Research Paper Engineering

Partial Replacement of Sand With Sawdust and Cow Dung in M15 Grade Concrete Production

Tanveer Asif Zerdi	Director, Professor Head of Civil Engg Dept, KCT Engineering college, Gulbarga, Karnataka, India.
Md Yousuf	UG Student Department OfCivil Engineering V.T.U University K.C.T.E.C Gulbarga Karnataka
Mohammed Fariduddin	UG Student Department Of Civil Engineering V.T.U University K.C.T.E.C Gulbarga Karnataka
Mohammed Jaleel	UG Student Department Of Civil Engineering V.T.U University K.C.T.E.C Gulbarga Karnataka

ABSTRACT

Cow dung and saw dust are the two waste products very less research work is done on these paradigmatic products use in concrete, hence this inspired the authors to do the work under consideration. This research aims to find out the optimum compressive strength of concrete produced with partial replacement of cement with cow dung and fine aggregates with sawdust. The concrete mix of 1:2:4 was prepared using water/cement ratio of 0.65 with 0%, 2%, 4% and 6% cow dung and 6% sawdust were used concurrently as partial replacement for fine aggregates and cement respectively. The different compressive strength developed were 18N/mm2, 15.4 N/mm2 ,13.8 N/mm2 12.5 N/mm2 at 28 days curing. As the curing period increases the compressive strength development gets accelerated.

KEYWORDS Compressive Strength, Curing, Water/Cement Ratio, Saw Dust, Cow dung.

I. INTRODUCTION:

The cost of building construction is increasing daily as a result of increasing in the cost of building materials such as-cement, granite, fine aggregates etc. This has prevented the low income earners to have their own house. Also, the agricultural and industrial wastes pose great hazard to environment and man as a result of improper management even when these wastes are burnt, they release carbon-monoxide to atmosphere which depletes the ozone layer. If these wastes are processed, they may be suitable for construction purpose. Base on these two major points given above, there is a need to investigate the use of alternative building materials which are locally available such as sawdust, cow dung, wastes from demolished building, palm kernel shell, mining wastes etc that can be used in concrete production. Since most building construction works consists of concrete work which happens to be the most expensive aspect, therefore, reduction in cost of concrete production will reduce the cost of building construction and paves ways for low income earners to become landlords and if these wastes are used in concrete production, there will be drastically reduction in amount of carbon emission, our environment will more friendly and depletion of ozone layer will seize. The overall relevance of concrete in virtually all Civil Engineering practices and building construction cannot be overemphasized. The compressive strength value obtained were found to confirm the minimum requirement of 17 N/mm^2 for light weight concrete specially when 2% cement and fine aggregate were replaced with cow dung and saw dust respectively[3]. In the saw dust replaced concrete compressive strength at 28 days falls within the characteristic strength of plain concrete[4].

II. Scope And Objective:

- The purpose of the present dissertation work is summarized as the following objectives
- To evaluate performance of light weight concrete.
- To make concrete production as cost effective.
- The implementation of waste sawdust can not only decrease environmental damage, but also can save the concrete materials.
- It has many advantages over traditional concrete, such as low bulk density, better heat preservation and heat insulation property.
- It has lower pollution for our environmental impact. it is also ecofriendly.
- A paradigmatic use of waste sawdust and cow dung

III. MATERIALS AND METHODS

Cow dung: This is obtained from the cow excreta. It was sun-dried and grounded to fine powder form like cement. The grounded cow dung particles were sieved through 90microns and used for concrete production without further treatment. The percentage replacements for cement were varied from 0%, 2%, 4% and 6%. The cow dung was obtained.

Sawdust: It was obtained from saw mill industry and sieved and retained on sieve aperture of 600microns, sundried, then kept in waterproof bags and used without further treatment. The percentages of replacements of fine aggregates by sawdust were varied from 6%
Cement: Portland cement was used for this research work and it was found to confirm with the requirements of IS 10262:(2009)

Water: The water used for this work is potable, clean and free from any visible impurities. It confirmed to IS 10262:(2009)

Fine aggregates: The fine aggregates used for this work is stone dust. It was retained on a 600microns sieve. The impurities were removed and found confirmed to the requirements of IS 10262:(2009)

Coarse aggregates: Granites were used for this work of size12.5mm. They are free from debris and other impurities. They are angular in shape. The tests carried out on these materials are slump test, sieve analysis, specific gravity and compressive strength

Slump test: The most widely used test for determine the workability of concrete. The test is a measure of the resistance of concrete to flow under its weight. The apparatus used is a hallow cone shaped mould test.

Compressive strength test: The compressive strength of concrete is one of the most important and useful properties of concrete. The primary purpose for design concrete is to resist compressive strength in structural members. Hence it is the role of a concrete designer to specify the expected characteristics strength of concrete/mix proportion to enable it resist external force.

Sieve analysis: This is a test that is performed to determine the percentage of different grain sizes contain within the material. The mechanical sieve analysis is performed to determine the distribution of coarser, larger-sized particles. The sieve analysis of this study was carried out on saw dust. Specific gravity test. This is a test that is performed to determine the density of the soil particle finer than 2mm. At least two specimens, each between 5g and 10g shall be obtained by riffling. The specimens shall be oven dried or sundried at 1050c to 1100c and stored in an airtight container.

Table-1 Physical properties of material.

Material	Specific gravity	Water absorption	Fineness modulus
Cement	3.13	--	<100 micron
Fine aggrerate	3.00	1%	4.84
Saw dust and cow dung	1.25 and 1.33	0.20%	> 600 micron
Coarse aggregate	2.72	0.5%	2.82

IV. Experimental program

The saw dust and cow dung were collected from saw mills and its properties were tested. Analysis was carried out in Concrete mixture. The concrete mix of 1:2:4 was prepared using water/cement ratio of 0.65 with 0%, 2%, 4% and 6% cow dung and 6% sawdust were used concurrently as partial replacement for fine aggregates and cement respectively. The specific gravity values of cement. The specimens were cast and tested to study the possibility of using saw dust and cow dung as a substitute material for sand in concrete .The control mix, Utilizing SD and cow dung replaced as the fine aggregate, was designed for the cube The mixture were 0%, 2%, 4%, 6%, with different cow dung value and saw dust 6% sawdust replacement in fine aggregate in analyzed. Tests to determine specific gravity, moisture content , water absorption, Bulk density, Compressive strength of cubes. For compressive strength tests 150 x 150 mm cubes were used. A total of 48 specimens were cast and cured in water at room temperature in the laboratory for 3days,7 days,14 , 28 days. At the end of each curing period, three specimens for each mixture were tested for Compressive strength, average was recorded.

Table-2 Mix proportion

Particulars	Plain concrete mix	2%	4%	6%
Cement kg/m3	310.5	310.5	310.5	310.5
Sand kg/m3	817.65	801.3	784.9	768.6
Sawdust cowdung kg/m3	0	16.35	32.7	49.05
Coarse agg kg/m3	1679	1679	1679	1679
Water kg/m3	146.74	146.74	146.74	146.74

V. RESULTS AND DISCUSSION

From the analysis done on the compressive strength of M15 concrete using 0%,2%,4% and 6% replacement of cement and fine aggregate with cow dung and saw dust respectively. It was observed that the compressive strength of concrete at 0% replacement of cement and fine aggregate with cow dung and saw dust was 18 N/mm^2 after curing for 28 days, while the compressive strength of the concrete at 2% replacement of cement and fine aggregate with cow dung and saw dust was 15.4 N/mm^2 after curing for 28 days as shown on table 1.2 and 1.3. It was also observed that the compressive strength of the concrete at 4% replacement of cement and fine aggregate with cow dung and saw dust was 13.8 N/mm^2 after curing for 28 days, while the compressive strength of concrete of the concrete at 6% replacement of cement and fine aggregate with cow dung and saw dust was 12.5 N/mm^2 after curing for 28.

Table-3 Specific gravity test result for different material

Materials	Specificgravity
Cowdung	1.33
Stonedust	3.0
Sawdust	1.25
Cement	3.13

Table-4 Compressive strength at different curing age

Percentage replacement	3 days	7 days	14 days	28 days
0	5.1	8.3	13.9	18.0
2	2.85	6.1	10.49	15.4
4	2.65	5.2	7.3	13.8
6	2.10	3.5	6.78	12.5

VI. CONCLUSION AND RECOMMENDATION

From the computed results and charts obtained from the study (test), it is obvious that the compressive strength of concrete increases with increase in curing days. Also, the compressive strength of M15 concrete at 0% replacement of cement and fine aggregate with cow dung and saw dust is greater than the compressive strength of concrete at 2% replacement of cement and fine aggregate, while the compressive strength of concrete at 2% replacement of cement and fine aggregate with cow dung and saw dust is also greater than the compressive strength of concrete at 4% replacement of cement and fine aggregate with cow dung and saw dust. The compressive strength of concrete at 4% replacement of cement and fine aggregate with cow dung and saw dust was greater than the compressive strength of concrete at 6% replacement of cement and fine aggregate with cow dung and saw dust. In other words, the compressive strength of concrete reduces with increase in the percentage of replacement of cement and fine aggregate with cow dung and saw dust (i.e. the higher the percentage of replacement of cement and fine aggregate with cow dung and saw dust the lower the compressive strength of the concrete).

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