iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** IV **Month of publication:** April 2021

DOI: https://doi.org/10.22214/ijraset.2021.33905

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue IV Apr 2021- Available at www.ijraset.com

Strength Determination Waste Tyre Rubber Chips in Concrete

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Abstract: ***The disposal of used tires is the major environmental problem throughout the World. which causes environmental hazards. Rubber Chips may be a waste that's ideal to be used in concrete applications. The aim of this study is achieved to use of rubber waste as partial replacement of course aggregate to supply rubberize concrete in M_{20} mix. Different partial replacements of rubber chips (M_{20}, 10, 20, 30, 40 and 50%) by volume of course aggregate are cast and test it's compressive strength, and Slump cone behavior. The results showed that compressive strength of rubberized concrete is quite less than M_{20} Grade concrete and slump value is differing than M_{20} Grade. It's recommended to use the rubberized concrete for non structural applications. From the experiment work it has been found that the 10% replacement gives the best result.***

Keywords: Waste Tyre rubber Concrete, Compressive Strength

I. INTRODUCTION

Concrete is a mixture of cement, coarse aggregates, fine aggregates and water. Concrete is cured is cured for 28 days to attain good strength. Workability is taken into account as fresh concrete property, where as compressive, tensile and flexural strengths belong to hardened concrete properties. Coarse and fine aggregate used in concrete function filling and densifying the material. Nowadays, concrete has become widely used material easily availability of sand and coarse aggregates. But there are many drawbacks of using aggregates in concrete on an outsized scale. Coarse aggregates are obtained from mountains and rocks through quarry and crushing: Nevertheless, these processes are hazardous and are badly damaging the environment. There is a possible use of rubber tyre chips with coarse and find aggregate in concrete. Many rubber tyers become waste per annum and their disposal has a very big problem. Moreover, the burning of the waste rubber tyres becomes a explanation for pollution for environment. Using rubber in concrete by partial replacing aggregates do not increase compressive strength than a standard concrete but an appropriate strength still are often obtained for use in structures. Rubber is often reused in sizes of coarse aggregates.

II. LITERATURE REVIEW

K.C Panda et al(1), "Scrap Tyre Rubber replacement for aggregate in cement concrete : Experimental study" In this Author study an effort has been made to spot the varied properties necessary for the planning of concrete mix with the coarse tyre rubber chips as aggregate during a systematic manner. The present experimental investigation, the M20 grade concrete has been chosen as a reference concrete specimen. Scrap tyre rubber chips has been found as coarse aggregate with the replacement conventional course aggregate. Mohammad Reza sohrabi et al(2)"An experimental study of compressive strength of concrete containing crumb rubber" In This paper the author mention that the 7- day and 28- day compressive strength of concretes containing crumb rubber; silica fume and crumb rubber; Nano silica and crumb rubber; and Nano silica, silica fume and crumb rubber is investigated.

For this purpose, 216 concrete specimens were prepared and their compressive strength was investigated. Ilker Bekir et al(3),"The properties of rubberized concretes "This paper proposed the concrete was modified by mixing with crumb rubber in coarse aggregate within the ratio of 15%, 30% and 45%. This study the changes of the properties of rubberized concrete were investigated according to the terms of both size and amount of rubber chips added. During this the physical and mechanical properties were determined consistent with that the strain strain diagram were developed from that the toughness value and therefore the plastic and elastic potential energy capacities were determined. Fattuhi et al(4), "Cement-based materials containing shredded scrap tyre rubber" The author proposed that, the cement paste, mortar, and concrete (containing OPC or grade rubber obtained from shredding scrap tyres. Properties examined for the 32 mixes prepared included density, compressive strength, impact and fire resistances, and.

Results showed that density and compressive strength of various mixes were reduced by the addition of rubber.rubber. (Rubber type had only marginal effect.) Density varied between about 1300 and 2300 kg/m3.Compressive strength reduced by 70% when the pro portion of rubber to total solid content by mass of concrete reached about 13. A.Subhasri et al(5), "Experimental investigations on self-compacting concrete with partial replacement of fine aggregate using crumb rubber" Author mention that Self Compacting Concrete mix design are prepared by using EFNARC (for M30 grade of concrete).The mechanical properties of concrete by partially replacing the fine aggregate by varying weight percentages Crumb Rubber (CR) (0%, 5%, 10%, 15%&20%) respectively. Tests were finished fresh concrete (i.e. Slump test & U-box) and for hard concrete (i.e. compressive strength, shear strength and Splitting Tensile test) for M30 Grade of concrete.

III. EXPERIMENTAL WORK

1) For the best utilization waste tyre rubber chips we cut the waste tyre same as aggregate size.
2) In this project Replace the aggregate by 10% to 50% by coarse aggregate
3) M_{20} Grade concrete is used throughout this project.
4) Quantity of cement, sand , aggregate, Rubber , water are calculated as follows

Table 3.1: Quantity of cement, sand, Aggregate, Rubber & Water

Replacement by Rubber	Cement (Kg)	Fine Aggregate (Kg)	Coarse Aggregate (Kg)	Rubber (Kg)	Water (lit)	Total weight (Kg)
M_{20}	1.54	2.31	4.62	-	0.77	8.5
10%	1.54	2.31	4.3	0.47	0.77	8.5
20%	1.54	2.31	3.816	0.954	0.77	8.5
30%	1.54	2.31	3.339	1.431	0.77	8.5
40%	1.54	2.31	2.862	1.908	0.77	8.5
50%	1.54	2.31	2.46	2.385	0.77	8.5

5) First of all Prepare the Standard M_{20} Grade concrete cube then prepare 10% to 50% replacement of waste tyre cube each having 3 cubes total 18 cubes is casting.
6) After calculating all above quantity Dry mixing of cement, sand, aggregate, waste tyre, and water are done.

Fig 3.1: Dry Mixing

7) Then casting the cubes in 150 ×150×150mm mould

Fig 3.2: Casting of cubes

8) Curing the cubes in cold water for 24 hrs.

Fig 3.3: Curing of cubes

9) Lastly Test the cubes in Compressive testing machine & Note the results.
10) Along with compression Test Workability of concrete is calculated after freshly mix the concrete.

IV. OBSERVATION TABLE

A. Following Results are obtained from Compression Test of cubes.

Table 4.1: Compressive Strength Observation of Standard M_{20} Grade Concrete

Sr. no.	Area of C/S mm²	Wt of standard cube kg	Mean	Compressive strength	
				28 days N/mm2	Mean
1	22500	8.5	8.5	21.77	21.49
2	22500	8.5		21.58	
3	22500	8.5		21.14	

Table 4.2: Compressive Strength Observation 10% Rubber Cube

Sr. no.	Area of C/S mm²	Wt of standard cube kg	Mean	Compressive strength	
				28 days N/mm2	Mean
1	22500	8.5	8.5	23.88	23.13
2	22500	8.5		22.10	
3	22500	8.5		23.43	

Table 4.3: Compressive Strength Observation 20% Rubber Cube

Sr. no.	Area of C/S mm²	Wt of standard cube kg	Mean	Compressive strength	
				28 days N/mm2	Mean
1	22500	8.5	8.5	21.13	21.05
2	22500	8.5		21.14	
3	22500	8.5		20.88	

Table 4.4: Compressive Strength Observation 30% Rubber Cube

Sr. no.	Area of C/S mm²	Wt of standard cube kg	Mean	Compressive strength	
				28 days N/mm2	Mean
1	22500	8.5	8.5	17.40	17.61
2	22500	8.5		17.85	
3	22500	8.5		17.58	

Table 4.5: Compressive Strength Observation 40% Rubber Cube

Sr. no.	Area of C/S mm²	Wt of standard cube kg	Mean	Compressive strength	
				28 days N/mm2	Mean
1	22500	8.5	8.5	9.50	9.76
2	22500	8.5		9.82	
3	22500	8.5		9.98	

Table 4.6: Compressive Strength Observation 50% Rubber Cube

Sr. no.	Area of C/S mm²	Wt of standard cube kg	Mean	Compressive strength	
				28 days N/mm2	Mean
1	22500	8.5	8.5	6.94	6.33
2	22500	8.5		6.05	
3	22500	8.5		6.01	

1) Final Summary of Compression Test

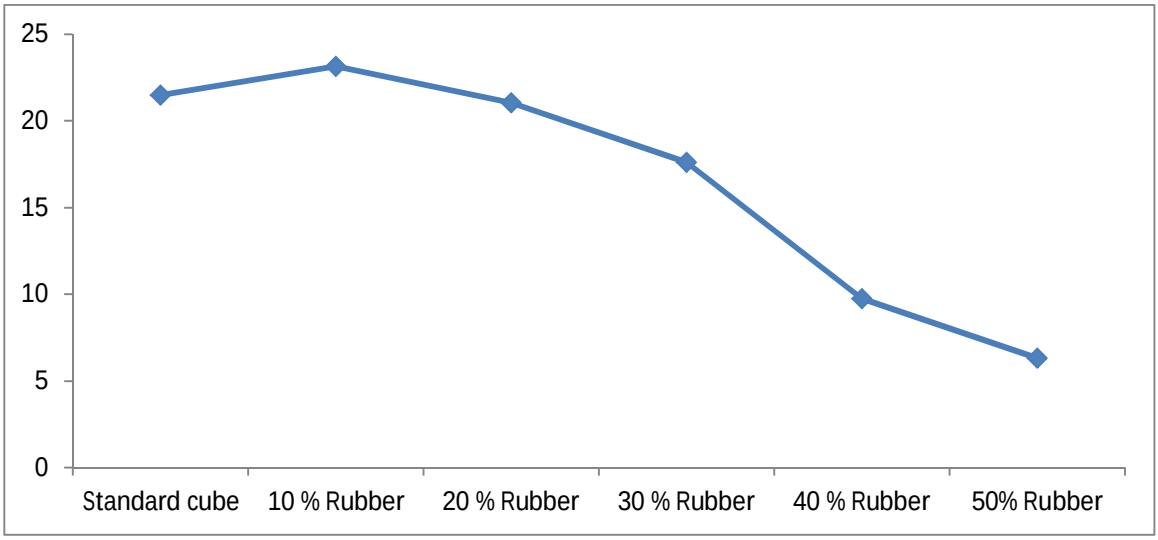


Fig 4.1: Comparative Studies of Comparative Strength

From these three trials we conclude that the compressive strength

a) For 10 % rubber Mix Concrete Compressive strength is more as compare to standard cubes.
b) For 20 % rubber Mix Concrete compressive strength is approximately equal to standard cubes.
c) And 30 %, 40%, 50% Rubber Mix concrete has less compressive Strength as compared to standard cubes.
d) So we can conclude 10% Rubber mix concrete has more compressive strength than others & it is used for Non structural work.

B. Following Results are obtained from Workability Test

Table 4.7: Workability of Rubber Cube

Replacement of Rubber in %	Slump Cone in mm
Standard concrete	80
10	72
20	65
30	41
40	25
50	12

1) Workability analysis

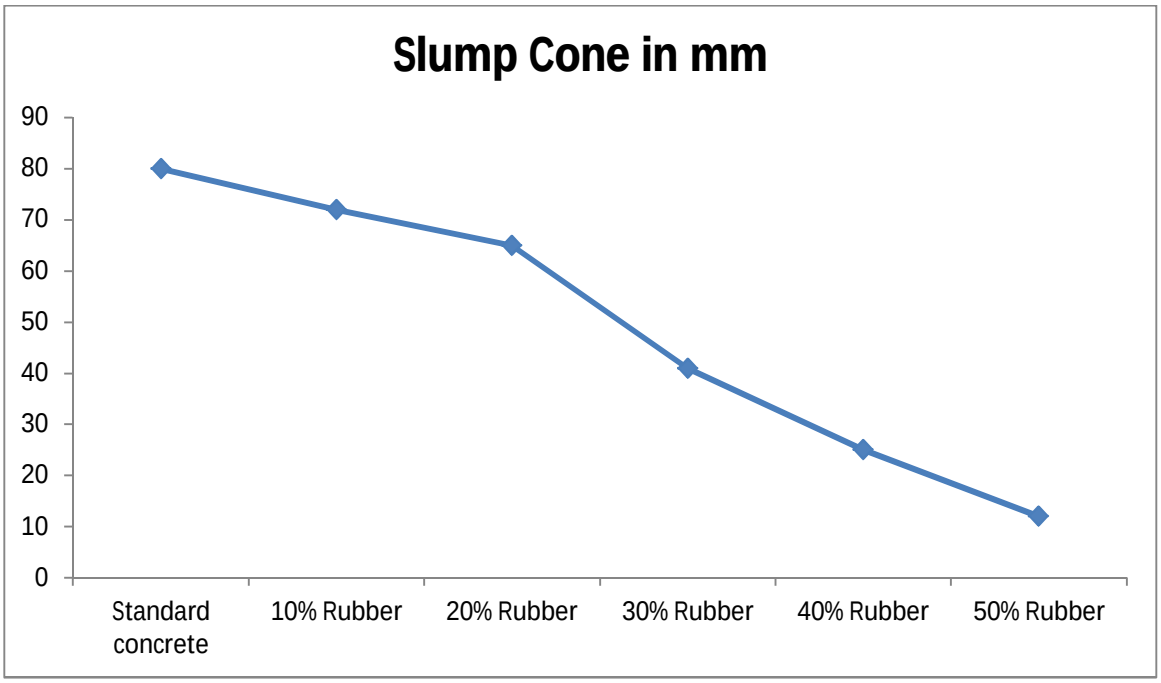


Fig 4.2: Comparative Studies of Workability

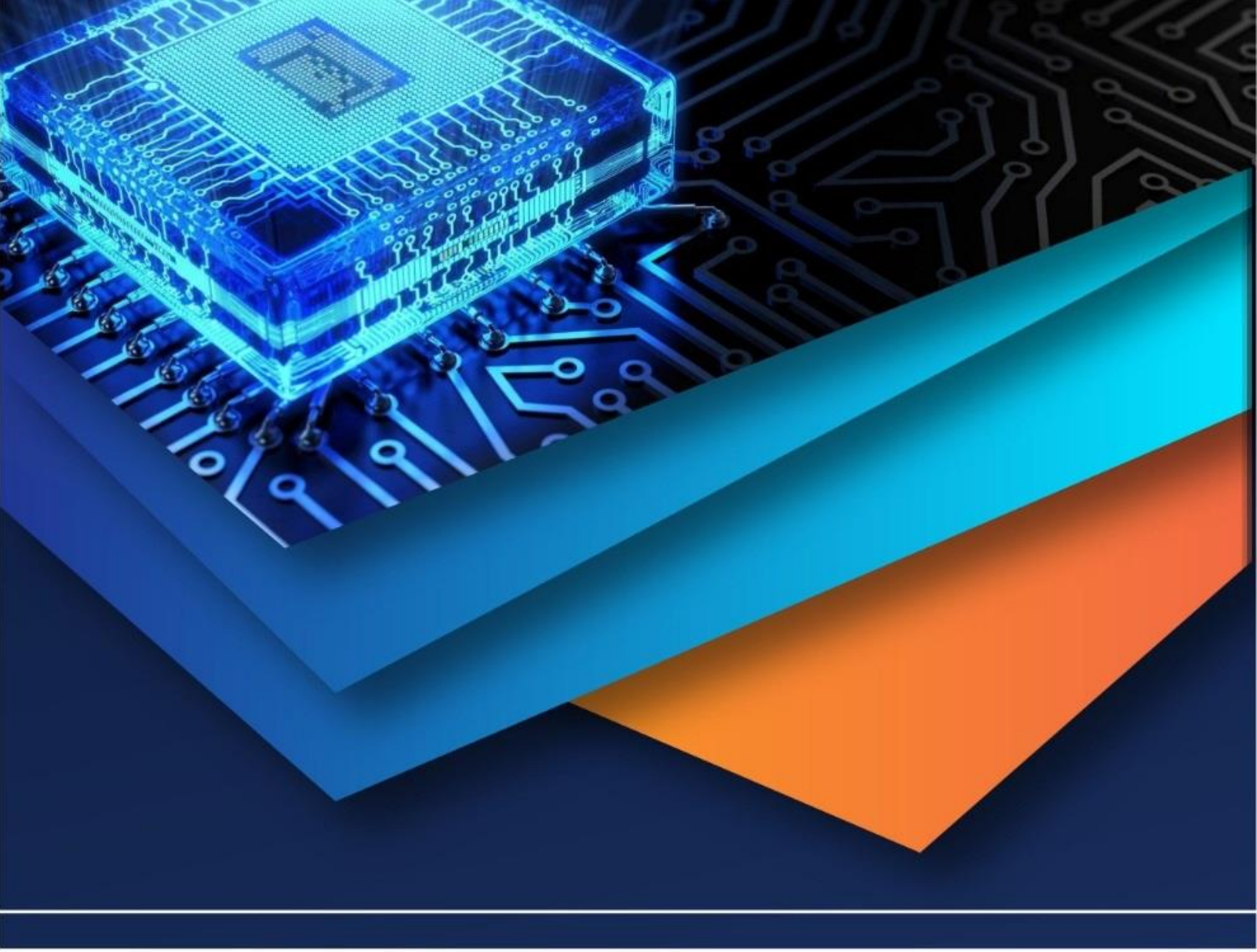
From above testing we can conclude that, 10% and 20% rubber concrete are more workable as compare to others and it is approximately equal to standard concrete.
But 30 %, 40 %, 50% rubber concrete is less workable as compare to others.

V. CONCLUSION

In this paper we can conclude that Use of rubber tyre chips in concrete is often useful against its environmental impacts. Its use in concrete quietly reduces its strength and workability. The percentage replacement of 10%, 20%, 30%, 40% and 50% is done and for each such case Three cubes where prepared. The final strength of 28 days of each such set of cube is taken out and is shown in fig no 4.1.From this graph it can be seen that compressive strength increases for the percentage replacement of 10% i.e. 23.13N/mm^2. However it is observed that with increased in the percentage replacement the strength of concrete is gradually reduced. Similarly, the slume test was conducted to check out the workability over where it is observed that with increased in the percentage replacement the workability or the slume value gradually decreases. The acceptable value for 10% replacement. It is often utilized in special circumstances, like non-load bearing structural members, noise reduction, earthquake resistant structures, foundations for machineries and railways etc.
From this it can be concluded that rubber can work as percentage replacement material for the concrete in a good way if it is replaced by 10%

REFERENCES

[1] K.C.Panda,P.S.Parhi, T.Jena “Scrap Tyre Rubber replacement for aggregate in cement concrete : Experimental study “International journal of earth Sciences and engineeringissn0974-5904, volume 05,no 06 (01)
[2] Mohammad Reza sohrabi, Mohammad karbalaie “An experimental study of compressive strength of concrete containing crumbsrubber “International Journal of Civil & Environmental Engineering IJCEE-IJENS Vol: 11 No: 03.
[3] Ilker bekir to pcu (1995) “The properties of rubberized concrete”, cement and concrete research, Vol.25, No.2, pp.304- 310, 1995.
[4] N. I. Fattuhi and L. A. Clark (1996) “Cement-based materials containing shredded scrap tyre rubber” Construction and Building Materials, Vol. 10, No. 4, pp. 229-236,1996.
[5] A.Subhasri, Dr.M. Kaarthik “Experimental investigations on self-compacting concrete with partial replacement of fine aggregate using crumb rubber” International Research Journal of Engineering and Technology (IRJET) Volume: 05 Issue: 04 Apr-2018 ISSN: e-2395-0056 p-ISSN: 2395-0072.



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