Use of Lathe Scrap as Addition of PPC cement in Concrete

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Abstract— Leaving the industrial waste material directly into the environment can lead to various problems. So it becomes necessary to reuse industrial waste material in an emphasized manner. Waste used to produce new products or used as admixtures so that natural resources used in an effective manner and environment protected from waste deposits and depletion of natural resources. Iron & Steel plants generate waste in form of Steel scrap (Lathe scrap) from Lathe machine. Every day about 8 to 10 kg of lathe waste are generated by each lathe industries in the Jalgaon and dumped in the barren soil there by contaminating the soil and ground water, which creates an environmental issue.

Key words: Steel (Lathe) Scrap, Compressive Strength, Tensile Strength

I. INTRODUCTION

Global warming and environmental destruction have become the major issue in recent years. Use of more and more environmental- friendly materials in any Industry in general and construction industry in particular, is of paramount importance. This waste in form of steel (lathe) scrap, cause a great impact on environment and humans. This paper describes use of Steel (Lathe) scrap and its feasibility in use of it as a partial addition to cement.

Steel (Lathe) Scrap is a by-product of iron steel manufacturing industry. Today construction industry is in need of finding a cost- effective material to increase the strength of concrete structures.

Today the construction industry is in need of finding cost effective materials for increasing the strength of concrete structures. It is inevitable to think about sustainable development by reducing the wastes generated or reusing it. Hence an attempt has been made in the present investigations to study the performance of addition of waste materials like steel lathe waste from workshop at a dosage addition of 2%, 4%, 6%, 8% of total weight of cement in concrete. Experimental investigation was done using M20 mix and tests were carried out as per recommended procedures by relevant codes. specimens of scrap concrete and made. This paper aims to have a comparative study between plain concrete to steel scrap reinforced concrete of M20 concrete. The test parameters include compressive strength, split tensile strength of conventional concrete and steel scrap in concrete

II. MATERIALS AND METHODS

A. Cement

PPC (Puzzolona Portland Cement)IS 4031:1968 adopted in this work. test conducted on Cement are as follow,

Sr. No.	Test	Result	IS Requirement
1	Finenes of Cement	4%	As per IS 269-1976 Max 10%
2	Consistency of cement	35%	-
3	Initial setting time	125min	As per IS 4031:1968 Min.30min
4	Final setting time	435min	As per IS 4031:1968 Max.600min

Table 1: cement

B. Coarse Aggregate

The aggregate used in this project mainly of basalt rock, which comes under normal weight category. The aggregates used are locally available. About 50% of the aggregate used are of 10-12 mm size and remaining 50% are of 20mm size. The coarse aggregate tested for their suitability for the experiment. The test conducted on aggregate are as in Table No. 2

Sr no.	Test	Result
1	Size Of Aggregate	10-12mm
2	Crushing Value	22.45%
3	Impact Value	12.73%
4	Abrasion Value	14.38%
5	Flakiness Index	16.2%
6	Elongation Index	14.9%

Table 2: Coarse Aggregate:

C. Sand

Natural sand, easily available and low in price used in the work. It has cubical or rounded shape with smooth surface texture. Being cubical, rounded and smooth texture it give good workability. Sand, used here taken from Girna River. Particles of this sand have smooth texture and are blackish. Tests conducted on Sand shown in Table No. 3.

Sr. no.	Test	Result	IS Requirement
1.	Fineness Modulus	3.07%	As per IS 383:1970 Max. 3.2
2.	Moisture Content	7.2%	-

Table 3: Sand

D. Steel Scrap (Lathe)

Steel scrap (Lathe scrap) from Lathe machine. Every day about 8 to 10 kg of lathe waste are generated by each lathe industries in the Jalgaon. are as in fig.1

Fig. 1:

Note: College itself provided all the materials and equipments, except Steel scrap (Lathe). Sand obtained from Girna River, which was gray blackish in colour.

E. Concrete Mix Design

In the present study, M20 grade with nominal mix as per IS 456-2000 was used. The concrete mix proportion (Cement: Sand: Coarse Aggregate) is 1: 1.5: 3 by weight and a water cement ratio of 0.50.

F. Casting and Testing Detail

Total number 15 cubes and 10 cylinders were casted. Addition of Steel (Lathe) scrap by cement in concrete in step of (0%, 2%, 4%, 6%, 8%) For each percent of Addition of Steel (Lathe) scrap by Cement, three cubes & two cylinders were casted for 28 days.

Final strength of cube & cylinder tested after 28 days curing. Compression Testing Machine (CTM) used for testing the Compressive Strength of cube and Split Tensile Strength of cylinder. The crushing loads noted and average compressive strength and tensile strength for three specimens and two specimens respectively is determined for each, given in Table No. 4 and Table No. 5 respectively.

% of steel (lathe) scrap	Avg. Strength at 28 days	Increase in Strength
0	30.12 N/mm2	-
2	38.90 N/mm2	29.15%
4	32.52 N/mm2	7.96%
6	34.51 N/mm2	14.57%
8	36.03 N/mm2	19.62%

Table 4: Compressive Strength

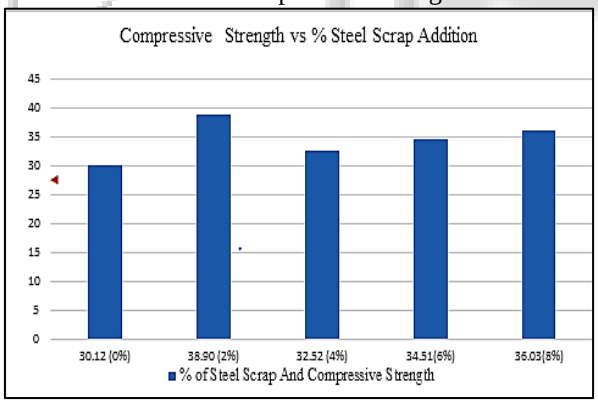

Fig. 2:

% of steel (lathe) scrap	Avg. Strength at 28 days	Increase in Strength
0	2.45 N/mm2	-
2	3.02 N/mm2	23.26%
4	2.69 N/mm2	9.75%
6	2.72 N/mm2	11.02%
8	2.94 N/mm2	20%

Table 5: Split Tensile Strength

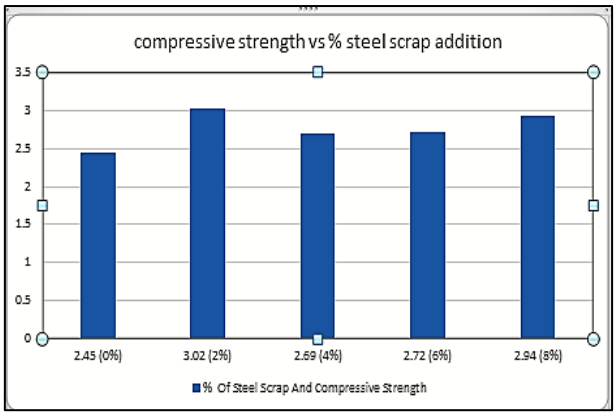

Fig. 3:

III. RESULT AND DISCUSSION

A. Compressive Strength

Compressive strength of concrete tested on cube at different percentage of Addition of Steel (Lathe) scrap by cement in concrete. The strength of concrete tested on cube at 28 days curing. 28 days test gives the data of final strength of concrete at 28 days curing. Compression Testing Machine (CTM) used for testing the compressive strength of concrete. At the time of testing the cube taken out of water, dried and then tested keeping the smooth faces in upper and lower part.

1) Discussion

With Addition of Steel (Lathe) scrap by cement, the strength of concrete gradually increases upto a certain limit then it gradually decreases.

1) With the Addition of Steel (Lathe) scrap by cement upto 2%, the initial strength gain in concrete is high.
2) At 2%, there is 29.15% increase in initial compressive strength for 28 days.

B. Split Tensile Strength

Split Tensile strength of concrete tested on cylinders at different percentage of Addition of Steel (Lathe) scrap by cement in concrete. The strength of concrete tested on cylinder at 28 days curing. 28 days test gives the data of final strength of concrete at 28 days curing. Compression Testing Machine (CTM) used for testing the Split Tensile Strength test on concrete along with two wooden boards. At the time of testing, the cylinder taken out of water further dried and then tested.

1) Discussion

1) With Addition of Steel (Lathe) scrap by cement, the strength of concrete gradually increases upto a certain limit, then it gradually decreases.
2) With the Addition of Steel (Lathe) scrap by cement upto 2%, the initial strength gain in concrete is high.
3) At 2%, there is 23.26% increase in initial split tensile strength for 28 days.

IV. CONCLUSIONS

1) The Compressive strength of Cubes are increased with upto Addition of Steel (Lathe) scrap by cement, 2% add by weight of cement and further Addition of Steel (Lathe) scrap by cement, lead to decrease in compressive strength.

2) The Split Tensile strength of Cylinders are increased with upto Addition of Steel (Lathe) scrap by cement, 2% add by weight of cement and further Addition of Steel (Lathe) scrap by cement, lead to decrease the Split Tensile strength.
3) Thus, we found out the optimum percentage for addition of steel (lathe) scrap with cement is almost 2% for cubes and cylinders.
4) We have put forth a simple step to minimize the costs for construction with usage of Steel (Lathe) Scrap which is freely or cheaply available, more importantly.
5) We have also stepped into a realm of saving the environmental pollution due to dumping of industrial wastes in form of steel (Lathe) scrap; being our main objective as Civil Engineers.

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REFERENCES

[1] ACI Committee 544 'Design Considerations for Steel Fiber Reinforced Concrete'
[2] ACI Committee 544 'Measurement of Properties of Fiber Reinforced Concrete Guide for Specifying, Proportioning, Mixing'
[3] G Vijayakumar1, P Senthilnathan1, K Pandurangan1 and G Ramakrishna 'Impact and energy absorption character tics of lathe scrap reinforced concrete' ISSN 2319 – 6009 Vol. 1, No. 1, November 2012© 2012 IJSCER
[4] Gambhir M. L., 1986, Concrete technology, Tata McGraw Hill publishing company Ltd., New Delhi.
[5] Hawken, P., 1994. Waste. New York: John Wiley and Sons.
[6] IS 10262:2009- Concrete Mix Design - Guidelines, Bureau of Indian Standards,(BIS), New Delhi India.
[7] IS 383 (1997) — Specification for course and fine aggregates from Natural Sources for Concrete.
[8] IS-516 (1959) — Methods of Tests for Strength of Concrete.
[9] IS-5816 (1999) — Splitting tensile strength of concrete-Method of test.
[10] Shetty M. S., 2002. "Concrete Technology", S. Chand and Company Ltd. Ramnagar, New Delhi.
[11] Shirule Pravin, Swami Suman and Nilesh Chincholkar 'Reuse of steel scrap from lathe machine as reinforced material to enhance properties of concrete' Global J. of Engg. and Applied Science 2012:2(2).

