iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** XI **Month of publication:** November 2022

DOI: https://doi.org/10.22214/ijraset.2022.47482

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue XI Nov 2022- Available at www.ijraset.com

Study of Partial Replacement of Cement Using Cow Dung Ash and Marble Dust Combination and Sand Using Glass Powder for M25 Grade of Concrete

Pratik Chouhan[1], Shanu Sharma[2], Vaibhav Raj Maru[3], Prince Jamra[4], Imran Shah[5]
[1, 2, 3, 4, 5]*Civil Engineering Department, Indore Institute of Science and Technology, Indore*

Abstract: ***The use of cement in concrete industries increasing day by day. Concrete is the most popularly used construction material in civil engineering industry because of its high structural strength, stability and durable. The most important part of concrete is the cement, fine aggregate, and coarse aggregate. In this modern era, many new technologies of construction materials are introduced. Growth of population, urbanization and industrialization has increased the requirement of cement. The production of cement leads to environmental issues due to release of gaseous pollutants. Cement manufacturing industry is one of the CO2 emitting sources besides deforestation and burning of fossil fuels. The global warming is caused by the ejection of greenhouse gases, such as CO2, to the atmosphere. Among the greenhouse gases, CO2 contributes about 65% of global warming. The global cement industry contributes about 7% of greenhouse gas emission to the earth's atmosphere. The study for the use of Cow Dung Ash (CDA) and marble dust as partial replacement in production of concrete. The experiments were designed to study the effects of adding Cow Dung Ash (CDA) and marble dust in various percentages by weight 5%, 10%, 15% and 20% for M-25 grade of concrete and cure for the periods of 7, 14, and 28, days respectively before testing for the Compressive strengths.***

The availability of River sand now days is an issue due to restrictions on mining because of environmental issues which cause increase in price of River sand. The environmental and economic concern is that the biggest challenge the concrete trade is facing, the problems of environmental and economic concern are self-addressed by the utilization of waste glass as substitution of fine aggregates in concrete. Fine aggregates will be replaced by waste glass powder as 5%, 10%, 15%, and 20% weight for M-25 grade of concrete. The concrete specimens will be tested for compressive strength at 7, 14, and 28 days respectively before testing for the Compressive strengths.

Keywords: Cow dung ash; Compressive strengths; Fine aggregates; Marble dust; Glass powder.

I. INTRODUCTION

In this research work the mixture of cow dung ash, marble dust and glass powder were used in concrete as a partial cement and sand replacement, to study its effect upon concrete strength. The mix proportion of 1:1:2 was selected for all the concrete samples with water to binder ratio of 0.40.

For comparison, a control sample of concrete was prepared without mixture of cow dung ash, marble dust and glass powder to compare it with the various samples containing different percentages (5%, 10%, 15% and 20%) of mixture of cow dung ash, marble dust and glass powder as a partial replacement of cement and sand in concrete. Results discovered that the usage of mixture of cow dung ash, marble dust and glass powder in concrete as a partial replacement of cement and sand increases the concrete strength. Such as compressive strength increases up to 21.96%, age of 7, 14 and 28 days. The basic properties like strength of concrete mainly depends on the quality of concrete. Different properties like impermeability and durability are dependent on the compressive strength of concrete.

Cow dung ash is characterized by a high concentration of alkali compounds (2.57 wt. % Cl, 30.6 wt. % CaO, 5.56 wt. % K_2O) together with high phosphorus content typical for animal manure.

Marble Dust is produce from calcium carbonate and is white in colour. The granularities of Marble dust can range from 0 to 400 microns.

Soda lime glass, which is most widely used in the construction industry, contains high levels of amorphous SiO2 (≥65%), Na2O (≥12%) and CaO (≥5%). Such a chemical composition create the glass powder an excellent pozzolanic material.

II. EXPERIMENTAL MATERIALS

1) *Cement:* The cement used to be Portland Pozzolana Cement (PPC). The Portland Pozzolana cement is produce by mixing ordinary Portland cement with 10 to 25 percent of the pozzolanic material. Fineness should not be less than 300 m^2/kg. The initial and final setting times were found as 30 minutes and 10 hours respectively.
2) *Sand:* M- sand was used as fine aggregate. The specific gravity and fineness modulus was 2.67 and 2.93 respectively. Silt content as the total quantity of fine particles of deleterious materials having particle from 0.06 mm to 0.002 mm present in sand.
3) *Coarse Aggregate:* The 20mm size aggregates were tested and the specific gravity value of 2.78 and fineness modulus of 7 find and selected. Smaller sized aggregates produce higher concrete strength.
4) *Water:* Potable water used for mixing and curing purposes. Preparing of concrete and for this purpose used in the Water cement ratio is W/C of 0.40 (40%) water range 6 to 7.5PPM.
5) *Cow Dung Ash:* Cow dung ash has chemical properties wide-range in Nitrogen, Potassium and calcium. It has extremely high carbon to the Nitrogen ratio. While it has physical properties such as it is huge in size, has large ash content and burning ratio is low. Cow dung ash that has been acquire from villages are dried under sunlight, burnt at a temperature of 450 to 500°C and cooled. After cooling it was crushed to powder form, sieved under 300micron sieve was stored in an air tight container preventing moisture ingress. The cow dung is exposed to sunlight to dry in order to have dung cakes which is then subjected to burning after it is drying to have the cow dung ash which is obtained in black colour.

Figure 1: Cow dung ash

6) *Marble Dust:* The marble dust is obtained from RAK ceramics. The specific gravity of marble dust is found to be 2.62 and the fineness is found to be 7.5%. Marble dust was obtained from the marble producing industry situated at Alwar in Rajasthan, India. XRD method is used to find the mineralogical composition of marble dust. XRD spectrum indicates that magnesium calcium bis (carbonate) (MgCa (CO3)2) and calcium magnesium aluminium catena- alum silicate is the main crystalline mineral present in marble dust.

Chemical composition of Marble Dust	
Oxides compound	percentage
CaO	42.45
Al2O3	0.520
SiO2	26.35
Fe2 O3	9.40
MgO	1.52

Table 1: Chemical composition of Marble Dust

Figure 2: Marble Dust

7) *Glass Powder:* Waste glass is easily obtaining from shops is collected and make glass powder. Before adding this glass material into concrete, we have to crush it first into desired size. For review glass powder pulverized for 45 minutes and size less than 4.75mm.

Compound	Glass powder (%)
Silicon dioxide (SiO_2)	71.09
Aluminium Oxide (Al2O3)	3.52
Sodium Oxide (Na2O)	10.46
Iron Oxide (Fe2O3)	1.77
Calcium Oxide (CaO)	10.59
Magnesium Oxide (MgO)	1.56
Potassium Oxide (K2O)	0.89
Loss on Ignition (LOI)	0.60
Sulphur Trioxide (SO3)	0.03

Table 2: Chemical composition of Glass powder

Figure 3: Glass powder

III. METHODOLOGY

1) *Batching and mixing of materials:* Batching of materials was done by weight. The percentage replacements of Portland Pozzolana Cement (PPC) and sand by cow dung ash, marble dust and glass powder were, 5%, 10%, 15% and 20%.
2) *Concrete Mix Design:* The concrete used in this research work was made using cement, Sand and Gravel. The concrete mix proportion was 1:1:2 by weight.
3) *Test specimens:* Test specimens consisting of 150×150×150 mm cubes for Compressive strength, 150mm dia, 300mm Length cylinders for split tensile strength and using different percentage for M25 grade of concrete mix were cast and tested as per IS:516:1959 and IS:1199:1959.
4) *Curing of concrete:* Casting of concrete after the completion of 24 hours mould will be removed then cured by using portable Water. The specimen is fully immersed in potable water for specific age of 7, 14, and 28 days. After the Completion of curing, it will be tested.

Figure 4: Cube

IV. RESULT & DISCUSSION

A. *Compressive Strength Test*

Figure : Testing on Cubes Figure 6: Cube casting

Mix	7 days (in MPa)	14 days (in MPa)	28 days (in MPa)
0%	21.88	28.84	35.08
5%	23.20	25.29	30.49
10%	23.13	27.47	27.37
15%	20.25	19.76	29.01
20%	19.73	23.55	24.72

Table 3:Compressive Strength test result

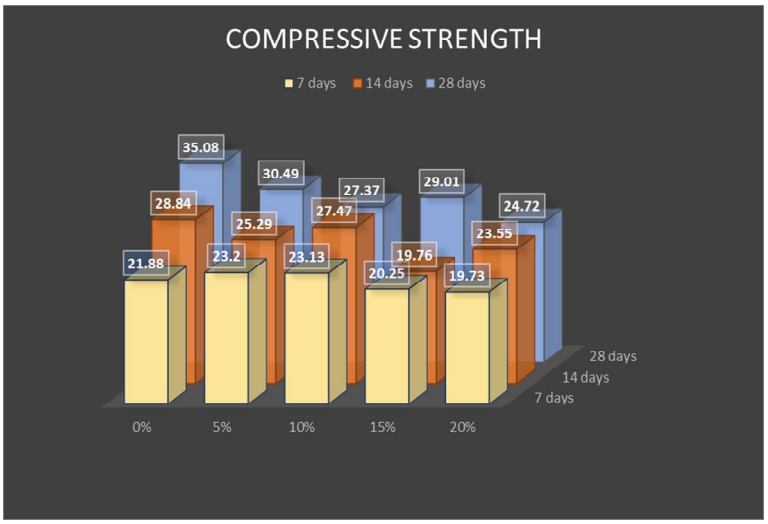


Figure 7: Compressive Strength Analysis

V. CONCLUSIONS

A. The partial replacement of cement with CDA & marble dust and sand by glass powder. Cement are partially replaced with four percentages 5%, 10%, 15%, & 20% of CDA & Marble dust. Sand are also replaced with four percentages 5%, 10%, 15%, & 20% of Glass powder.

B. The compressive strength of the concrete specimens (15cmx15cmx15cm) were determined at 7, 14 & 28 respectively.

C. The replacement of cement with CDA & Marble dust and sand by Glass powder 5% & 15% leads to increases in compressive strength was maximum in 28 days. Whereas the percentages replacement of 20% leads to decrease in compressive strength.

D. The compressive strength is increased when the cement and sand was replaced by 5% & 15% of CDA & marble dust and glass powder. Hence, it is concluded that the 5% & 15% cement & sand can be replaced with CDA, marble dust & glass powder in concrete.

E. Based on test result we conclude the partial replacement of cement & sand with 5% & 15% of CDA, marble dust & glass powder increase the compressive strength of the concrete than that of conventional concrete. So, it should use in construction of the any structure.

F. The compressive strength of the concrete is less with the increase in CDA and in strength increase with the increase in curing days.

G. Marble dust could be conveniently used in making good quality concrete & construction materials.

H. In general, glass addition can reduce cost of cement. In addition, production of every six ton glass powder concrete results in the reduction of each ton Co2 emission form cement production and save the environment significantly by reducing green-house gas & particulate production.

REFERENCES

[1] Vinita Meena, Dr. Hemant Sood- "A Review on Partial Replacement of Cement with Cow Dung Ash (CDA) in Concrete" M.E. Student & Professor, Civil Engineering Department, NITTTR Chandigarh, India- JEITR December 2021, Volume 8, Issue 12.

[2] Duna Samson, Omoniyi Tope Moses (2014)," Investigating the Pozzolanic Potentials of Cow dung Ash in Cement Paste and Mortars", Civil and Environmental Research ISSN 2224-5790 (Paper), Vol.6, No.8, 2014.

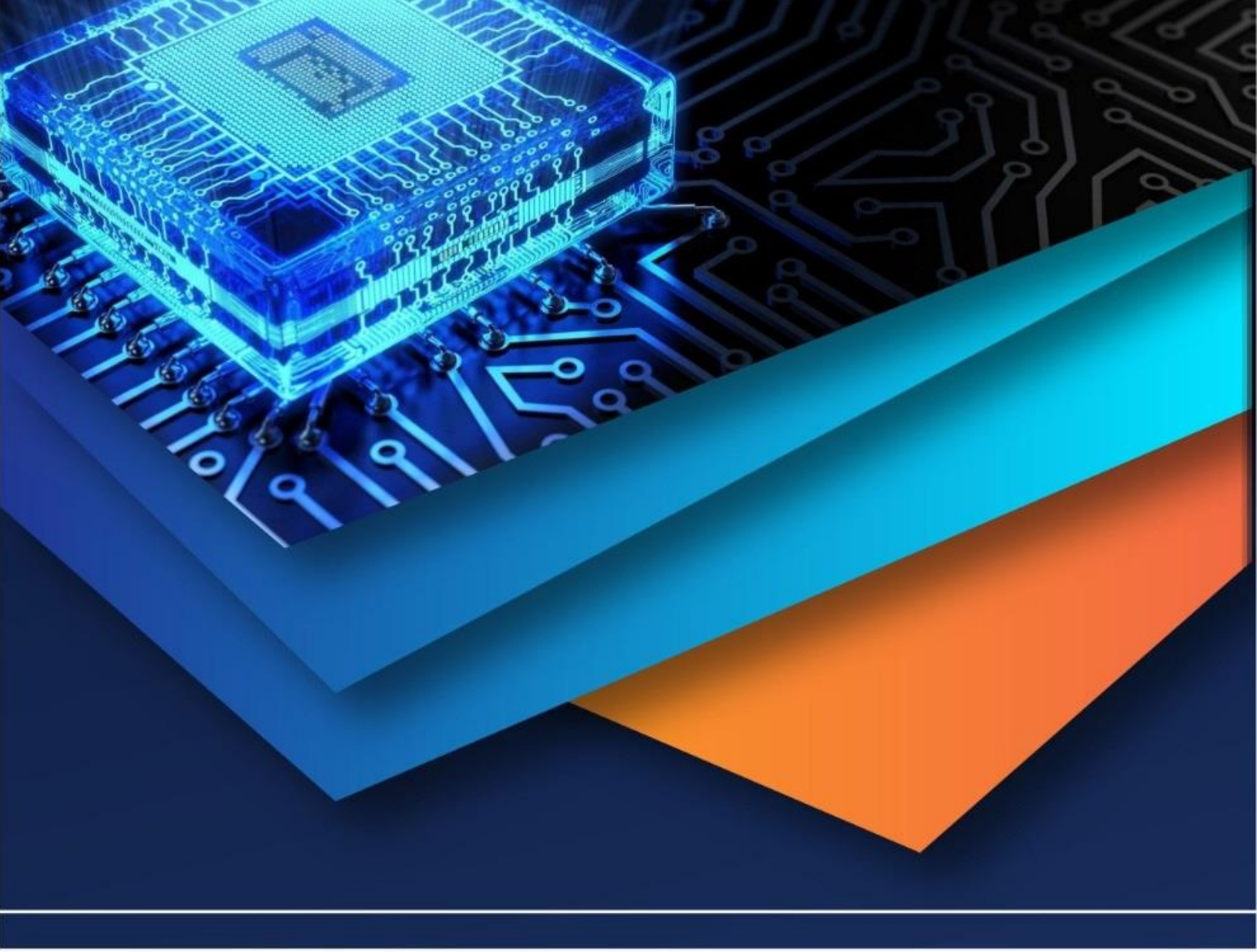
[3] O. Y. Ojedokun, A. A. Adeniran, S. B. Raheem and S. J. Aderinto Civil Engineering Department, The Polytechnic, Ibadan, Oyo State, Nigeria-" Cow Dung Ash (CDA) as Partial Replacement of Cementing Material in the Production of Concrete"- British Journal of Applied Science & Technology June 2014.

[4] J Arthika, C Venkatasubramanian, D Muthu, Neha P Asrani, R. Gayathri M. Tech Student, Associate Professor, Assistant Professor, School of Civil Engineering, SASTRA Deemed University, Thanjavur 613401, "India Utilization of Cow-dung Ash, Granite Powder and Marble Stone to Enhance Strength of Concrete"- International Journal of Engineering & Technology, 7 (3.12) (2018) 168-170.

[5] Vijayvenkatesh Chandrasekaran Final year student, Department of Civil Engineering, St. Josephs College of engineering & technology, Thanjavur, India. "Partial Replacement of Cement with Marble Powder in Concrete" by CIDC October 1, 2017.

[6] N. Gurumoorthy Assistant Professor in Civil Engineering, PSNA College of Engineering and Technology, Dindigul, Tamilnadu. - "Influence of Marble Dust as Partial Replacement of Cement in Concrete" International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 3 Issue 3, March – 2014.

[7] Suraj P Mishra, Kalpana D Thakur, Vicky N Gupta Thakur College of Engineering & Technology, Mumbai, Maharashtra "Partial Replacement of Fine Aggregate by Glass Powder in Concrete" International Journal of Engineering Research & Technology (IJERT), IISN: 2278-0181, Vol. 9 Issue 02, February-2020.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY