is the most important constituent used in concrete production this leads to continuous or increasing demand of natural materials like aggregate. We need to preserve natural resources or protect the environment. we can use recycling tyres in the form of crumb rubber replacing with fine aggreagate. By the year 2030, this number expected to reach 12000 million in the world annually almost 10000 million tyres are generated. Increasing automobile industries leads to production of tyre also. It is very difficult to dispose the waste tyres. Every year large amount of waste tyre rubber is accumulated and in the process of dispose the rubber is by burning but burning of rubber, a large amount of pollution and smoke is generated and another method we use to dispose waste rubber by landfilling. But the availability and capacity of landfill places now a days decrease. Due to potential environment threat this is not only dangerous but also forms fire hazardous and provide breeding grounds for mosquitoes and rats, mice, vermins. The disposal tyres is one of the serious problem to hazard the environment. The rapid depletion of available sites landfilling is becoming unexpectable for waste disposal. In order to prevent the problem of environment is an innovative idea to recycle tyre. It is the process of recycling tyres like vehicle tyres that are no longer suitable for use on vehicles due to irreparable damage or wear. This is the best way to overcome to find alternate aggregate for construction.Generation of waste tyre far exceeds than that which are being recycled.The waste tyres cause serious environment problem all around the world. Hence this waste material can be use for the civil engineering construction purpose

MATERIAS USED:

1. **Cement**- Ordinary Portland Cement of 53 grade was used in this work.
2. **Fine Aggregate**- Locally available river sand conforming to grading Zone-II was used. The sand was screened at site to remove deleterious material.
3. **Coarse Aggregate**- In the present study a locally available coarse aggregate from quarry was used.
4. **Crumb Rubber**- Crumb rubber is a term usually applied to recycled rubber from truck scrap tyre during the recycle process fluff and steel is remove leaving tyre rubber with a granular consistency.

ADVANTAGES:

1. Rubberized concrete is affordable and cost effective.
2. It can resist the high pressure, impact and temperature.
3. They have good water resistance with low shrinkage, high impact resistance and excellent sound and thermal resistance.
4. The rubber modified concrete has low unit weight.
5. It has high resilience, durability and elasticit.
6. It can absorb the shocks and vibration.
7. Using recycled materials as gravels reduce the need for gravel mining.

II.METHODOLOGY:

In this experimental program the cubes were cast with M25 Mix Design of concrete using 0%, 10%, 15% and 20% partial replacement of waste tyre Crumb Rubber as fine aggregate.The ingredients for the mix were weighted, required water was added and mixed by using pan mixture. In order to prepare the recycled Crumb Rubber concrete specimens, fine aggregate were replaced by waste materials of Crumb Rubber in 0%, 10%, 15%, and 20%. For this the specimens are cast in steel mould and compacted using standard cubes of dimensions 150mmX150mmX150mm for determination of compressivestrength. The specimens were demoulded and place in water tank for curing.

Experimental program:

A. Sieve analysis of coarse aggregate:

The sieve analysis of coarse aggregate test indicates the size distribution of coarse aggregate particles in a given coarse aggregate sample. The fineness modulus is the indication of the mean size of the particles. The fineness modulus is used to grade the given aggregate. We can calculate relationships between different aggregate or aggregate mixes from the gradation data to check suitability with such blends and to anticipate trends during production by plotting gradation curves.A change in the fineness modulus value of coarse aggregate indicates a change in the source material, affecting the workability of concrete.

B. Sieve analysis of Crumb Rubber:

To find the size and fineness of given tyre crumb rubber we have performed the sieve analysis of crumb rubber.

C. Fineness of cement:

Fineness test of cement is done to determine the particle size of cement.

As, the rule of thumb, the finer the cement particle the best will be the cement and on the other hand the coarser the particle it will not be that good.The fineness of cement is determined by methods;

Sieving Method.:

1. This is the most common and easiest method to test fineness of cement.As per Indian Standard, the cement particle more than 10% shall not retain on the sieve (90 µm).

D. Soundness of cement by Lechateliers Apparatus:

Cement is a composition of lime, silica, alumina, magnesia, alkaline, sulfur trioxide, iron oxide, and calcium sulfate. Among which, lime constitutes 60 to 70%. Hence, a cement deficient in lime will set quickly and will affect the property of the cement. Lime content in higher amount will make the cement unsound. An unsound cement will affect the quality of the cement work performed.This demands of soundness test of cement before using it. Through this test, it is ensured that the cement wont under go any sort of expansion due to the presence of excess amount of lime.

Mix proportioning:

For our Project work we are using M25 mix design. The M25 concrete which denotes the propoerti of cement, sand , and aggregate is 1:1:2 .

The cubes of nominal mix and replacement by 10% ,15%, and 20% are casted in 150mmX150mmX150mm size mould, each of 3 and place in curing tank for curing. The cube are tested on 7 , 14 and 28 days after curing on standard compression testing machine.

III.RESULTS:

The test results shows how concrete bahaviour will change as a result of the volumetric replacement of sand with crumb waste tyres. For this the Cubes are tested on 7 , 14 and 28 days after curing on standard compression testing machine and the readings are notes down.

Cube Compressive Strength :

	7 days	14 days	28 days
Nominal mix	360 KN	410 KN	445 KN
10% CR	365 KN	400 KN	410 KN
15% CR	375 KN	425 KN	430 KN
20% CR	300 KN	330 KN	350 KN

Table: Cube Compressive Strengths

IV.CONCLUSION:

1. The test results of this study indicates that there is great potential for the utilisation of waste tyres in concrete mixes in several percentages, ranging from 0% to 15 %.
2. The strength of modified concrete is reduced with an increase in the rubber content; however lower unit weight meets the criteria of light weight concrete.
3. The compressive strength of concrete is considerably increases at 15% replacement of fine aggregate with crumb rubber.
4. However on further the compressive strength of concrete is decreases when 20% fine aggregate is replaced by crumb rubber.

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