An Experimental Study On Flexural Behavior Of Concrete Using Lathe Scraps With Steel Fibres

Mr. K. Sudhakar #1, Ramakrishnan V R #2, Sarma S #3, Suganeswaran D #4, Boopathi V #5
Assistant Professor, Department Of Civil Engineering,
Gnanamani College Of Technology,
Tamilnadu, India

ABSTRACT - Concrete is used more than any other man-made material in the world. One of the issues raised since the concrete structure was introduced in the construction industry is go to increase strength if concrete as well as efficient and economical. One of such innovation is High Strength Concrete can be achieved by many modes but in this project it is planned to use lathe scraps and steel fiber in concrete to achieved high strength. The nature sand was replaced with lathe scraps by following proportion (5%, 10%, 15%, 20%). This Paper aims to have a comparative study of flexural behavior of ordinary reinforced concrete with steel fiber reinforced concrete. The fibers added in this study are the waste for lathe shops. The behavior of concrete samples is investigated by adding steel fiber of 2%.

Key words: Steel fiber, Lathe scraps, Compressive strength, Tensile strength, Flexural strength.

INTRODUCTION:
Lathe waste in crimped fiber form is a waste from lathes. Various experimental studies conducted on lathe waste reveal that there is a considerable increase in compressive strength and flexural strength than conventional concrete. The main aim of this thesis is to determine then strength characteristics of RC beams under combined bending and shear and pure bending. The lathe waste was processed manually to get an aspect ratio from 50 to 120. The lathe waste was also changed the failure pattern in RC beams. So the study of behavior of lathe waste concrete in RC beams is important. By adding fibers made of steel to reinforced concrete, the matrix shall not possess cracks which enable the structure to be more durable.

OBJECTIVE
- To achieve high strength concrete economically
- To study the utility of Lathe scraps and Steel fibers as an additive in concrete
- To study and compare the performance of conventional concrete and high strength concrete using Lathe scraps and Steel fibers
- To understand the effectiveness of Lathe and Steel fibers in enhancement of concrete strength
- To study the effect of varying percentage of replacement of fine aggregate by lathe scraps and steel fibre on concrete.
- To investigate the appropriate replacement percentage for lathe scraps and lathe scraps based on the strength and workability parameters.
- To study the degree of workability of concrete on all proposed replacement percentages.

SCOPE OF THE INVESTIGATION:
- The main aim of this project is utilization of waste material (Lathe scraps and Steel fibres) as cement which is mixed (addition and partial replacement) with PPC to investigate the affect of these waste material on various parameter of concrete grade. i.e M30.
- To compare the engineering properties of so improved concrete for M40 (addition and partial replacement) specimens with controlled mix concrete.
- Thus replacing the natural cement in concrete applications with lathe scraps would lead to considerable environmental benefit & would be economical.

METHODOLOGY:
1. LITERATURE REVIEW
2. MATERIAL COLLECTION
3. TESTING OF MATERIAL
4. MIX DESIGN
5. CONCRETE PREPARATION
6. FRESH CONCRETE TEST
7. HARD CONCRETE TEST
8. RESULT AND DISCUSSION
9. CONCLUSION
**Possibilities of Application Iron Containing Waste Materials in Manufacturing of Heavy Concrete**

Third International conference civil engineering’ 11 Proceedings

Rational use of highly dispersed metal is an important issue of material science and environment protection. The quantity of the powdered metallic materials used in industry is steadily increasing; they are especially widely used in the enterprises producing iron powder, in metal sheet production, as well as in abrasive machining. This paper presents an analysis of several kinds of metal waste such as iron and steel powders, mill scales, steel punching, metal shavings and other containing waste from mechanical engineering and metallurgy industries, and the possibility of their in the manufacturing of concrete products like fillers. This study investigates properties of the samples of the concrete manufactured using highly dispersed metallic fillers. The highest density obtained is in the range of 4000 – 4500 kg/m³. The common characteristic of the afore mentioned materials are their low cost, availability and thus the potential for large production volumes, need for recycling, and tendency to further oxidation and corrosion.

**G.Vijayakumar, P.Senthilnathan, K.Pandurangam and G.Ramakrishna Impact and Energy Absorption Characteristics of Lathe Scraps Reinforced Concrete, Vol. 1, No. 1, November 2015**

This project work emphasis on the study of using lathe scrap as fibre reinforced concrete in the innovative construction industry. Every day about 8 to 10kg of lathe waste are generated by each lathe industries in the Pondicherry region and dumped in the barren soil there by contaminating the soil and ground water, which creates an environmental issue. Hence by adopting proper management by recycling the lathe scrap with concrete is considered to be one of the best solutions. The test were conducted as per the Indian standard procedure for its mechanical properties such as flexural, split tensile, compressive, and impact strength and compared conventional PCC. The 7 days strength of the lathe scrap reinforced concrete shows an increase in its compressive strength when compared with PCC, and almost become equal to the strength when tested on 28 days under normal curing. The addition of lathe scrap in concrete has increase the performance of beam in flexural by 40% when compared with PCC. There is only a considerable increase in the split tensile strength of concrete with lathe scrap when compared with PCC. The workability of fresh concrete that containing different rations of lathe scrap was carried out by using slump test. The result showed that addition of lathe scrap in to PCC mixture enhanced its compressive strength while it decreased the workability of the fresh concrete containing the lathe scraps. The impact strength of concrete mixed with lathe scrap shows increased impact strength when compared with PCC.

**Dr.N.Ganesan, Mr.T.Sakar Effect of Steel Fiber on the Strength of High Performance Concrete Composites**

This paper presents the results of an experimental investigation carried out to study the effect of addition of steel fibers on the various strength properties of High Strength Performance Concrete (HPC) composites. The main variables considered in this study are: (i) 3 different aspect ratios of steel fibers viz. 50, 75, and 100, and (i) 3 different volume fractions of steel fibers viz. 0.5%, 0.75%, and 1.0%. Test result indicate that the addition of steel fibers to HPC enhances its various strength properties and strength-to–weight ratio markedly.

**MATERIALS USED:**

a) Cement (PPC 53).

b) Coarse Aggregate.

c) Fine Aggregate

d) Lathe scraps & Steel fibres

e) Mixing water.

**Cement:**

PPC 53Grade conforming IS 12269:1987,Minimum cement content : 300 kg/m³ (IS456:2000), Specific gravity of Cement: 2.93

![Fig.a. Cement](image)

**Coarse aggregate:**

As per IS 383:1970 the nominal size of aggregate is 20mm used. The shape of coarse
aggregate is angular, water absorption is 0.5%. specific gravity of coarse aggregate is 2.60.

c) Fine aggregates:
As per IS 383:1970 the nominal size of aggregate is 20mm used. The shape of coarse aggregate is angular, water absorption is 0.6%. specific gravity of coarse aggregate is 2.64.

d) Lathe scraps:
Lathe scraps are the waste materials which are collected from workshops and other steel industries at very minimum cost. They are similar to the sand but they do not have any regular shape and size. The dimension and fineness varies with the nature of source, that is depends upon the types of industries. Every day about 4 to 6 kg of lathe waste are generated by each lathe industries in the Salem region and depends on the lathe scraps few of them only recycling the lathe scraps waste as a recycled metals, by selling their lathe scraps to recycling industries.

e) Mixing water:
Combining water with a cementitious material forms a cement paste by the process of hydration. The cement paste glues the aggregate together, fills voids within it, and makes it flow more free.

PROPERTIES OF MATERIALS:
Specific gravity for cement (2.93)
Consistency test on cement (33%)
Specific gravity for fine aggregate (2.64)
Specific gravity for coarse aggregate (2.60)
Specific gravity for coarse aggregate (2.93)
Specific gravity for coarse aggregate (7.90)

MIX DESIGN:
The mix design was made confirming IS 10262:2009.M20 grade concrete is used. The mixes were made by partially replacing lathe scraps and steel fibres to fine aggregate of percentage 0%,5%,10%,15%,20%.

Mixing of materials.
W/C ratio: cement: fine aggregate: coarse aggregate
1:1.54:2.37

Table 1. Types of specimen and replacing %

<table>
<thead>
<tr>
<th>S. NO</th>
<th>Type of specimen</th>
<th>No of specimen</th>
<th>% of Lathe scraps +</th>
<th>Steel fibres</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cube</td>
<td>3</td>
<td>0</td>
<td>10+2</td>
</tr>
<tr>
<td>2</td>
<td>Cylinder</td>
<td>3</td>
<td>0</td>
<td>15+2</td>
</tr>
<tr>
<td>3</td>
<td>Prsim</td>
<td>3</td>
<td>0</td>
<td>20+2</td>
</tr>
</tbody>
</table>

strength, freeze- thaw, abrasion and impact resistance of the building. On the other hand, it is easy to shape the fibres. There are different types of steel fibres for different purposes. By

Sudhakar, Ramakrishnan, Sarma, Suganeswaran, Boopathy ... (IJ0SER) April–2018
Compressive Strength Test

Compressing test machine

The compressive strength of concrete is one of the important and useful properties of concrete. In most structural applications concrete is employed primarily to resist compressive stresses. The size of the cube specimen is 150 mm x 150 mm x 150 mm. The maximum load applied to the specimen until failure was recorded.

Compressive strength = $\frac{\text{Ultimate load (N)}}{\text{Sectional area (mm}^2\text{)}}$

<table>
<thead>
<tr>
<th>S. no</th>
<th>Specimen Name</th>
<th>Percentage of Lathe Scrap + Steel Fibres</th>
<th>Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 days</td>
</tr>
<tr>
<td>1</td>
<td>A00</td>
<td>0</td>
<td>11.25</td>
</tr>
<tr>
<td>2</td>
<td>A05</td>
<td>5+2</td>
<td>7.14</td>
</tr>
<tr>
<td>3</td>
<td>A10</td>
<td>10+2</td>
<td>14.07</td>
</tr>
<tr>
<td>4</td>
<td>A15</td>
<td>15+2</td>
<td>11.11</td>
</tr>
<tr>
<td>5</td>
<td>A20</td>
<td>20+2</td>
<td>9.11</td>
</tr>
</tbody>
</table>

Split Tensile Strength Test:

The split tensile strength is determined using concrete cylinders of 150 mm diameter and 300 mm long. The test results of various proportions for 7 & 28 days are given below.

Split Tensile Strength = $\frac{2P}{\pi DL}$

Where,

$P$ = ultimate load at cylinder
$L$ = length of the cylinder
$D$ = Diameter of the cylinder
Flexural tensile strength tests were carried out on prism of size 500 mm x 100 mm x 100 mm specimens at the age of 28 days curing, using 60 tonne capacity universal testing machine as per BIS: 5816-1970.

Flexural strength = \( \frac{P l}{b d^2} \) (N/mm\(^2\)) Where,
- \(P\) = Applied load (N),
- \(L\) = Length of the prism (mm),
- \(d\) = Depth of the prism (mm),
- \(b\) = Breadth of the prism (mm).

### Split Tensile Strength for 7, 14 & 28 days

<table>
<thead>
<tr>
<th>S.no</th>
<th>Specimen Name</th>
<th>Percentage of Lathe Scraps + Steel Fibres</th>
<th>Split Tensile Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 days</td>
</tr>
<tr>
<td>1</td>
<td>A00</td>
<td>0</td>
<td>1.07</td>
</tr>
<tr>
<td>2</td>
<td>A05</td>
<td>5+2</td>
<td>1.16</td>
</tr>
<tr>
<td>3</td>
<td>A10</td>
<td>10+2</td>
<td>1.14</td>
</tr>
<tr>
<td>4</td>
<td>A15</td>
<td>15+2</td>
<td>1.21</td>
</tr>
<tr>
<td>5</td>
<td>A20</td>
<td>20+2</td>
<td>1.18</td>
</tr>
</tbody>
</table>

### Flexural Strength of Concrete

<table>
<thead>
<tr>
<th>S.no</th>
<th>Specimen Name</th>
<th>Percentage of Lathe Scraps + Steel Fibres</th>
<th>Flexural Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 days</td>
</tr>
<tr>
<td>1</td>
<td>A00</td>
<td>0</td>
<td>0.41</td>
</tr>
<tr>
<td>2</td>
<td>A05</td>
<td>5+2</td>
<td>0.51</td>
</tr>
<tr>
<td>3</td>
<td>A10</td>
<td>10+2</td>
<td>0.53</td>
</tr>
<tr>
<td>4</td>
<td>A15</td>
<td>15+2</td>
<td>0.63</td>
</tr>
<tr>
<td>5</td>
<td>A20</td>
<td>20+2</td>
<td>0.70</td>
</tr>
</tbody>
</table>
Flexural strength for 7, 14 & 28 days

CONCLUSION:

Based on the above discussion, the following conclusions are drawn;

An experimental study on flexural behaviour of concrete using lathe scraps with steel fibres but in that conventional concrete and partial replacement of lathe scraps and addition of steel fibres are showing strength as minimum difference. So we have used lathe scraps in concrete at particular percentage. It will give more strength than conventional concrete and also availability of materials in lathe workshops. So we done this project in incredible manner.

REFERENCE:


• IS 10262-2009, “Indian Standard recommended guidelines for concrete mix design”

• IS 456 –2000 code for plain and reinforced cement concrete.