IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 11, May 2023

Use of Rice Husk as a Partial Replacement to Sand in Concrete

Shrivardhan Bhosale, Siddharth Alhat, Siddharth Landge, Rahul Hazare,
Vedant Raje Shirkhe, A. A. Avasthi
Pimpri Chinchwad Polytechnic, Pune, Maharashtra, India

Abstract: *Due to rapid expansion of construction and infrastructure activities in India the demand of construction material such as concrete, bricks and sand increasing. Rice Husk can be a strong alternative to sand in concrete for construction in many areas. This paper reports on the influence of replacement of sand by rice husk on the workability, density and compressive strength of concrete, water absorption and compressive strength.*

Keywords: Rice Husk, Cement, Sand, Compressive Strength, Workability.

I. INTRODUCTION

In various civil engineering works, the concrete is used extensively worldwide. As a composite material, the constituents of concrete include binding material (mostly cement), aggregates (fine and coarse) and water. In concrete work, the main function of fine aggregate or sand is to produce workability and uniformity in the mix due to its well graded nature. With the concern rising about the environmental conservation, the issues of degradation and pollution of environment have become the hot topic in today's world. As concrete composes the sand as essential constituents, the main source of it is, naturally flowing rivers which leads to shortage also creates the problem to the environment.

In the world, to find the best alternative of the concrete constituents, various experiments have been carried out by the replacement of certain portion of concrete constituents with materials such as rice husk ash, corn cob ash, fly ash, hemp etc. The rice husk has not been used significantly for any purposes besides manufacturing some rice husk stoves targeting the poor people, whose commercialization at large scale is yet to take place. This shows that the huge amount of rice husk is left unused as waste material annually.

On the other hand, the waste material rice husk, which is a by-product of rice, on burning too causes pollution to the environment. So, with motive to utilize the rice husk as an alternative to the sand, this research was designed to investigate the effect of rice husk content on the properties of concrete mainly workability, density, water absorption, compressive strength.

II. MATERIALS AND METHODS

2.1) Rice Husk

Rice husk (RH) has been long considered an agriculture waste from the rice milling process. It is the coating on a seed or grain of rice. Rice farming is very common in Maharashtra; thus, RH can be easily collected and is cheap. It is often dumped and/or burned. Each kg of milled white rice results in roughly 0.20 kg of rice husk as a by-product of rice production during milling. RH is formed from hard materials, including silica and lignin, to protect the seed during the growing season. It is resistant to natural degradation, in which adequate alternative disposal arrangements must be considered to avoid environmental effects. Rice husk is in loose form that can be substitute as a fine aggregate in the construction industry, reduces the cost of concrete production, and reduces the negative environmental impact. Rice husks width ranges from 2 to 4 mm and the maximum length is about 10 mm. It is relatively homogenous in particle size distribution. RH can produce a uniform distribution of air voids throughout the concrete mixture.

The lightweight RH concrete block can be a new technology made in order to facilitate various constructions and save time for the constructors it is lightweight and also reduces the density of the concrete cube/block. This versatile material is a revolutionary non-structural construction material much needed for quality housing, modern high-rise buildings with framed structures etc.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 11, May 2023

Fig 1A: Rice Husk

Fig 1B: Rice Husk Ash(RHA)

2.1.1 Physical and Chemical Properties of RHA

Table No. 1.0

PROPERTY	VALUES
Gravel sizes (%)	0
Sand sizes (%)	84
Fines (%) a. Silt sizes (%) b. Clay sizes (%)	16 16 0
Liquid Limit (%)	NP
Plastic Limit (%)	NP

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 11, May 2023

Specific gravity	1.8
Optimum moisture content (OMC) (%)	38
Maximum dry density (MDD) (g/cc)	0.7
Angle of Shearing Resistance	36

The rice husk ash is a green supplementary material that has applications in small to large scale. It can be used for waterproofing. It is also used as the admixture to make the concrete resistant against chemical penetration.

2.2) Sand or Stone Dust

Stone dust is a waste material obtained from crusher plants. It has potential to be used as partial replacement of natural river sand in concrete. Use of stone dust in concrete not only improve the quality of concrete but also conserve the natural river sand for future generations.

Figure No. 3.0 Stone Dust

Table No. 2.0 Physical properties of sand

PROPERTY	VALUES
Gravel sizes (%)	0
Sand sizes (%)	98
Fines (%) a. Silt sizes (%) b. Clay sizes (%)	2 2 0
Liquid Limit (%)	NP
Plastic Limit (%)	NP
Specific gravity	2.67
Optimum moisture content (OMC) (%)	5.6
Maximum dry density (MDD) (g/cc)	1.84

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 11, May 2023

Angle of Shearing Resistance	36
California bearing ratio (CBR) (%)	10

III. OBJECTIVE

To study the properties of concrete with rice husk as a partial replacement to sand. As infrastructure and construction is increasing in our country according the demand for cement and sand is increasing day by day. Cement being a very hazarders material emitting lots of Co2 in our atmosphere and cement also causes difficulty in waste disposal. To curb both the problems we can use rice husk which is an agricultural waste as a partial replacement to sand in concrete.

IV. METHODOLOGY

Various percentages of sand with 0%, 10%, 20%, 30%, 40%, 50% of dry weight of RHA are prepared and tested for compaction, angle of shearing resistance and CBR tests.

Table No 3.0: Proportions of Mix

Mixes	RHA	Sand
M1	0%	100%
M2	10%	90%
M3	20%	80%
M4	30%	70%
M5	40%	60%
M6	50%	50%

The concrete shall be manually mixed according to design mix of M20, placed in three layers compaction. The mix ratio adopted was 1:2:4 by weight and volume respectively. Slump tests will determine the workability of fresh concretes. Concrete cube of size 150×150×150 mm is to be prepared for the tests. After the 24 hours of sample preparation, they should be cured in curing tank for 28 days. The bulk density, water absorption and compressive strength will be determined afterwards taking the average of 6 cube samples for each different mix.

IV. RESULTS AND DISCUSSION

As per the available literature Rice husk Ash has been a competent construction material, therefore we plan to perform tests like compressive test, durability test on rice husk as a partial replacement to sand in concrete.

V. CONCLUSION

This is a review paper about partial replacement to sand in cement by rice husk ash. The results will be compared to the original conventional concrete and will be presented in the research henceforth. Also, long-term behaviour of Rice Husk Concrete should be investigated.Volume batching should be used in works involving Rice Husk.

REFERENCES

[1] I.O. Obilade. Experimental study on rice husk as fine aggregates in concrete. The International Journal of Engineering and Science (IJES), 3:9–14, 2014.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 11, May 2023

[2] M. I. Malik, A. Manzoor, B. Ahmad, S. Syed, and R. Ali. Effectiveness of use of rice husk ash as partial replacement of cement in concrete. International Journal of Modern Engineering Research (IJMER), (5):49–54, 2015.

[3] T. C. Ling. Prediction of density and compressive strength for concrete blocks. Construction and Building Materials, 25:361–366, 20.