AN EXPERIMENTAL INVESTIGATION OF SCRAP STEEL REINFORCED WITH M20 CONCRETE

Sajad Ahmad Mir[1], Kshipra kapoor[2], Mukesh Kumar[3], Mohit Kansal[4]
[1]M. Tech Scholar, [2]Asst. Professor& HOD (UIET Lalru), [3,4]Asst. Professor (PPIMT Hisar)
Department of Civil Engineering, Universal Institute of engineering & technology Lalru Chandigarh

Abstract: The objective of this kind of work is to study the properties of concrete ,when it is reinforced with the scrap steel fibers generated from the lathes . In lathe machines wastes are generated in large quantities in the form of steel scraps, which are produced from the various job operations ,like finishing ,grinding of different machine parts .if we will not properly manage this wastes ,it will pollute our green environment ,makes the soil less productive . in this technology age these Scrap material can be added to concrete ,it improves the workability and mechanical properties of concrete .This scrap material when is added to concrete it is called steel Fiber Reinforced Concrete .various research work has taken place on this type of concrete .In this experimental investigation , scrap steel of diameter 0.5mm and length of 40mm was used with aspect ratio of 80mm and the fibers was used in varying percentages as 0%,0.4% ,0.8%,1.2% ,1.6% ,2% & 2.4% by the weight of concrete on M20 grade of Mix (1:1:6:2.99) With water cement ratio 0.42

I. INTRODUCTION

To introduce these kinds of lathe wastes generated from the lathe machines is the great task, keeping the environmental factor into mind as it can reduce the pollution level ,strategies for solid waste management are made now a days to solve the problems regarding pollution ,which is originated these kinds of solid wastes. By using the lathe scrap material ,it improves toughness of the steel scrap fiber concrete under different types of loading..& also increases the strength It has so many merits as compared to plain concrete .it decreases the permeability ,and increases the ductility ,with the addition of these kinds of fibers it improves the quality of concrete ,.this type of concrete can be used where the plain concrete fails ,it can be used in dams, bridges & multistoreyed structures .It has high strength as compared to plain concrete

II. LITERATURE REVIEW

Various investigations has taken place on the fiber reinforced concrete. As we came to know that the scrap steel material of lathe reinforced with concrete .Now a days large number of papers has been published and their result which they concluded in their papers like compressive strength & split tensile strength .Ahsana Fathima kmi & shibi Varghese[1] ,they used steel fibers &polypropylene fibers & study the impact of these materials on the concrete properties .They used fiber of length 25mm with aspect ratio 50 and replaced hooked end with crimped steel fibers .Vasudev R,Dr B.G vishnuram[2] they worked on M30 concrete reinforced with fibers with and added varying ranging of fibers 0,0.5,0.75& 1% and resulted that compressive strength increases from 20 -22 %.Shende.A.M.I &Pande .A.M[3]. Their work was on the fiber reinforced concrete by using different percentage of fiber 0, 1%, 2% & 3%by volume and aspect ratio was found 50,60 ,67 taking different length of fibers .they concluded that the flexural strength increases up to 3 % of fiber content .pooja shrivasta & Dr Y.P Joshi [4] they worked on the concrete reinforced with waste steel .they investigate that with the use of steel scraps as a steel fiber in rigid pavement ,improves the physical and mechanical properties .they used the percentage of fiber 0 % , 0.5 % ,1% ,1.5 % & 2 % and the average split tensile strength was found 3.4,3.63,3.91,4.06,3.82.

III. MATERIAL USED IN THE EXPERIMENTAL WORK

Cement : Ordinary Portland cement of 43 grade of ultra tech has been used in this work for the experimental purposes as per is 4031-1988

Aggregates : Aggregates are classified broadly into Fine and coarse aggregates

Fine aggregates : Fine aggregates which I used in my experimental work was that type of sand which was locally available and that before that this sand was used it was firstly sieved in IS sieve 4.75 mm and it was used for the preparation of steel fiber reinforced concrete Total weight of sand was taken 1kg and the time of sieving was 15 minutes .The properties of fine aggregate are as given in following tables

Coarse Aggregate : The coarse aggregates which was selected for this experimental work was obtained from local quarry . the maximum size of these coarse aggregate was 20mm .The physical properties of coarse aggregates like fineness modulus 2.3 and specific gravity of 3.10

Table 1.Properties of cement

Sr. No	Properties	Calculated experimental values	Specified values as per Is standard IS:8112-1989
1	Consistency of cement (%)	33	33
2	Specific gravity	2.99	3.15
3	Initial setting time in minutes	32	30
4	Final setting time in minutes	300	600
5	Compressive strength		

	(N/mm^2) After 3 days After 7 days After 28 days	 25.51 39.42 46.51	 23 33 43
6	Soundness test	9	10
7	Finess of cement	6 %	10 % IS:269-1976

Table No.2 Sieve analysis of fine Aggregate (As per 383-1970)

Sr.no	IS sieve used	Mass retained on Sieve (gm)	Percentage retained (%)	Cumulative Percentage Retained (c)
1	4.75mm	0	0	0
2	2.36mm	30	3	3
3	1.18mm	19	1.9	4.9
4	600µ	17	1.7	6.6
5	300µ	431	43.1	49.7
6	150µ	369	36.9	86.69
7	75µ	118	11.8	98.4
8	Pan	16	1.6	100
∑c= 349.29				

Calculations :-
Fineness modulus of sand =∑*c*/100
Fineness modulus of sand = 349.29/100 =3.49
Fibers : These fibers were collected from the scrap material generated from lathe .the shape of fibers was straight and deformed & with Diameter of 0.5 has been used in this experimental work for the preparation of fiber reinforced concrete .The length of fibers was selected 40mm and density 7850 and with tensile strength 500-300 N/mm2
Water : water which was selected for the mixing and curing in this experimental work was free from oils ,acids ,alkalies ,salts and sugar .As per IS code 456:2000 potable water is generally considered for the concreting operations

IV. EXPERIMENTAL WORK

As for the experimental work is concerned following tests are performed like Flexural strength test Compressive strength and Split Tensile test
Flexural strength Test : The flexural strength were tested after 7 days and 28 days and the result is enlisted below (Table no 3)
Compressive Strength: The compressive strength was conducted on the cubes .The specimens were placed under the apparatus .The compressive strength are given in following table no 4
Split tensile strength: split tensile strength of concrete mixtures was calculated after 7 Days & 28 Days ACI-544,2R-89,refer splitting test for the fiber content concrete .the results are given in table no 5

Table 3.Flexural strength results

Mix Designation	Percentage of steel fibers (%)	Flexural strength after 7 days	Flexural strength after 28 Days
Mxo	0	1.39	2.19
Mx1	0.4	1.46	2.98
Mx2	0.8	1.77	3.31
Mx3	1.2	1.89	3.25
Mx4	1.6	2.1	3.53
Mx5	2	1.79	3.04
Mx6	2.4	1.9	3.11

Table 4 .compressive Strength Results

Mix Designation	Percentage of steel fibers (%)	Compressive strength after 7 days	Compressive strength after 28 Days
Mxo	0	15.18	29.25
Mx1	0.4	18.88	31.99
Mx2	0.8	19.25	33.77
Mx3	1.2	18.73	33.84
Mx4	1.6	21.99	36.21
Mx5	2	17.85	32.73
Mx6	2.4	18.73	34.22

Table 5.Showing the Split Tensile strength result

Mix designation	% Of steel fiber	Split tensile strength after 7 days (N/mm2)	Strength After 28 days (N/mm2)
Mxo	0	1.41	2.28
Mx1	0.4	1.62	2.52
Mx3	1.2	1.80	2.94
Mx4	1.6	1.83	3.11
Mx5	2	1.75	2.55
Mx6	2.4	1.61	2.61

From the result it clearly showed that the split Tensile strength increases with the scrap steel reinforced with concrete .And result also showed that the mechanical properties of scrap steel increases up to 1.6% fiber contents on further increasing , it decreases strength ACI also recommend use of fiber content up to 2 % more ,it needs further investigation

V. CONCLUSION

From the Results of the experimental investigation following are the conclusion

- The experimental investigation shows the properties of M20 reinforced with scrap material (steel fibers) generated from lathe
- The Experimental work also showed that the workability of SFRC gets reduced as we increased the fiber amount
- It also shows that the compressive strength of SFRC gets increased up to 12% with 1.6% of steel fibers

used as compared to plain concrete

- It has been concluded that use of fiber content of 1.6% by weight of concrete is the optimum dosage
- The split tensile strength of steel fiber reinforced concrete gets increased up to 24% with 1.6 % as compared to plain concrete

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