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Effect on Strength Properties of M30 Grade of Concrete by Using Waste Wood Powder as Partial Replacement of Sand

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ABSTRACT

Saw dust is also known as wooden dust. It is the result of cutting, drilling wood.it is composed of fine particles of wood, certain animals, birds and insects which live in wood such as carpenter ant are also responsible for producing the wooden dust. It is produced as a small irregular chips or small garbage of wood during sawing of logs of timber into different sizes. In this work partial replacement of waste wood powder is investigatedby varying proportion in the concrete .The replacement of fine aggregate (sand) with certain wooden powder in concrete that makes the structure more light in weight. The workability, strength and durability test are studied in this paper. The most important properties of concrete is the compressive strength. Also, increasing the wooden dust in corporation caused decreases in unit weights and compressive strength values of mortars with a parallel increase in water absorption values at all ages. The replacement of fine aggregates (sand) with wooden powder gives the properties and the benefits in the actual production of concrete.

***Keyword*--**Wooden Powder, Fine aggregates, compressive strength, saw dust

I. INTRODUCTION

Now a day's lots of invention in the field of concrete technology that can control the use of Cement in concrete. If there will be the replacement of fine aggregates (sand) with wooden powder with other material. Then there will be the less emissions of carbon dioxide in environment. As we are using the industrial waste material to produce a better quality concrete. The environmental problem can be solve by the replacement of industrial wastes and by product. The replacement of fine aggregates (sand) with the help of waste materials (wooden powder) can be beneficial for the structure, environment. Thus, the properties of concrete are change such as workability, compression test, elongation index etc.

II. OBJECTIVE

- The main aim of this work is utilization of waste materials (wooden powder) as fine aggregates which is mixed (addition & partial replacement) with OPC to investigate the affect of these waste materials on various parameters of concrete grade i.e. M30.
- To evaluate and compare the results of density, workability, compressive strength of M30 grade of concrete by using wooden powder with standard concrete.
- To compare the engineering properties of so improved concrete for M30 (addition & partial replacement) specimens with controlled mix concrete.
- To ensure the optimum use of domestic and industrial waste and reduce the carbon footprints.
- The primary objective is to generalize the properties of concrete with the use of waste material such as wooden powder.

III. METHODOLOGY

The methodology of the work is shown in fig 1

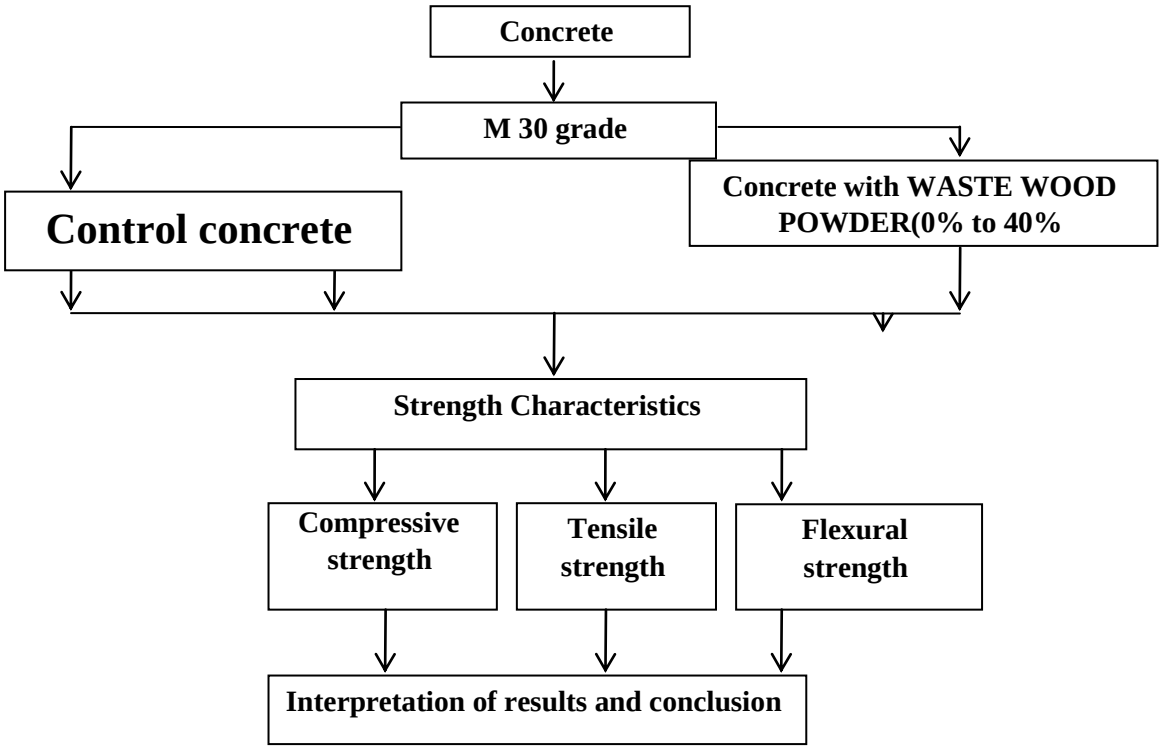

Fig 1 Methodology

IV. MATERIAL PROPERTIES

CEMENT

The characteristic of cement is one of the most essential parameters governing the performance of the concrete. OPC 43 grade cement with specific gravity 3.15 has been used in this investigation. Initial setting time was 60min.

FINE AGGREGATE

River sand of zone III Passing through IS sieve 4.75mm and free from deleterious materials was used. River sand confirming to IS 383:1970 was used for this work. specific gravity of sand was 2.66

COARSE AGGREGATE

The coarse aggregate passing through IS Sieve 20mm and retained in 12.5mm sieve was used in this work. Specific gravity was found to be 2.87

WATER

Potable water free from organic and inorganic salts was used in this work for curing and mixing of concrete.

SAW DUST

Wooden saw dust obtained from wood cutting industry with specific gravity 1.65 and saw dust passing through 2.36mm sieve was used in this work.

SUPER PLASTICIZER

Super plasticizer of high range water reducer from fosroc was used in this work

Mix Proportion

M30 Grade of concrete with cement content 450kg/m^3, fine aggregate 650kg/m^3 and coarse aggregate 1100kg/m^3 . Mix design was done as per IS 10262:2009 . slump value was 100mm

Table 1 showing % of wood waste powder

% OF SAW DUST REPLACED WITH RIVER SAND
10
20
30

40

COMPRESSIVE STRENGTH TEST

The cube compressive strength results at the various ages such as 7 days and 28 days for different replacement percentage for river sand10%, 20%, 30%, 40%. cubes were cast as per IS 516:1959 .size of cube used 150mmx150mmx150mm. Results are shown in table 2

TABLE 2 COMPRESSIVE STRENGTH OF WOOD WASTE POWDER CONCRETE

% OF SAW DUST REPLACED WITH RIVER SAND	**AVG COMPRESSIVE STRENGTH AT 7 DAYS (N/mm^2)**	**AVG COMPRESSIVE STRENGTH AT 28 DAYS (N/mm^2)**
0	17.5	32.36
10	18.55	34.29
20	18.96	36.74
30	18.22	35.36
40	18.00	34.51

SPLIT TENSILE STRENGTH TEST

This is an indirect test to determine the tensile strength of cylindrical specimens. Splitting tensile strength tests were carried out on cylinder specimens of size 150 mm diameter and 300 mm length at the age of 7, 28 days curing. Test was performed as per IS 516:1959.Results are shown in table 3

TABLE 3 SPILT TENSILE STRENGTH OF WOOD WASTE POWDER CONCRETE

% OF SAW DUST REPLACED WITH RIVER SAND	**AVG SPLIT TENSILE STRENGTH AT 7 DAYS (N/mm^2)**	**AVG SPLIT TENSILE STRENGTH AT 28 DAYS (N/mm^2)**
0	3.11	4.25
10	3.45	4.39
20	3.78	4.47
30	3.26	4.13
40	2.98	4.09

V. RESULT AND DISCUSSION

The replacement of fine aggregates by wooden powder in concrete generally increases the ultimate strength of concrete. The compressive strength, split tensile strength were found to be reducing when waste wood powder is more than40%.The optimum proportion of the wooden powder by which the maximum strength is achieved were found to be light in weight compared to the normal concrete and environment friendly

VI. CONCLUSION

From the above test it is concluded that addition of wood ash as alternate material for sand can be done. Partial replacement of wood ash with sand up to 30% is effective. Compressive strength and split tensile strength was found to be good when compared to control concrete, percentage increase of wood ash showed increase in strength. Addition of wood ash makes the concrete light weight. Wood waste powder replacement with sand for 10%, 20%, 30% was found to be higher than conventional concrete .Using of wood waste powder as replacement of sand is cost effective and user friendly. Optimum performance was found at 20% replacement of wood ash with sand. From this it is clearly known that wood ash can be partially replaced for sand and it can be considered as an alternative fine aggregate.

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