EXPERIMENTAL STUDY ON CONCRETE IN PARTIALLY REPLACEMENT OF FINE AGGREGATE WITH SAW DUST

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Abstract— The possibility of using sawdust as a construction material for concrete was experimentally investigated by replacing fine aggregate as a sawdust. Sawdust is available as natural material and also useful for industrial purpose in order to minimize the fine aggregate and also the cost in the construction field. A comparative study was analyzed on the effect of concrete properties when sand was partially replaced by sawdust. The sawdust sieved using a 4.76mm sieve and 53 grade of cement. Using design mix M30 grade of conventional concrete and has to ratio of 1:1:2 (cement: sand: aggregate) has to be taken and percentage of replacement of fine aggregate with saw dust of 10%,20% and 30% respectively. Experimental investigation were carried out on concrete cubes, flexural beams and cylindrical moulds. The mix was designed for target cube strength of 30N/mm² at 28 days.

Keywords— sawdust; aggregate; cement; curing

1. Introduction:
Concrete is most widely used as a construction material in day-to-day life and it also has abundantly all over today. Concrete is the best material of choice of where strength, durability, ductility, tensile and absorption resistance are required. In order to minimize the cost of the construction material in day-to-day life and to utilize the natural source materials such as saw dust, rice husk, egg shell, coir are used. Saw dust is the waste product which is available huge in quantity and which can be used as substitute of fine aggregate. In the last decade, construction industry has been conducting research on the utilization of waste product in concrete. Each waste product has its own specific effect on properties of fresh and hardened concrete. Conservation of natural resources and presentation of environment is the essence of any development. The problem arising from continuous technological and industrial development is the disposal of waste material. If some of the waste material are found suitable in concrete making not only cost of construction can be cut down and also safe disposal of waste material can be achieved. The use of waste product in concrete not only makes it economical but also solves some of the disposal problems.

2. Saw dust
Sawdust or wood dust is a by-product of cutting, grinding, drilling, sanding, or otherwise pulverizing wood with a saw or other tool and it is composed of fine particles of wood. It is also obtained from debris of certain animals, birds and insects which live in wood, such as the woodpecker and carpenter ant.

The material is fine. The specific gravity of sawdust is 1.33. The water absorption is 13%. The majority of the fine particles of sawdust passed through 4.76mm BS test sieve.

3. Methodology
The object of this paper is to make a comprehensive study on the compressive, split tensile and flexural of the conventional concrete and the saw dust concrete and to find the saw dust content required to attain maximum compressive strength. Adding saw dust to the mix by partially replacing fine aggregate to cast concrete specimens. The saw dust have to add by 10, 20 & 30 percentage of weight of the fine aggregates to compare with conventional concrete. The moulds of cubes, cylinders and prisms are casted as per the standard size; for each percentage have to compare the compressive, tensile and flexural strength of the saw dust concrete with conventional concrete at 7, 14 & 28 days of curing.

3. Experimental evaluation
The following test to be conducted to determine the hardened property of the saw dust concrete:

1. Compressive Strength test
2. Split tensile Strength test
3. Flexural Strength test

The above tests helps to find characteristic strength of saw dust concrete and ease to compare with conventional concrete. The result and analysis graph of
Addition of 30% of saw dust in concrete mix gives nearly 8.12% increases in flexural strength compared with conventional concrete.

Addition of 30% of saw dust provides 13% increase in compressive strength than that of conventional concrete specimen.

After comparing the above results following discussions are made:

- Addition of 30% of saw dust in concrete mix gives nearly 6.2% increases in tensile strength compared with conventional concrete.
- Addition of 30% of saw dust provides 13% increase in compressive strength than that of conventional concrete specimen.
- Addition of 30% of saw dust in concrete mix gives nearly 8.12% increases in flexural strength compared with conventional concrete.
- It figures that the further increment in saw dust will increase characteristic strength of the concrete.

4. Discussions

Table 1. Compressive Strength Results

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<th>28 Days</th>
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<tbody>
<tr>
<td>1</td>
<td>M₁</td>
<td>3.10</td>
<td>3.37</td>
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<td>2</td>
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<tr>
<td>4</td>
<td>M₄</td>
<td>3.41</td>
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Table 2. Split Tensile Strength Results

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<td>4</td>
<td>M₄</td>
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Table 3. Flexural strength results

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<td>4</td>
<td>M₄</td>
<td>4.12</td>
<td>4.35</td>
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</tbody>
</table>

Fig.1: Graphical representation of compressive strength of 7 days and 28 days curing.

Fig.2: Graphical representation of Split tensile strength.

Fig.3: Graphical representation of Flexural strength of prism.

Fig.4: Graphical representation of compressive strength of cubes cured by using sand pit method.
5. Conclusion

According to the discussion of above results the following conclusions are derived from this study:

- Every percentage of increase of saw dust replaced by fine aggregates; increases the compressive, tensile and flexural strength.
- Ultimate increase in compressive, tensile and flexural strengths of saw dust concrete is identified as 35.92, 4.01 and 3.65 respectively.
- The result concluded the saw dust increases 30% of characteristic strength of concrete.
- It is clearly identified that the saw dust increases the crack arresting property of the concrete with the increment of saw dust. Hence it proves that the added percentage of saw dust controls the cracks and arrests the porous available in concrete.
- Addition of minimal percentage saw dust itself increases the compressive strength in higher manner.
- So, it is preferable and economical when the places required high compressive strength instead of going special cements.

References