

# Study on Addition of Lathe Scrap to Improve the Mechanical Properties of Concrete

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**ABSTRACT:** This project work assess on the study of the workability and compressive strength of the concrete reinforced with waste lathe scrap. In each lathe industries wastes are available in form of steel scraps are yield by the lathe machines in process of finishing of different machines parts and dumping of these wastes in the barren soil contaminating the soil and ground water that builds an unhealthy environment. When the steel scrap reinforced in concrete it acquire a term; fiber reinforced concrete and lathe scrap fibers in concrete defined as Lathe scrap fiber reinforced concrete (LSFRC). In this study, M30 concrete is used and lathe scrap fiber is added up to 2% by weight, at a gap of 0.4%. In this investigation, a comparison have been made between plain cement concrete and the fiber concrete containing steel (lathe) scarp in various proportions by weight. The workability of fresh lathe fiber concrete is restricted to less lathe contents. The compressive strength of Lathe Fiber Concrete (LFC) is found to be maximum for 1.2% (28 days strength) lathe scrap fiber added concrete.

**KEYWORDS:** lathe scrap, compressive strength, sustainability, workability, etc

## I. INTRODUCTION

The present day, world is facing the construction of very challenging and difficult civil engineering structures. Concrete, being the most important and widely used material, is called upon to possess very high strength and sufficient workability properties and efforts are made in the field of concrete technology to develop the properties of concrete by using fibers and other admixtures in concrete up to certain proportions. In the view of the global sustainable developments, it is imperative that Fiber Reinforced Concrete (FRC) provide improvements in tensile strength, toughness, ductility, post cracking resistance, fatigue characteristics, durability, shrinkage characteristics, impact, cavitations, erosion resistance and serviceability of concrete<sup>[13]</sup>. Due to these benefits, the use of FRC has increased during last two decades.

In the present experimental investigation, an attempt will be made to analyze the compressive strength of the waste lathe scrap material which is available from the lathe machine, is used as a steel fiber in cement concrete for various construction works and to optimize fiber content. Lathe Fiber Reinforced

### 1.1 Plain Cement Concrete [PCC]

Plain concrete possess large compressive strength and sufficient workability properties but it possesses a 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 the 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

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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.

## 1.2 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 fibres used in FRC are short and discrete because fibres which are too long tend to "ball" in the mix and create workability problems<sup>[14]</sup>.

## II. DETAILS EXPERIMENTAL

### 2.1 Materials

**2.1.1 Cement:** Ordinary Portland cement (OPC- 53 grade) is used in this experimental work and tested as per IS 12269-1987.

*Table no. 1 Properties of cement*

Sr. No.	Properties	Values
1	Standard Consistency (%)	30
2	Initial Setting Time(min.)	50
3	Final Setting Time(min.)	560
4	Specific Gravity	3.15
5	Compressive strength at 28 days N/mm <sup>2</sup>	45.33
6	Fineness (%)	4

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## 2.1.2 Aggregates

**Fine aggregates:** Fine sand used from zone II consider for the experiment (IS 2386-1963). The properties of fine aggregates are

**Table no.2 Properties of Fine aggregates**

Sr. No.	Properties	Values
1	Water absorption (%)	1.59
2	Specific Gravity	2.55
3	Clay and silt content (%)	2

**Coarse aggregates:** The properties of the course aggregate are

**Table no.3 Properties of Coarse aggregates**

Sr. No.	Properties	Values(20 mm)
1.	Water Absorption (%)	0.45
2.	Specific Gravity	2.94
3.	Elongation Index (%)	5.15
4.	Impact Value (%)	8.45
5.	Abrasion Value (%)	10.71
6.	Flakiness Index (%)	9.27

**2.1.3 Fibers:** These steel fibers are in scarped form called steel scrap or elongated chips. These are in form of waste product and used as steel fibers in concrete.

## 2.2 Methodology

### 2.2.1 Concrete Mix Design

In the present study M30 grade concrete mix design as per IS: 10262-2009 is carried out. The concrete mix proportion was 1:1.73:3.3:0.45 and water content was 170l/m<sup>3</sup>

### 2.2.2 Casting and Testing

Total number 36 cubes were casted. Scrap Steel Fiber was added in concrete in 5 different percentages starting from 0.0%, and rose the mixing of Scrap Lathe fiber up to 2.0%, at an interval of 0.4%. For each percent of scrap steel fiber addition, 3 cubes were casted. Final strength of cubes was tested after 14 and 28 days curing. Compression testing machine is used for testing the compressive strength of cube. The crushing loads were noted and average compressive strength for three specimens is determined for each which is given in table 7 and table 8 respectively.

## III. RESULT AND DISCUSSION

**3.1 Workability:** The workability of fresh LFRC is a measured of its ability to be mixed, handled, transported and importantly place and consolidated. Slump test is a common, convenient and inexpensive test but refer only for small fiber contents, for high volume contents inverted cone or vebe test is referred (IS 1199-1959).

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**Table no.6 Slump for LFRC**

Sr. No.	Lathe scraps Fiber (%)	Values
1	0	80
2	0.4	75
3	0.8	73
4	1.2	71
5	1.6	70
6	2	70

**3.2 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.7 Compressive strength of LFRC**

Lathe scrap Fiber (%)	Sr.No.	Load at failure (KN)	Strength at 14 days(N/mm <sup>2</sup> )	Average Strength at 14 days(N/mm <sup>2</sup> )
0	1	750	33.33	33.33
	2	740	32.88	
	3	760	33.77	
0.4	1	780	34.66	34.66
	2	770	34.22	
	3	790	35.11	
0.8	1	830	36.89	36.44
	2	810	36.00	
	3	820	36.44	
1.2	1	790	35.11	34.66
	2	780	34.66	
	3	770	34.22	
1.6	1	750	33.33	34.07
	2	790	35.11	
	3	760	33.7	
2	1	700	31.11	32.74
	2	710	31.35	
	3	720	32.00	

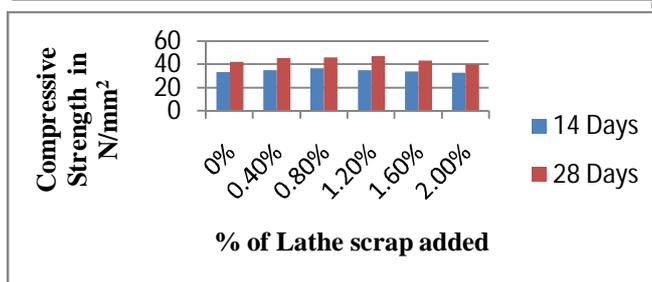
**Table no.3.3 Compressive strength of LFRC**

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Lathe scrap Fiber (%)	Sr.No.	Load at failure(KN)	Strength at 28 days(N/mm <sup>2</sup> )	Average Strength at 28 days(N/mm <sup>2</sup> )
0	1	930	41.33	42.07
	2	950	42.22	
	3	960	42.67	
0.4	1	1030	45.78	45.18
	2	1000	44.44	
	3	1020	45.33	
0.8	1	1060	47.11	45.92
	2	1000	44.44	
	3	1040	46.22	
1.2	1	1100	48.88	46.66
	2	1000	44.44	
	3	1050	46.67	
1.6	1	1000	44.44	43.26
	2	950	42.22	
	3	970	43.11	
2	1	880	39.11	39.70
	2	920	40.88	
	3	880	39.11	



## IV. CONCLUSION

The study proves that the compressive strength of the concrete is increased by increasing the proportion of the lathe scrap up to 0.8% for 14 days and up to 1.2% for 28 days. From 1.2% to 2.0%, it shows slight decrease in compressive strength (28 days). Addition of scrap lathe fibers to concrete increases the compressive strength of concrete marginally (by 11%).

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