

Experimental Study on Concrete by Partial Replacement of Cement by Cow Dung Ash (CDA)

Jakkoji Satheesh¹ Shaikh Jain Saheb² Maheboob Pasha³ Rajkumar Pathakala⁴

¹Student ^{2,3,4}Assistant Professor

^{1,2}Jogaiah Institute Technology and Sciences, Kalagampudi, Palakol, West Godavari, AP, India

³Bharatratna Indira Gandhi College of Engineering, Solapur, Maharashtra, India ⁴Kshatriya College of Engineering, Armoor, Nizamabad, Telangana, India

Abstract— It is a known fact that concrete is the best adopted material for any type of building and reinforced construction. This may be due to the advantageous properties of concrete as it has good strength, thermal resistance and cost effectiveness. For obtaining such properties, a sound concrete must be ensured by using a proper materials such as cement, fine aggregate and coarse aggregate with appropriate amount of water content. The use of cement has been increased as there is growth of population, industrialization and infrastructure. The production of cement also requires huge amount of energy and causes pollution. Many alternate materials are partially replaced by cement so as to avoid energy consumption and pollution. The alternate materials may include fly ash, cow dung ash, rice husk ash, coconut shell powder etc....which may requires less energy for its production. Cow dung ash is the naturally available material and is of less cost. As our India is a farming country and lot of farmers depends on agriculture it is easily and cheaply available material. It also has thermal resisting, binding and other properties nearly familiar to cement. This project is done to dig out the properties of concrete by adding cow dung ash in various percentages such as 2%, 4%, 6%, 7%, 8%, 9% and 10% and tests like consistency, initial setting time, final setting time, specific gravity, workability and compressive strength are conducted. The obtained results are compared to properties of normal concrete values. The addition of cow dung ash will have an impact on strength properties of concrete up to certain limit. The strength may increase and suddenly drops when there is decrease in cement amount got replaced by cow dung ash. The main aim of this project is to estimate the optimum percentage of cow dung ash that has to be replaced for obtaining required strength.

Keywords: Cow dung ash

I. INTRODUCTION

It is assessed by a study directed by World Health Organization (WHO) that about 5% of world's contamination is because of concrete creating enterprises. In spite of the fact that the concrete created everywhere throughout the world is high however request of concrete is significantly more because of overwhelming development works going on everywhere throughout the world. So as to take care of these issues, preservation of concrete and condition is to be accomplished. Under these conditions, the utilization of normally accessible waste material or modern side-effects can bring about significant reserve funds of vitality and crude materials all the more so when these results or waste items have just piece esteem. What's more by using the modern squanders in valuable way the ecological contamination is likewise lessens generally.

Despite the fact that Portland concrete is stopped reasonable for ordinary development work, the properties like toughness, impermeability, and concoction obstruction are constrained. Thus there is a need to go for uncommon applications, for example, utilizing certain admixtures with concrete. Bovine Dung Ash (CDA) is normally happening fine pozzolanic material appropriate to be utilized as an admixture in concrete to upgrade certain properties squanders in valuable way the ecological contamination is likewise lessens generally.

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II. NECESSITY AND AIM OF PRESENT STUDY

- 1) To produce and evaluate the products for partial replacement of cement using by-products.
- 2) To minimize the overall environmental effects of concrete production using these materials as partial replacement.
- 3) To promote the preservation of the natural resources through a process optimization of waste.
- 4) To develop a cost competitive structural light weight concrete by incorporating supplementary materials.
- 5) To impart strength to the concrete by replacing with the naturally available materials.
- 6) To produce an eco-friendly concrete this does not affect the environment.

III. MATERIALS USED

A. Cement

Portland pozzalona cement of 53-grade Birla brand confirming to ISI standards is used in present investigation. The cement is tested in various properties as per IS code. The test results on cement are shown in table

B. Cow Dung Ash

Cow dung ash is the ash produced by burning the excreta of cow by drying them in sunlight. The ash is collected in

Jakranpally village of Nizamabad district. The collected ash is free from salts and soil particles.

C. Fine Aggregate

The sand is free from clay matter, salt and organic impurities. The sand is tested for various properties like bulking of sand and specific gravity etc., in accordance with the IS 2386-2963(28).

D. Coarse Aggregate

Machine crushed and granite metal from the local sources is used as coarse aggregate. The coarse aggregate is also tested for various properties. The specific gravity, abrasion test, impact test and are carried out on coarse aggregate.

IV. MANUFACTURING PROCESS

A. Mixing

The mix is prepared by taking Nominal design of concrete and the mix proportion used is M20. Here the whole experiment is carried out by hand mixing. The water-cement ratio is maintained as 0.45 till the completion of project. The mixing of concrete should be done on a dry platform.

- For casting of cube, standard cast iron metal moulds of size 150x150x150mm have been used.
- The moulds have been cleaned of dust particles and applied with mineral oil on all sides, before concrete is poured into the mould.



Fig. 1: Preparation of moulds

- Thoroughly mixed concrete is filled into mould. During filling the mould, for each layer of mould 25 number of blows should be given.
- Level the top surface and smoothen it with trowel.

B. Curing of specimen

Generally curing is defined as the process of maintaining the moisture and temperature conditions of concrete for hydration reaction to normally so that concrete develops hardened properties over time. The main components which need to be taken care are moisture, heat and time during curing process.

After casting, the mould specimens are stored in the laboratory free from vibration in moist air and at room temperature for 24 hours. After this period the specimens are removed from the moulds and immediately submerged in the clean fresh water of curing tank. The curing water is renewed after every five days. The specimens are cured for 28 days.



Fig. 2: curing of concrete cubes

V. TESTS CONDUCTED ON CDA CONCRETE

A. Slump cone test

Generally concrete slump value is used to find the workability, which indicates water-cement ratio, but there are various factors including properties of materials, mixing methods, dosage, and admixtures etc. also affect the concrete slump value.



Fig. 3: Slump cone test

B. Vee- bee consistometer test

The main objective of Vee-bee test is to determine the workability of the freshly mixed concrete. The Vee-bee test gives an indication about the mobility and the compatibility aspect of the freshly mixed concrete.



Fig. 4: Vee-bee test on concrete

C. Compaction factor test

Compaction factor test is the workability test for concrete conducted in laboratory. The compaction factor is the ratio of weights of partially compacted concrete to fully compacted concrete. It was developed by Road Research Laboratory in United Kingdom and is used to determine the workability of concrete. Generally the compaction factor for concrete ranges

from 0.7 to 0.9. The compaction factor of concrete having more than this value is somewhat less workable.



Fig. 5: Compaction factor test



Fig. 6: Failure of concrete mould and corresponding load applied

D. Testing of cube Specimens for Compressive Strength

Compressive strength is the ability of material or structure to carry the loads on its surface without any crack or deflection. A material under compression tends to reduce the size, while in tension, size elongates.

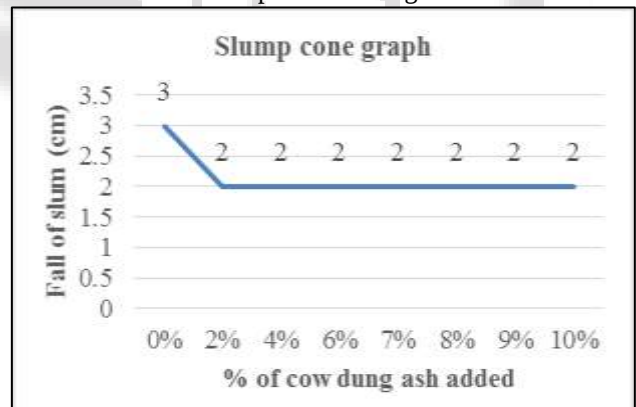
Compressive strength of concrete cube test provides an idea about all the characteristics of concrete. By this single test one judge that whether concreting has been done properly or not. Concrete compressive strength for general construction varies from 15Mpa to 30Mpa and higher in commercial and industrial structures. The cube specimens are cured as explained above are tested as per standard procedure after removal from the curing tank and allowed to dry under shade. The cube specimens tested under microprocessor based compression test machine of 2000KN capacity.



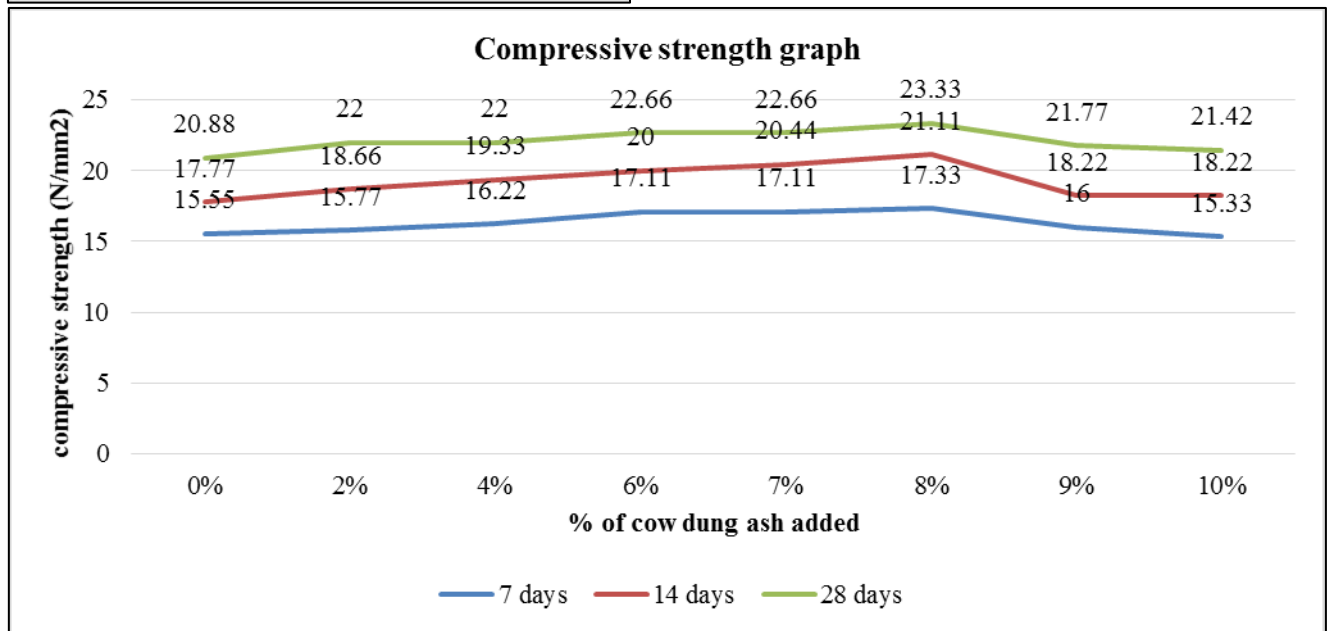
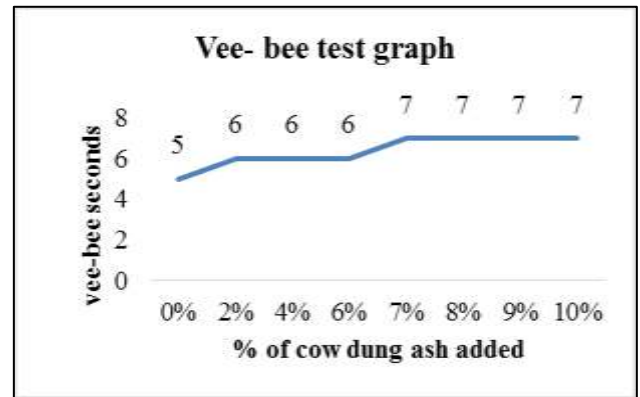
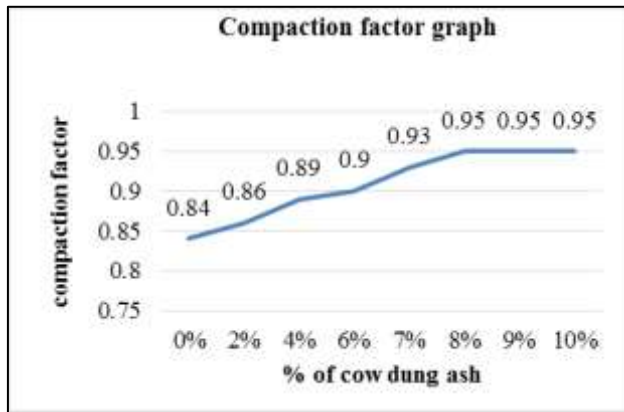
VI. RESULTS AND DISCUSSIONS

S. no	% of cow dung ash added	Fall of slump cone (cm)	Type of slump	Compaction factor	Vee-bee seconds
1	0%	3	Shear	0.84	5
2	2%	2	Shear	0.86	6
3	4%	2	Shear	0.89	6
4	6%	2	Shear	0.9	6
5	7%	2	Shear	0.93	7
6	8%	2	Shear	0.95	7
7	9%	2	Shear	0.95	7
8	10%	2	Shear	0.95	7

Compressive strength



% of cow dung ash added	Compressive load (KN)			Area of cubes (m ²)	Compressive strength (N/mm ²)		
	7 days	14 days	28 days		7 days	14 days	28 days
0%	350	400	470	22.5x10 ³	15.55	17.77	20.88
2%	355	420	485	22.5x10 ³	15.77	18.66	22
4%	365	435	490	22.5x10 ³	16.22	19.33	22
6%	385	450	510	22.5x10 ³	17.11	20	22.66
7%	385	460	510	22.5x10 ³	17.11	20.44	22.66
8%	390	475	525	22.5x10 ³	17.33	21.11	23.33
9%	360	420	490	22.5x10 ³	16	18.22	21.77
10%	345	410	482	22.5x10 ³	15.33	18.22	21.42



VII. CONCLUSION

From this paper it has been concluded that the use of cow dung ash can improve the compressive strength when it is used in optimum percentage i.e., the strength may increase up to 10% only.

- It is also noted that there is somewhat less workability of concrete may be due to increasing the ash content. This can be avoided by adding plasticizers or super plasticizers which are helpful in reducing the water quantity.
- This cow dung ash concrete can act as a retarder where the setting time can be allowed slow. By the addition of cow dung ash to the concrete is possible to produce a light weight eco-friendly concrete because the ash is in light in weight.
- Cow dung ash concrete is recommended for certain floor and wall that will be subjected to heavy load or structures that are temporary use.
- In general cow dung ash concrete is not suitable for use where high structural strength is required or where would be subjected to heavy traffic and several abrasive actions.
- The cow dung ash concrete is also not to be use in a water accumulation area or for structures that are related to water.

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