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Comparitive Study on Partial Replacement Of Sand By Using Crumb Rubber With Conventional Concrete

[1] B.Sundhar, [2] M.Manimaran, K.Manikandan, R.Vignesh, M.Manimuhilan,
Department Of Civil Engineering Kings College Of Engineering,

Abstract: ***The use of rubber product is increasing every year in worldwide. India is also one of the largest country in population exceeds 100cr. So the use of vehicles also increased, according to that the tyres for the vehicles also very much used and the amount of waste of crumb rubber is increasing. For this issue, the easiest and cheapest way of decomposing of the rubber is by burning it. This creates smoke pollution and other toxic emission and it create global warming. This creates a major problem for the earth and their livings. Currently 75-80% of scrap tyres are buried in landfills. Only 25% or fewer are utilized as a fuel substitute or as raw material for the manufacture of a number of miscellaneous rubber goods. Disposal of whole tyre has been banned in the majority of landfill operations because of the bulkiness of the fires and their tendency to float to the surface with time On the other hand a wide variety of waste materials has been suggested as additives to cement based materials. Other construction products are also based on rubber powder obtained from the cryogenic milling of tires mixed with asphalt or bituminous materials. An experimental study is proposed to be conducted by using crumb rubber as sand in cement concrete. It is used in many works such as Road construction, Mould making etc,***

Keywords— crumb rubber, tyre,sand ,aggregates,water

I. INTRODUCTION

The use of rubber product is increasing every year in worldwide. India is also one of the largest country in population exceeds 100cr. So the use of vehicles also increased, according to that the tyres for the vehicles also very much used and the amount of waste of crumb rubber is increasing. For this issue, the easiest and cheapest way of decomposing of the rubber is by burning it. This creates smoke pollution and other toxic emission and it create global warming. This creates a major problem for the earth and their livings. Currently 75-80% of scrap tyres are buried in landfills. Only 25% or fewer are utilized as a fuel substitute or as raw material for the manufacture of a number of miscellaneous rubber goods.(Eldin NN,Senouci AB(1993).
Replacement details

The main objective of the present investigation is to evaluate the possibilities of using crumb rubber as replacement to fine aggregate. During the present study,
5% 10%, & 15% of replacement of fine aggregate was replaced with crumb rubber. Compression strength, split tensile strengths were founded after 7 and 28 days for curing of the specimens.

II. LITERATURE REVIEW

Mr. N. J. Azmi, Mr. B. S. Mohammed, and Mr. H. M. A. Al-Mattarneh, National University of Tenaga (2008): A control Portland cement concrete mix (PCC) is designed using American Concrete Institute mix design methods and crumb rubber contents of 10, 15, 20 and 30% by volume were chosen by partially replacing the fine aggregate with crumb rubber. Totally 15 concrete mixes with three different water cement ratio (0.41, 0.57 and 0.68) were cast and tested for compressive strength, splitting tensile strength, flexural strength and modulus elasticity. Rubber Crumb used in this study was having a 2-2.36 mm maximum size. It is observed that there was a reduction approximately 35% in compressive values when fine aggregate replaced with crumb rubber compared with control mix. Because the fine aggregate was partially replaced by crumb rubber, the reduction in strength is anticipated. Based on the result, the maximum compressive strength value for crumb rubber concrete increased from age 7 to age 28 day, decreased with increasing water cement ratio from 0.41 to 0.68 and decreased with increasing the amount of crumb rubber from 0% to30%.

Mr. Erhan Guneyisi, Mehmet Gesog Lu, Turan O zturan, Bebek, Istanbul, Turkey (2004): A test program was carried out to develop information about the mechanicalproperties of rubberized concretes with and without silica fume. Two types of tyrerubber, crumb rubber and tyre chips, were used as fine and coarse aggregate,respectively, in the production of rubberized concrete mixtures which were obtainedby partially replacing the aggregate with rubber. Six designated rubber contentsvarying from 2.5% to 50% by total aggregate volume were used.

Gintautas Skripkiunas, Audrius Grinys, Benjaminascernius: The aim of investigation was to study the deformation properties of Portland cement concrete with rubber waste additive. Concrete mixtures with the same compressive strength as concrete without this additive were tested. Used tires rubber wastes were crumbed into fraction 0/1. The rubber additive was used as fine aggregate replacement in concrete mixtures by 3.2
% of aggregates mass. The effect of rubber waste additive on technological properties, air content in fresh concrete, density and deformation properties under the static and dynamic load of concrete was investigated.

Parveen, Sachin Dass, Ankit Sharma: The disposal of used tires is a major environmental problem throughout the world which causes environmental hazards. Crumb rubber is a waste material that is ideal for use in concrete applications. The aim of this study is achieved to use of rubber waste as partial replacement of fine aggregate to produce rubberize concrete in M30 mix. Different partial replacements of crumb rubber (0, 5, 10, 15 and 20%) by volume of fine aggregate are cast and test for compressive strength, flexural strength, split tensile strength and stress-strain behavior. The results showed that there is a reduction in all type of strength for crumb rubber mixture, but slump values increase as the crumb rubber content increase from 0% to 20%. Meaning that crumb rubber mixture is more workable compare to normal concrete and also it is useful in making light weight concrete.

Material Used

Ordinary Portland Cement

Cement is the binding material in concrete which is used for all building elements. Ordinary Portland cement of Shankar brand of 53 grade confirming to IS 12269-1987 was used throughout the project. Specific gravity of cement is

3.15.

Fine Aggregate

Sand used for the experimental program was locally available material and conformed to Indian Standard Specifications IS: 383-1970. Sand used was river sand with specific gravity 2.6 the fine aggregate was in zone II.

Coarse Aggregate

Crushed granite coarse aggregate conforming to IS 383-1987 was used. Coarse aggregate of size 20mm was used. The specific gravity of coarse aggregate is 2.63

Water

In the present experimental program, portable tap water was used for preparation of specimens. Ordinary portable tap water available in laboratory was used for mixing and curing of concrete.

Crumb Rubber

Crumb rubber is a term usually applied to recycled rubber from automotive and truck scrap tyres. During the recycling process steel and fluff is removed leaving Tyre rubber with a granular consistency. Continued processing with a granulator and/or cracker mill, possibly with the aid of mechanical means, reduces the size of the particles further.

The source of the rubber aggregate was recycled tires which were collected from the tire recycle plant located in Vellore named as gennext hi Tec rubber. For uniformity of the concrete production and convenience, all the tires collected were from those which were originally produced from Tire factory. This study has concentrated on the performance of a single gradation of crumb rubber prepared by machine grinding. The maximum size of the rubber aggregate was 30 mesh (0.9mm).Specific gravity of crumb rubber is 1.12.

Properties of crumb rubber

Property	Value
Specific Gravity	1.12
Bulk Density	489 kg/m3
Tensile Resistance	3.2-15 Mpa
Speed Of Combustion	Very Low
Water Absorbance	0.65%
Sunlight Effect	Nil
Sunlight Effect	Nil

RESULT AND DISCUSSION

Test Result of Cement

S.No	Description	Result
1	specific gravity	3.15
2	Fineness	1.5%

3	Initial Setting Time	35 minutes
4	Final Setting Time	12hours
5	Consistency	35%

Test Result of Fine Aggregate

S.No	Description	Result
1	Specific Gravity	2.6
2	Bulk Density	1860kg/m3
3	Fineness modulus	2.36%

The sand conforms to zone II as per the specifications of IS 383: 1987

Test Result of Crumb Rubber

S.No	Description	Result
1	Specific Gravity	1.12
2	Water absorption	2.0%
3	Fineness modulus	3.48%

Test Result of Water

S.No	Property	Value
1	Ph	7.1
2	Taste	Agreeable
3	Appearance	Clear

Result on Properties of Fresh Concrete Test

Workability Test

The concrete mix used for the test is of low to medium workability hence Slump cone, vee-bee and flow tests are carried out since it is relevant for the study. Slump value decreases with the increase in amount of crumb rubber. At first it decreases rapidly and then it decreases

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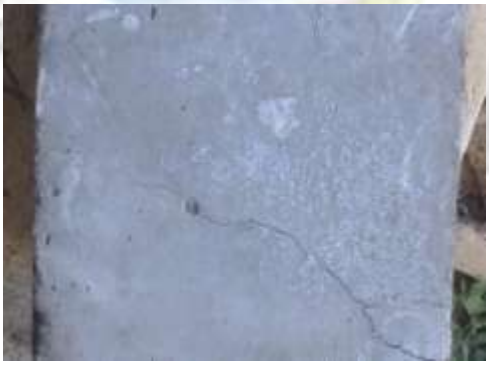

Result of Compressive Strength of Concrete

S.No	Mix	Compressive strength N/mm^2	
		7 Days	28 Days
1	Conventional Concrete	17.3	27.76
2	5%	17.8	29.47
3	10%	17.6	27.12
4	15%	15.3	23.82

This is an indirect test to determine the tensile strength of cylindrical specimens. They were cleaned thoroughly using a waste cloth and then properly oiled along its faces. Splitting tensile strength tests were carried out on specimens of size 150 x 300 mm length at the age of 7and 28 days using universal testing machine. The load was applied gradually till the specimens split and reading were noted.18 cylinders were caste with different proportion of crumb rubber with fine aggregate. The compression strength of the concrete at 7th and 28th days were conducted is given.

Result of Split tensile strength of Concrete

S.No	Mix	Split tensile strength N/mm^2	
		7 days	28 days
1	Conventional Concrete	2.3	3.8
2	5%	3.4	4.2
3	10%	2.5	3.94
4	15%	1.9	3.71

DISCUSSIONS

The normal and crumb rubber concrete are tested for their performance by determining their split tensile strength at different ages of 7th and 28th days.

CONCLUSION

From this study the effective utilization of rubber tyre waste has been developed and it made to use in the concrete mixture as fine aggregate. Therefore the use of discarded tyre rubber aggregates in concrete shows promise for developing an additional route for used tyres. The test results of this study indicate that there is great potential for the utilization of waste tyres in concrete mixes in several percentages, ranging from 5% to 15%. Based on present study, the following can be concluded:

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