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# AN EXPERIMENTAL STUDY ON USC OF COW DUNG ASH AND RICE HUSK ASH AS PARTIAL REPLACEMENT OF CEMENT IN CONCRETE

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ABSTRACT

Rice Husk Ash(RHA) and Cow Dung Ash (CDA) are agriculturally grounded pozzolanic accoutrements ;these accoutrements are available in huge amounts. This final time design report highlights and presents the results of the study on the use of Cow Dung Ash and Rice Husk Ash as partial relief of cement in concrete. The trials were conducted to study the impacts of adding Cow Dung Ash and Rice Husk Ash in several probabilities by weight(0,5,10,15,and20) of cement and cure for ages of 28 days before testing for contraction strength. The thickness, plasticity, sieve analysis of summations were also tested in this exploration study. The Compressive test results are37.75 N/ mm2,31.25 N/ mm2,31.25 N/ mm2 and25.25 N/ mm2 for 0, 5, 10 and 15 relief of cement with Cow Dung Ash and Rice Husk Ash independently at 28days. The Plasticity results gives 45 mm, 49 mm, 56 mm, 68 mm and 75 mm independently for,5, 10, 15, and 20 relief of cement with Cow Dung Ash and Rice Husk Ash. The thickness test results are0.29,0.32, 0.36,0.41 and 0.43 for 0, 5, 10, 15 and 20 relief of cement with Cow Dung Ash and Rice Husk Ash independently. The bulk viscosity results are2452.53 kg/ m3,2370.8 kg/ m3,2380.0 kg/ m3 and2348.5 kg/ m3 for 0, 5, 10 and 15 relief of cement with Cow Dung Ash and Rice Husk Ash independently. The main highlights, it should be stressed that the further volume of water is needed to standard thickness as the probabilities of Cow Dung Ash and Rice Husk Ash are added. Dung Ash and Rice Husk Ash concrete is recommended for use when a ten chance (10) of Cow Dung Ash and rice cocoon ash aren't exceeded.

**Key words:** cement, concrete, cow dung ash, rice husk ash, workability, standard consistency,Slump test, bulk density, curing, mortar, aggregates, water, compressive strength.

## INTRODUCTION

Developing countries like India are improving 's infrastructure and there is a lot of room in it, but many 's challenges are on the way, especially the high cost of cement. The consumption of natural resources by the concrete industry is large compared to all other natural resources such as water, sand, gravel and crushed stone, and is mostly consumed by the concrete industry. Of the total emissions of greenhouse gases into the earth's atmosphere, 7% of which is contributed by the global cement industry due to emissions of toxic gases such as CO2 and NO by cement production companies. The natural environment causes pollution and global warming due to the degradation of the ozone layer. Given the severity of this problem, serious measures need to be taken, such as replacing cement with waste such as cow dung ash and rice husk ash.

Concrete is an important man-made composite building material primarily used in the modern construction industry around the world where we live. This useful building material is obtained by mixing appropriate proportions of aggregate (fine and coarse), cement, additional cementitious materials, water, and additives that set and harden the mixture over time. . The demand for cement in structural concrete technology is urgently needed every day to fill gaps in infrastructure development such as buildings, highways, bridges, tunnels, parking lots, stadiums, railways, airports, hydraulic structures due to industrialization, commercial centres. It has been.

The cement production in manufacturing industries leads to the negative effects to the environment due to emitting of polluted gases like carbon dioxide (CO2) that leads to the air pollution which has more effects on the climate change and global warming .The cement manufacturing factory produces about 6 percent of all CO2 emitted in atmosphere, 0.9 tons of carbon dioxide is produced by 20 bags of cement manufactured

Co-binders such as cow dung ash, sawdust, fly ash, silica and fumes such as rice husk ash allow concrete technology to use millions of tons of by-products that pose a waste disposal problem (Mehta, 2004). Therefore, civil engineers are constantly looking for an environmentally friendly construction industry as they have a responsibility to fill gaps and fill gaps. Supplemental cementitious materials should be sought for use as partial cement replacements.

The population in developing countries like India are largely adding day by day. So ,they need architectures installations similar as structures, roadways ,hydraulic structures , airfields ,parking to accommodate the effectively. Those architectures bear construction accoutrements primarily concrete and others. Currently,the cost of structure accoutrements especially publishing andcementitious accoutrements inInd iais veritably high.Environmentally, cement manufacturing diligence produces smothers which contributes to the air profanations which leads to the global warming and climatic change. also, large quantum of agrarian wastes produced in manufacturing diligence like rice cocoon has been causing waste disposal problems.

This has encouraged people to use other available original accoutrements like cow soil and fly ash, complexion, which are cheap to acquire. This exploration focuses on use of cow soil ash and rice cocoon ash as partial relief of cement in concrete.

## RESEARCH OBJECTIVES

1. To determine the techniques for improving economical concrete with partial replacement cement by cow dung ash and rice husk ash at appropriate percentages.
2. To examine the effectiveness of using CDA and RHA as partial replacement of cement by studying strength parameters.
3. To investigate the compressive strength and of concrete with CDA and RHA to that of normal concrete.
4. To use supplementary cementitious materials to produce concrete which is affordable and structural light in weight.
5. To minimize the environmental effects resulted from the production of cement by using alternative local available cementitious materials as partial replacement.
6. To promote the usage of local available wastes with the aim preservation of environment.
7. To minimize the usage of the raw material large replacement is done using the various by product materials that are available in the present day.
8. To use locally available material and to reduce the cost of producing concrete.
9. To enhance available local materials to improve economical concrete with partial replacement cement by cow dung ash and rice husk ash at appropriate percentages in search of solution to the above dual problem.

**LTERATURE REVIEW –**

**SHETTY, 2005,** discussed that RHA is obtained by burning rice husk in controlled temperature with aim of protecting environmental pollution. RHA has high SiO2 content so that can be used as concrete admixture. RHA displays high pozzolanic characteristics and adds to high impermeability and thigh strength of concrete. RHA basically comprise of amorphous silica (SiO2), 5% of carbon and 2% of K2O. In USA, the trade name of highly pozzolanic RHA is known as "Agrosilca", the specific surface of RHA varies between 40 to 100 m2/g.

**Dabai & Muhammad, 2009** ,studied the effect of RHA as cement admixture by testing the compressive strength of cement cubes produced by replacing cement percentages with the RHA. The results Cleary showed that suitable strength of concrete at 28 days obtained with RHA could be replace for OPC at 10% and 20% of replacement. (Gambhir, 2006) highlighted that the average composition of RHA is 90% amorphous silica, 5% of carbon, and 2% of K2O.

**Varshney, 2015,** reported that the RHA agricultural wastes based on pozzolanic material, generated during rice milling. During milling, 80% weight of rice grains are obtained and 20% remained are rice hulls.

**Kumar , P. T. & Reddy, R. H., 2015** , Rice Husk Ash (RHA) and Cow Dung Ash (CDA) are agriculturally based pozzolanic materials, these materials are available in huge quantities. This final year project report highlights and presents the results of the study on the use of Cow Dung Ash and Rice Husk Ash as partial replacement of cement in concrete. The experiments were conducted to study the impacts of adding Cow Dung Ash and Rice Husk Ash in several percentages by weight (0%, 5%, 10%, 15%, and 20%) of cement and cure for periods of 28 days before testing for compression strength. The consistency, workability, sieve analysis of aggregates were also tested in this research study. The Compressive test results are 37.75 N/mm2, 31.25 N/mm2, 31.25N/mm2 and 25.25 N/mm2 for 0%, 5%, 10% and 15% replacement of cement with Cow Dung Ash and Rice Husk Ash respectively at 28days.

**Ojedokun & Adeniran, 2014** studied on CDA as partial replacement of cementing material in concrete, they highlighted that setting times increases as the percentages of CDA is added. Finally, they advocated using CDA concrete only when 10% of CDA is added. They recommend that CDA is suitable for certain floor and wall which are not subjugated to the heavy loads and is not to use for structures related to the water.

**Omoniyi, et al., 2014** highlighted that initial and final setting time increases by 12.2%-59.3%and2.74%-43.90% respectively as the % of CDA increases, this indicates that CDA is a set retarder. The compressive strength results pointed increases with curing time and deceases with increases of CDA content.

**Kumar & Reddy, 2015** searched on cement replacement in concrete by CDA and found that 5% of CDA replacement increases the compressive strength. It observed that the 5% of CDA replace cement in mortar.

**Sruthy & Krishnan et etal, 2017 ,**Studied on normal concrete strength to that of concrete with CDA, they fore grounded that concrete strength increases when 8% CDA replace cement.

## III. MATERIALS USED

### A. **Cow Dung Ash**

The cow dung was collected from local areas in Morar Bada Gaon Gwalior The cow dung was dried by exposing them to the sunlight, dried cakes were used to cook and CDA collected as wastes.

Figure No. 1 Cow Dung Ash

### B. **Rice Husk Ash**

The RHA was collected from Shree Krishna Exports, morena (m.p.) After milling the rice grains, rice husks as waste are collected for any intended purpose and others are burnt. It was brought in Materials and Concrete Laboratory and then sieved on 90micron ASTM sieve.


(a)


(b)

Figure No. 2 Rice Husk Ash

**C. Cement**

Cement used in this work was manufactured by Ultra-tech and is available on market countrywide. The grade of cement was 32.5N is highly being used in construction industry in India. The standard consistency in the laboratory. All the tests were carried out in compliance with procedure laid down in IS 12269 – 1987.

Figure No.3 Cement

D**. Fine Aggregate**

The sand used in this research study was no deleterious materials and prepared in accordance with IS 383:1970.

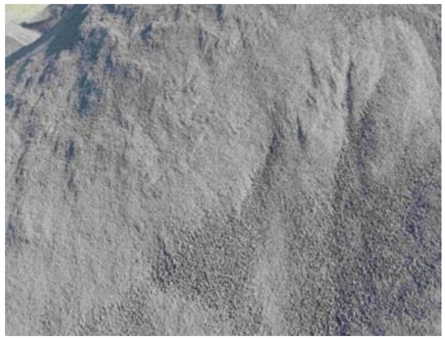


**Figure No.4 Fine Aggregate**

**E. Coarse Aggregate**

In this research, CA of 6.3-25 mm maximum size was used. Proper inspection was carried out to ensure that it was free from impurities materials as complied by IS 383:1970.

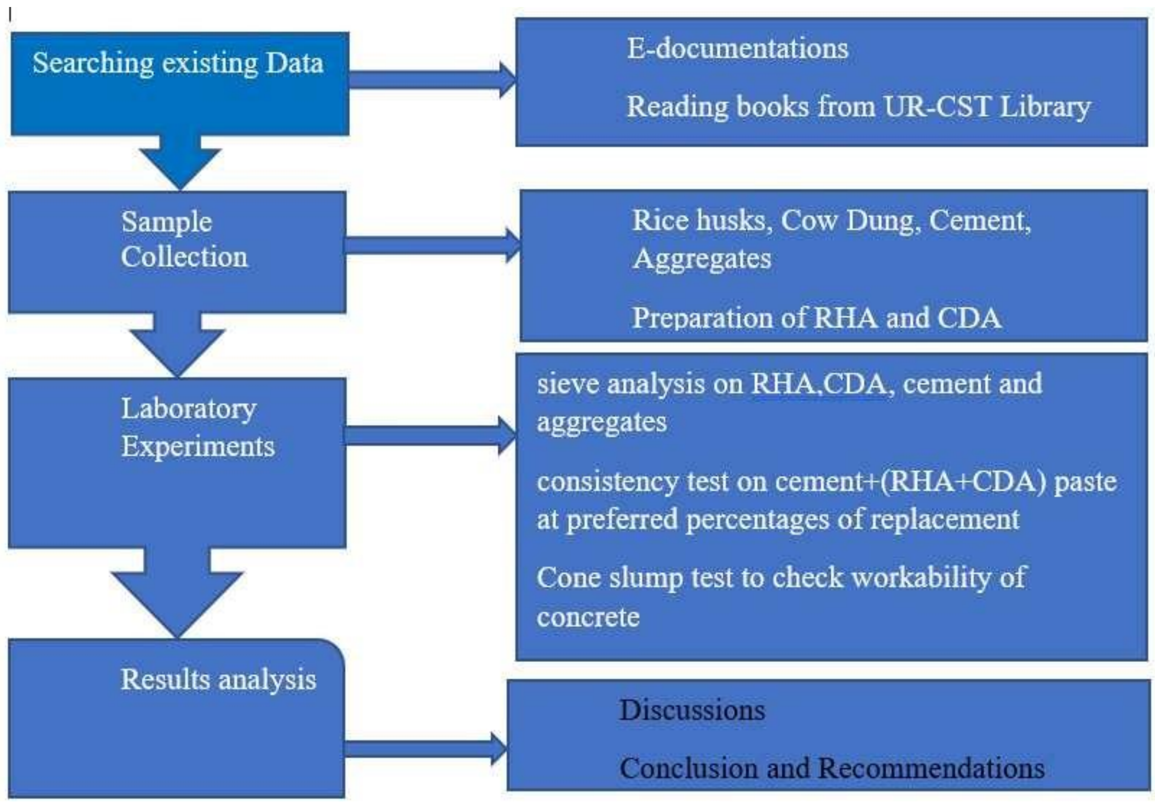
Figure No.5 coarse aggregate

**F. Water**

This is the least expensive but most important ingredient of concrete. Here, normal tap water has been used for the preparation of concrete.

METHODOLOGY




**RESULTS ANALYSIS AND DISCUSSION**

Consistency limit

This test is carried out to determine the standard water required to produce workable paste of cement and conforming IS4031-1988. The RHA and CDA are mixed with cement to produce paste as a percentage of weight of cement. The results obtained for consistency limit test are as follow in table below. The test result show that the much water is required to obtain the desired consistency as the percentage of CDA and RHA increase. The consistency limit curve is show in figure 6.

**Table 1:Consistency limit for different mix ratio of RHA and CDA in paste of cement**

| RHA+CDA | 0% | 5% | 10% | 15% | 20% |
|---|---|---|---|---|---|
| Consistency limit | 0.29 | 0.32.5 | 0.36 | 0.41 | 0.43 |

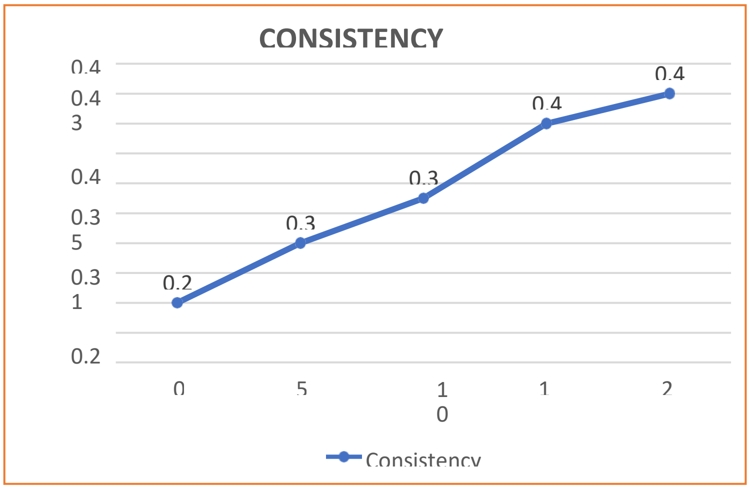



**Figure 6:Line chart representing consistency limit**

## Fine aggregates sieve analysis

This test is carried out to find the distribution particles of fine aggregates passing through the standard set of sieves complying the test procedure is given IS: 2386 (Part I). The sample of sand was dried and then sieved in these set of sieves 4.75mm, 3,36mm, 1.18mm, 600mm, 300mm, 150mm and pan. Fineness modulus is required to classify samples varies between 2.0 and 3.5 for fine aggregates, between 5.5 and 8 for coarse aggregate, and 3.5to 6.5 for all in coarse aggregate. The following table showing the results obtained for sample of 2000g. the fineness modulus of sample is 3.18 which is belong between 2 and 3.5, this is shows that is fine aggregates. The gradinggraph presents the distribution of aggregates on the sieves used.

**Table 2: Fine aggregates sieve analysis**

| **ASTM Sieve Size** | **Weight of retained** | **cumulative of weight retained (g)** | **% Cumulative of weight retained (g)** | **% Passing** |
|---|---|---|---|---|
| 4.75mm | 22.07g | 22.07 | 1.1035 | 98.8965 |
| 3.36mm | 100.86g | 122.93 | 6.1465 | 93.8535 |
| 1.18mm | 768.03g | 890.96 | 44.548 | 55.452 |
| 600micron | 500.82g | 1391.78 | 69.589 | 30.411 |
| 300micron | 560.44g | 1952.22 | 97.611 | 2.389 |
| 150micron | 47.21g | 1999.43 | 99.9715 | 0.0285 |
| Pan | 0.58g | 2000.01 | 100.0005 | -0.0005 |
| | | | 318.97 | 281.03 |

Fineness modulus (F.M) = ∑ (Cumulative % retained)/100=318.97/100=3.1897

## Table 3:Coarse aggregates sieve analysis

| Sieve size | Weight retained (g) | %weight Retained (g) | Cumulative % weight retained | %Passing |
|---|---|---|---|---|
| 40mm | 0 | 0 | 0 | 100 |
| 37.5mm | 0 | 0 | 0 | 100 |
| 25mm | 533.34 | 10.67 | 10.67 | 89.33 |
| 20mm | 4081.84 | 81.64 | 92.31 | 7.69 |
| 16mm | 304.94 | 6.10 | 98.41 | 1.59 |
| 12,5mm | 62.72 | 1.25 | 99.66 | 0.34 |
| 10mm | 1.58 | 0.03 | 99.69 | 0.31 |
| 4.75mm | 15.58 | 0.31 | 100 | 0 |
| Pan | 0 | 0 | 100 | 0 |
| Total | 5000 | 100 | 500.74 | |

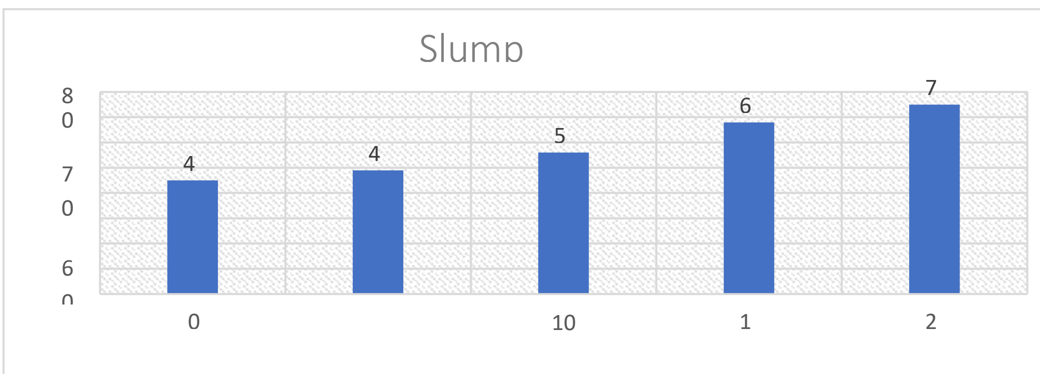
Fineness modulus (F.M) = ∑ (Cumulative % retained)/100=500.74/100=5.0074

### Workability Results

Workability implies the ease to work with which concrete mix is handling and it can be determined by cone slump test as per IS1199-1988. The following table17 shows the workability of each mix of concrete varying the % of RHA+CDA with the highest workability value of 75 is obtained for 20% of RHA+CDA in cement.

**Table 4:Workability Results**

| RHA+CDA | 0% | 5% | 10% | 15% | 20% |
|---|---|---|---|---|---|
| Slump | 45 | 49 | 56 | 68 | 75 |




## CONCLUSION

A. Cow Dung Ash and Rice Husk Ash concrete can be made to perform well in certain floor and wall applications when a ten percentage (10%) replacement is not exceeded. B. The Cow Dung Ash and Rice Husk Ash requires more quantity of water as the percentage increases in the concrete, therefore it has a serious limitation that must be understood before it is put to use. C. The Cow Dung Ash and Rice Husk Ash have an advantage that offers lightness of weight that makes it useful construction material. D. More water is required to achieve the standard consistency as the amount of CDA+RHA increases. E. Compressive strength decreases as the CDA+RHA content increases and increases as the curing period is prolonged. F. With strength as a criterion, CDA+RHA of no more than 15% can be used to produce good and quality mortar and concrete. Compressive strength of concrete cube increase by 30% increase by adding 5%of CDA and RHA.

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