

EXPERIMENTAL STUDY ON STRENGTH OF CONCRETE BY PARTIAL REPLACEMENT OF FINE AGGREGATE WITH SAW DUST

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Abstract-This paper represents the results of the investigation carried out from the use of saw dust as partial replacement for fine aggregate in concrete. Saw dust is a byproduct of cutting drilling or otherwise resulting from the mechanical milling. In this fine aggregate was replaced by saw dust as 0%, 5%, 10%, 15% by weight for M-20 Mix. The concrete cubes were tested for compressive strength at the age of 7 days and 28 days. The result obtained was compared with normal concrete M-20 Mix. The result shows that compressive strength decreases as the saw dust percentage increases. Optimum replacement of sand with saw dust was found to be 15%.

Keywords-concrete, saw dust, ordinary portland cement, compressive strength

1. INTRODUCTION

Concrete is necessary in modern society's interest with new roads, industry, buildings and other constructions. Concrete has unlimited opportunity for advanced application design and construction technique [45-50]. It is the material of choice where strength, performance, fire resistance, durability is required. Concrete with the advanced technologies such as reinforce cement concrete and fiber reinforced concrete provides extra strength and durability against sliding cracking buckling and overturning [1-6]. Its high compressive strength and mouldability provides its widespread use in various constructional. Concrete properties can be improved by use of industrial and domestic waste such as rice husk ash, timber ash, steel fibers, glass fibers etc. In this paper saw dust ash was used as prime material for the improvement of the compressive strength of concrete at age of 7 and 28 days of curing period [7-13].

2. MATERIALS USED

Saw Dust

Saw Dust used in this study was collected from local mills. Specific gravity of sawdust is 2.12

Table:1 Chemical properties of saw dust

OXIDE	PERCENTAGE (BY WEIGHT)
SiO ₂	68.3
Al ₂ O ₃	3.5
Fe ₂ O ₃	2.23
MgO	5.4
CaO	5.0

Cement

Cement used in this experiment was 43 grade ordinary Portland cement confirming IS-8112:89.

Table:2 Physical properties of Cement

Sl. No	Characteristics	Values
1	Specific gravity	3.12
2	Normal consistency, percent	37
3	Initial setting time, minutes	55

Fine Aggregate

The fine aggregate used was collected from locally available sites and confirmed into zone-3 of IS 383:1970.

Table:3 Physical properties of Fine Aggregate

Sl. No	Characteristics	Values
1	Specific gravity	2.55
2	Fineness modulus	3.25
3	Water absorption	105

Coarse Aggregate

The coarse aggregate used was collected from locally available places having size 20mm and confirming to IS 183:1970.

Table:4 Physical properties of Coarse Aggregate

Sl. No	Characteristics	Values
1	Specific gravity	2.71
2	Aggregate impact value, percent	23.9
3	Los Angeles, percent	12.85

Water

The Water used here was portable water and was clean without having any visible impurities [37-44].

3.EXPERIMENTAL PROCEDURE

Mix Design

M20 grade of concrete was designed for this experiment with mix proportion of 1:1.60:2.78 with water cement ratio 0.45. The concrete mix design has been designed based on IS 10262:2009

Water	Cement	Fine aggregate	Coarse aggregate
0.45	1	1.60	2.78

Batching, Mixing and Casting

The batching, mixing and casting was done with proper care and handling. The materials were weighed properly accordingly as required and hand mixed was thoroughly on a flat form and then water was added per the requirement. 150mm*150mm*150mm cubes is casted. The moulds were levelled properly. The specimens were kept for 24 hours, demoulded and then set for curing. Curing is done in curing tank at a room temperature in clean water. The curing was allowed until the date of testing i.e., 7th & 28th day [14-21].

Testing of samples

The compressive test on a concrete cube were carried out with compressive test machine the machine automatically stops [28-36] when failure occurs and then displays the failure load. The test was done for 7th & 28th day. The result was shown in table:5

4.RESULTS AND DISCUSSIONS

The results of the compressive strength performed on the test samples as presented in the table:5 with various percentage of saw dust and different number of days for curing [22-27].

Table:5 Compressive Strength of cubes with various percentage of saw dust and days of cure

Cement grade	% saw dust	7 days	28 days
		compressive strength (N/mm ²)	compressive strength (N/mm ²)
M-20	0	9.67	25.41
M-20	5	11.08	24.20
M-20	10	10.98	23.75
M-20	15	7.88	17.54

Figure:1 Compressive strength of the Cubes for 7 days

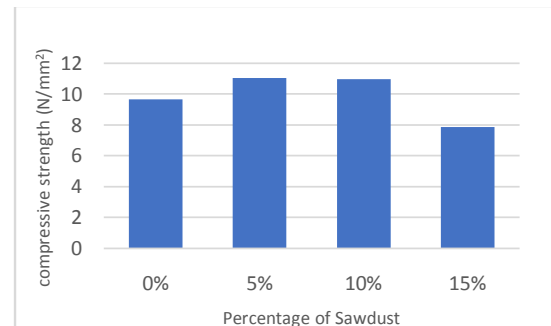
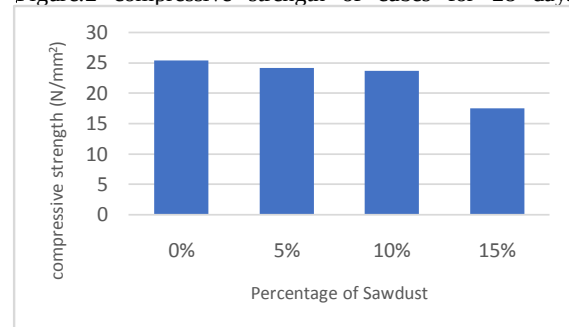


Figure:2 compressive strength of cubes for 28 days



5.CONCLUSION

Following points are observed in the current study

- The utilisation of saw dust in concrete provides additional environmental as well as technical benefits for all related industries
- Partial replacement of saw sawdust reduces the cost of making concrete
- It has been observed that when we increase the saw dust percentage the compressive strength of the concrete decrease
- Increase in water cement ratio also decrease the compressive strength of the concrete
- Water absorption increased with increasing saw dust percentage
- To achieve a better result sawdust, replace with fine aggregate by 10%

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