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EXPERIMENTAL INVESTIGATION ON USE OF LATHE SCRAP STEEL FIBERS IN RIGID PAVEMENT

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Abstract— **Due to globalization and the construction of very challenging and difficult civil engineering structures, Concrete is the most suitable material which is used in construction worldwide. It is called upon to possess very high strength and sufficient workability properties and efforts are made in the field of concrete by using fibres and other admixtures, In concrete up to certain proportions, In the view of global sustainable developments. waste scrap steel which are produced in different manufacturing processes of lathe machine works can be used as reinforcing material in concrete to enhance the various properties of concrete. The aim of the paper was to study the feasibility of using steel scrap in concrete by checking various concrete parameters like compressive strength, tensile strength and flexural strength. All the parameter checked with varying percentage by 0%,0.5%,1%,1.5%,2% by weight of concrete. This paper presents the current status and past studies in the area of reuse of waste materials in concrete. However, this building material is in the development stage and it has a wide scope in the future.**

Index Terms— **Lathe steel scrap fiber, compressive strength, fatigue endurance, flexural strength, workability, tensile strength.**

I. INTRODUCTION

Concrete pavement is a key structure of highway pavement in india due to increase in ride superiority, minimum maintenance, and extended design life. These rigid pavements may sometimes experience pavement distress that results in premature failure. This research studies the application of fibers in concrete due to its enhancement resistance to cracking. Now-a-days steel fibers in concrete increase intensively as an engineering demand. From the present scenario it is not only essential to provide safe, efficient and economical design, but it also provide as balanced base for future application. The energy consumption and cost associated with concrete pavements can be reduced through the use of recycled materials with more effective construction techniques. The inclusion of fiber in concrete ,mortar and cement paste can enhance many of the engineering properties of the matrix, such as fracture toughness, flexural strength and resistance to fatigue, impact, thermal shock and spalling. The modern use of fibre reinforced concrete started in 1960s using straight, smooth and discontinuous steel fibres. Applications for SFRC are used in floors, pavements and other plane structures where fibres act as crack distributing reinforcement. The fibres may act as shear reinforcement and also improve the capacity of the bars due to increased crack distribution.

A. Plain Cement Concrete (PCC)

Plain concrete possess large compressive strength and sufficient workability properties but it possess very low tensile strength, limited ductility and little resistance to cracking. Internal micro-cracks are inherently present in the concrete and its poor tensile strength is due to propagation of such micro–cracks. Eventually leading to brittle fracture of the concrete. In plain concrete and similar brittle materials, structural cracks (micro-cracks) develop even before loading, particularly due to drying shrinkage or other causes of volume change. The development of such micro cracks is the main cause of inelastic deformations in concrete. Thus need for multidirectional and closely spaced steel reinforcement arises, which is not possible practically fiber reinforced concrete is the solution for this problem. The addition of small closely spaced and uniformly dispersed fibers to concrete would act as crack arrester and would substantially improve its static and dynamic properties.

B. Fiber reinforced concrete

Fiber reinforced concrete is a concrete mix that contains short discrete fibers that are uniformly distributed and randomly oriented. Lathe scrap fiber reinforced concrete (LSFRC) defined as composite materials made with OPC, aggregates and reinforced with steel scrap randomly distributed fibers or discrete discontinuous fibers. The function of fibers in SSFRC is to improve-

- post peak ductility

- Durability
- Pre-crack tensile strength
- Fatigue strength
- Impact strength

The fibers used in FRC are short and discrete because fibers which are too long tend to "ball" in the mix and create workability problems.

II. OBJECTIVE AND SCOPE

The objective of this paper is mentioned point wise as follows:

a) To study effect of waste steel scrap in concrete.

b) To establish the alternatives of ingredients of concrete.

c) To check the feasibility of waste steel scrap in concrete.

d) To check feasibility various tests done on prepared concrete specimen like compressive strength, split tensile strength, flexural strength etc.

e) To compare test results with conventional concrete.

III. DETAILS EXPERIMENTAL

A. Materials

1) Cement : Ordinary Portland cement (OPC-43grade) of sp.gr. 3.15 is used in experimental work and tested as per IS:12269-1987.

2) Aggregates

Fine Aggregates: fine sand used form zone II of sp.gr.2.68 and water Absorption 2.10% is consider for the experimental (IS2386-1963).

Coarse aggregates: 20mm size aggregates of sp.gr. 2.92 and water Absorption 0.94% is used for experimental work.

3) Fibers: These steel fibers are in scraped form called steel scrap or elongated chips. These are in form of waste product and used as steel fibers in concrete.

B. Methodology

1) Concrete Mix Design

In the present study M30 grade concrete mix design as per IS: 10262:2009 is carried out with water content was 152 l/m3.

2) Casting and Testing

Total 30 cubes were casted. Scrap steel fibers was added in concrete in 5 different percentages staring from 0.0%, and rose the mixing of scrap Lathe fibers up to 2.0%, at an interval of 0.5%. for each percent of scrap steel fiber addition , 3 cubes, 3 beams and 3 cylinders were casted. Final strength of cubes was tested after 7 and 28 days of curing. beams and cylinders were tested after 28 days of curing. Compression testing machine is used for testing compressive strength and split tensile strength of concrete and flexural testing machine was used to determine flexural strength of concrete. The crushing loads were noted and average strengths for three specimens tested were determined for each percentage of fiber added, which is given in the table 1, 2, 3 and 4 respectively.

IV. RESULT

A. Compressive strength:

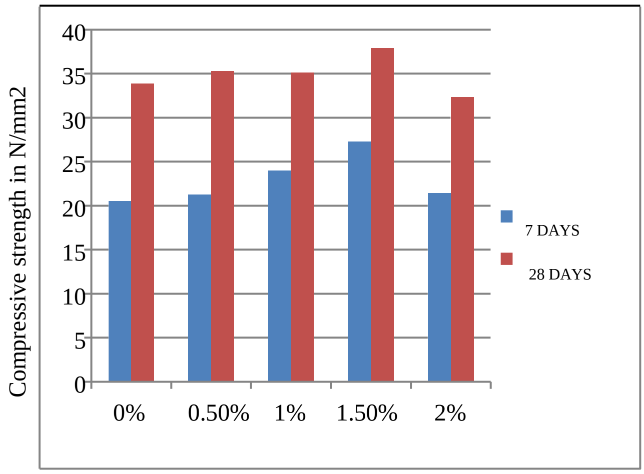
(IS 516-1959)Fibers usually minor effects on compressive strength, slightly increasing or decreasing the result. Cubes moulds are used to prepare 15 cubes testing under universal testing machine.

Table no. 1 Compressive strength of LFRC at 7 days

Lathe scrap Fibers (%)	SR. NO.	Load at Failure (KN)	Strength at 7 Days (N/mm$^{2)}$	Average strength At 7 days
0	1	450	20.00	20.55
	2	465	20.67	
	3	472	20.98	
0.5	1	470	20.89	21.32
	2	480	21.33	
	3	489	21.73	
1	1	510	22.67	24.00
	2	520	23.11	
	3	590	26.22	
1.5	1	590	26.22	27.26
	2	620	27.56	
	3	630	28.00	
2	1	470	20.89	21.42
	2	475	21.11	
	3	501	22.27	

Table no. 2 Compressive strength of LFRC at 28 days

Lathe scrap Fibers (%)	SR. NO.	Load at Failure (KN)	Strength at 28 Days (N/mm$^{2)}$	Average strength At 28 days (N/mm^2)
0	1	730	32.44	33.90
	2	795	35.33	
	3	763	33.91	
0.5	1	795	35.33	35.26
	2	825	36.67	
	3	760	33.78	
1	1	820	36.44	35.11
	2	790	35.11	
	3	760	33.78	
1.5	1	820	36.44	37.93
	2	855	38.00	
	3	885	39.33	
2	1	730	32.44	32.37
	2	735	32.67	
	3	720	32.00	



% of Lathe scrap added

1) Flexural strength test

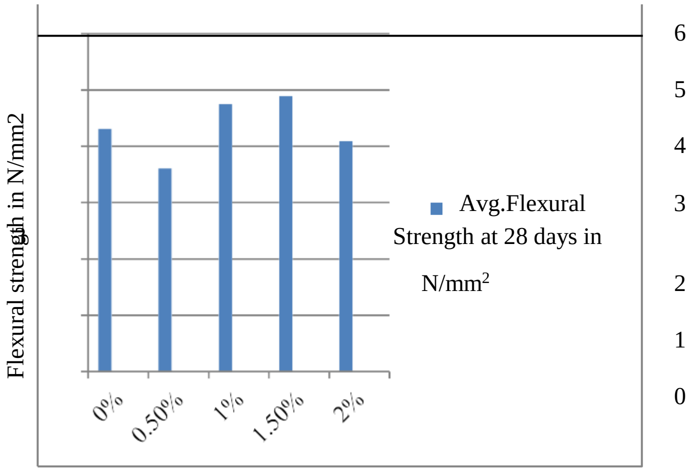
For flexural strength test beam specimens of dimension 150x150x700 mm were cast. These flexural strength specimens were tested under two point loading as per IS 516-1959, over effective span of 600 mm on flexural testing machine. Load and corresponding deflections were noted up to failure. In each category there beams were tested and their average value is flexural strength was calculated as follows,

Flexural strength (MPa) = (P x L)/(b x d2)

Where, P = failure load, L= centre to centre distance between the support= 600 mm, b= width of specimen=150 mm, d= depth of specimen =150mm

Table no.3 Flexural strength of LFRC at 28 days

Lathe scrap Fibers (%)	SR. NO.	Load at Failure (KN)	Strength at 28 Days (N/mm^2)	Average strength At 28 days (N/mm^2)
0	1	23.50	4.18	4.31
	2	24.40	4.34	
	3	24.90	4.43	
0.5	1	19.30	3.43	3.61
	2	20.00	3.56	
	3	21.60	3.84	
1	1	22.50	4.00	4.75
	2	25.60	4.55	
	3	32.00	5.69	
1.5	1	27.00	4.80	4.89
	2	27.50	4.89	
	3	28.00	4.98	
2	1	23.50	4.18	4.09
	2	22.60	4.02	
	3	23.00	4.09	



% of Lathe scrap added

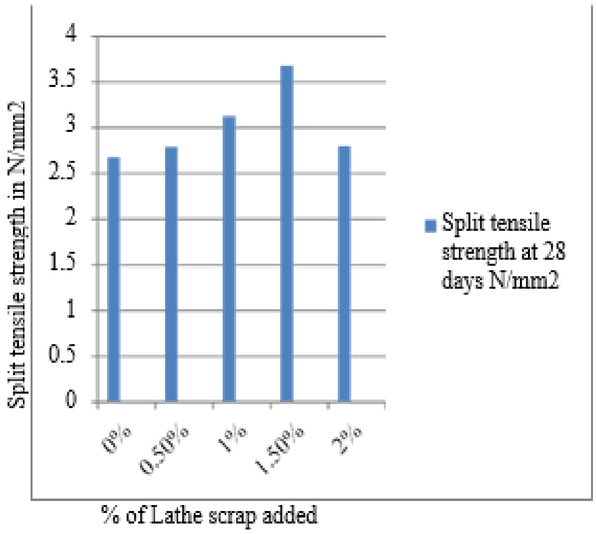
2) Split tensile strength:

For split tensile strength test, cylinder specimens of dimension 150mm diameter and 300 mm length were cast. These specimens were tested under compression testing machine, in each category three cylinders were tested and their average value is reported. Split tensile strength was calculated as follows as split tensile strength:

Split tensile strength (MPa) =2P / πDL. Where P =failure load, D= diameter of cylinder, L = length of cylinder.

Table no. 4. Split tensile strength of LFRC at 28 days

Lathe scrap Fibers (%)	SR. NO.	Load at Failure (KN)	Strength at 28 Days (N/mm^2)	Average strength At 28 days (N/mm^2)
0	1	180	2.55	2.68
	2	189	2.68	
	3	198	2.80	
0.5	1	195	2.76	2.79
	2	197	2.80	
	3	199	2.81	
1	1	220	3.11	3.13
	2	221	3.13	
	3	223	3.15	
1.5	1	250	3.54	3.68
	2	263	3.72	
	3	267	3.78	
2	1	197	2.79	2.80
	2	200	2.83	
	3	196	2.78	



V. CONCLUSION

The study proves that the compressive strength, flexural strength and split tensile strength of the concrete is increased by increasing the proportion of the lathe scrap up to 1.5% for 7 days and 28 days. From 1.5 % to 2 %, it shows slight decrease in compressive strength, flexural strength, split tensile strength (28 days).

VI. FUTURE SCOPE

Effect of rusting of the steel lathe scrap on the strengths of concrete can be determined. Also the effect of lathe scrap on the reinforcement provided in R.C.C. structure can be determined.

REFERENCES

[1] Structural strength enhancement of rigid pavement using scrap steel fibre Reinforcement. G.Niranjana,researchscholar, Dr. Samson Mthew, Assistant Professor,and Dr. P.Jayabalan, department of civil engineering ,NIT, Tiruchirappali.

[2] An Expérimental investigation on mechanical properties of Scc Using Steel Scrap. S. arunkumar, S. vijaya Baskar assistant professor department of civil engineering, P.S.R Engineering college, sivakasi, India.

[3] Analysis of properties of concrete using steel scrap. Shivam Darji, Raju Prajapati department of civil engineering, Sardar Patel college of engineering,Bakrol- anand, india.

[4] An Experimental study on strength and corrosion of concrete with steel scrap.Aravind N. Department of Built and Natural Enviroment, Caledonian College of Engineering, Sultanate of Oman.

[5] Performance analysis of steel scrap in structural concrete.Abdul Rahman, Ashwin R.Lords Institute of engineering and technology, india.

[6] Reuse of lathe waste steel scrap in concrete pavememts. Pooja shrivastava, Dr.Y.P.Joshi. Department of civil engineering, SATI govt. Engineering college,Vidhisha.

[7] An experimental study on Mechanical Properties of scrap Reinforced Concrete using waste metal. Dhilip kumar.p Shankar.p, nandha engineering college Erode, Tamilnadu, India.

[8] Effect of lathe waste in concrete as reinforcement. Prof. Kumaran M.universal engineering college, thrissur, Kerala, india. 1989.