iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** IX **Month of publication:** September 2018

DOI:

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: 6.887
Volume 6 Issue IX, Sep 2018- Available at www.ijraset.com

Evaluation of Physical Characteristic of Industrial Waste in Civil Engineering

Pervaz Ahmad[1], Sameer Malhotra[2]
[1]*M.Tech Scholar Civil Engg. Department,Gurukul Vidyapeeth Institute of Engineering and Technology-Ramnagar-140601 (India)*
[2]*Assistant professor Civil Engg. Department, Swami Vivekanand Institite of Engineering and Technology-Ramnagar-140601 (India)*

Abstract: ***Due to rapid growth in population and industrialization, some new technologies are made for waste utilization and cost reduction in industrial processing by using rice husk (lignocellulosic biomass) ash and fly ash as a valued material. Rice husk act as adsorbent for removing heavy metals from wastewater. In mostly countries of the world biomass used for bioethanol production because it is a renewable and environment friendly fuel. India is a major rice producing country, and the husk generated during milling is mostly used as a fuel in the boilers for processing paddy, producing energy through direct combustion and / or by gasification. About 20 million tones of Rice Husk Ash (RHA) is produced annually. In the same way fly ash is also a industrial waste. Many researches are already done on usefulness of fly ash by replacing the cement upto some extent. RHA and fly ash is a great environment threat causing damage to the land and the surrounding area in which it is dumped. Lots of ways are being thought of for disposing them by making commercial use of this RHA and fly ash both. In present study we use RHA and FA at 10, 20 30 and 40 % by replacing it with cement. It include evaluation of various properties like compressive strength, consistency, initial & final setting time etc.*** **and** ***evaluates how different contents of Rice Husk Ash added to concrete may influence its physical and mechanical properties. Sample Cubes were tested with different percentage of RHA and FA replacing in mass the cement. Due to the pozzolanic reactivity, rice husk ash (RHA) and FA is used as supplementary cementing material in mortar and concrete and has demonstrated significant influence in improving the mechanical and durability properties of mortar and concrete. It has economical and technical advantages to use in concrete.***
Keywords: Rice Husk Ash, Fly Ash, Cubes, Cement, Industial Waste

I. INTRODUCTION

The population increase more generated source and waste, one of source is need shelter used to cement,1 ton generated cement approximately 0.6 ton CO_2 gas emission produced ,which causes to global warming.7% Total produced CO_2 gas emission in atmosphere, reduces CO_2 gas emission is cement replacing some waste or ash, used waste in concrete. Most of the waste generated to India is several issues reducing waste, stone waste (SW),fly ash (FA),palm oil fuel ash (POFA),rubber waste (RW),wood powder (WP),plastic waste (PW),rice husk (RH) and municipality solid waste ash (MSWA)these types of waste suitable replacing cement in concrete because of this fine particles.

In the middle of 20^{th} century the burnt rice husk ash is used to production of tooth power used as fuel in cooking purpose and dish cleaning power due to lack of knowledge. By continuous research on properties of rice husk ash, the results shows that it contain high silica content which is more than 90%, it reduces shrinkage cracks and leads to increase the strength of concrete. In present study we choose rice husk ash with fly ash in different percentage like 10, 20, 30 and 40 % to mix in concrete and check various properties.

A. Material Used for Present Study

Concrete is a variable material. It is not practical to expect that the characteristics of a concrete mix can be identically replicated on a consistent basis. One of the main reasons for the variability in the concrete is because of the variability in the materials used to make the concrete. The five basic constituents of concrete used in present study are:

1) *Cement:* Ordinary Portland cement (OPC) is by far the most important type of cement. The OPC was classified into three grades namely, 33 grade, 43 grade and 53 grade depending upon the strength of the cement at 28 days when tested as per IS 4031-1988. Ordinary Portland cement of 43 grade of ultratech cement is used in this experimental work.
2) *Fly Ash:* The fly ash used in the present study is collected from khedar power plant. The specific gravity of the used fly ash is obtained as 2.25. The figure 3.1 shows the fly ash.

Figure 1 Fly Ash

Rice Husk Ash- The rice husk ash used in the present study is collected from Faridabad. The specific gravity of the used rice husk ash is obtained as 2.02. The figure 3.2 shows the rice husk ash.

Figure 2 Rice Husk Ash

B. Water

Potable tap water is used for experimental work.

Objective of the Study

1) To determine the effect of rice husk ash with fly ash on the compressive strength of concrete.
2) To study the effect of rice husk ash with fly ash on workability of concrete.
3) To study the some physical property like initial setting time, final setting time, consistency etc.

II. LITERATURE REVIEW

(Okafor et al. 2009), showed the effect of rice husk ash (RHA) on some geotechnical properties of a lateritic soil classified as A-2-6 (0) or SW for sub-grade purposes. The investigation includes evaluation of properties such as compaction, consistency limits and strength of the soil with RHA content of 5%, 7.5%, 10% and 12.5% by weight of the dry soil. The results obtained show that the increase in RHA content increased the optimum moisture content but decreased the maximum dry density. It was also observed that increase in RHA content, reduced plasticity and increased volume stability as well as the strength of the soil. 10% RHA content was also observed to be the optimum content.

(Alhassan 2008), find in his study that soil sample collected from Maikunkele area of Minna, classified as an A-7-6 lateritic soil on AASHTO classification was stabilized with 2-12% rice husk ash (RHA) by weight of the dry soil. Using British standard light (BSL) compaction energy level, performance of the soil-RHA was investigated with respect to compaction characteristics, California bearing ratio (CBR) and unconfined compressive strength (UCS) tests. The results obtained, indicate s a general decrease in the maximum dry density (MDD) and increase in optimum moisture content (OMC) with increase in RHA content. There was also slight improvement in the CBR and UCS with increase in the RHA content. The peak UCS values were recorded at between 6-8% RHA, indicating a little potential of using 6-8% RHA for strength improvement of A-7-6 lateritic soil.

(Anupam 2016), This work presents the laboratory study conducted on fly ash and rice husk ash as soil stabilizers. Admixing of fly ash and rice husk ash reduces the maximum dry density but increase the water demands. The variations of elastic deformation and resilient modulus were significantly influenced by fly ash and rice husk ash contents. Better performances were observed for

admixed soil irrespective of number of load applications. The results obtained from the laboratory confirm the potential use of subgrade soil admixed with fly ash and rice husk ash with respect to the permanent deformation.

(Shafigh et al. 2014) Studies show the possibility of use and acceptable performance of certain agricultural solid wastes, e.g. oil palm shell, coconut shell, rice husks, and tobacco waste, as aggregate in making concrete. Since aggregate makes up about 60–80% of the volume of the concrete, the substitution of solid waste as full or partial replacement for conventional aggregate contributes significantly in cost effectiveness, energy saving and mitigation of the environmental impact of the construction industry. Considering the current criteria for a sustainable infrastructure, green building rating systems and related environmental benefits, making concrete using agricultural wastes as aggregate can help in making the concrete industry environmentally friendly. Therefore, the development of existing knowledge and identification of other useful solid wastes to be used in making concrete will also provide a valuable contribution in the environmental sustainability of the industry.

(Salas et al. 1986) The low strengths achieved, even with negligible proportions of husk, of 22.96% and 32.4% should be noted. One possibility put forward for achieving greater strengths with the same proportion of husk is to only substitute sand, instead of sand and gravel.

(Kathirvel et al. 2013) showed that in case of quaternary blending, there is an increase in compressive, split tensile and flexural strength f or cement with 20 % fly ash, 10 % of LP and 10 % of RHA. Also the durability tests revealed that quaternary-blended cements perform better in all aspects of corrosion. Hence, the qua-ternary mix of cement with 20 % fly ash, 10 % of LP and 10 % of RHA is found to enhance the strength as well as corrosion resistance.

III.METHODOLOGY

The experimental program are carried out with an objectives to study the effects of using rice husk and fly ash as partial replacement of cement, and also to study the effects of using rice husk with fly ash as cement on the performance of concrete. The experiment was done to determine the effects of replacing part of Ordinary Portland cement with rice husk ash and fly ash with different percentage on various properties of cement such as water requirement or normal consistency, setting time, soundness and compressive strength strength.

A. Tests Conducted on Materials

Each mix underwent a series of tests. These tests were chosen to assess the individual characteristic of the aggregates as well as the workability, strength and durability indicators of the concrete. A complete list of the tests is given below

1) Particle Size Distribution and Specific Gravity
2) Water Absorption
3) workability
4) Compressive Strength

IV.RESULT AND ANALYSIS

An Experimental study on the behavior of fly ash and rice husk ash based concrete has been conducted for various loading conditions. The results of the present investigation are compared with the other investigation. A good agreement between the compression, workability test and flexural strength has been obtained. The results of the present investigation are discussed under the following heads

A. Consistency Test

Normal consistency tests, for the blended cements, are conducted, by Vicat apparatus, to observe the changes in water requirement of pastes due to the presence of rice husk ash and fly ash. In present study no. of sample casted are big in number so it is decided to nomenclature each sample with particular code.

From the figure giv wen below , there is variation on cement paste up to 30% of addition of rice husk ash and fly ash and after more addition there is no change in consistency. The above change in consistency at initial stage is due the particle size of rice husk ash and fly ash. The particle size of rice husk ash and fly ash is less as compare to cement so it fill maximum voids of the paste, which help in increase in consistency of the paste.

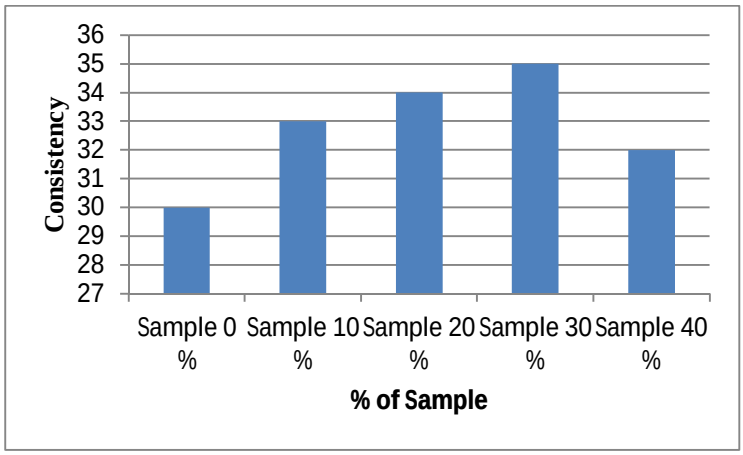


Figure 3: Consistency Graph

B. Setting Time

Tests for setting time are conducted to compare the setting time of the blended cements with standards and also with the control paste. Figure 4 show the variation of initial and final setting time of cement after addition of rice husk ash and fly ash. After addition of rice husk ash and fly ash there is little increase in initial and final setting time of cement.

Below figure shows a little variation in initial and final setting time of cement. This variation is up to 30% of rice husk ash and fly ash and after furthest addition of rice husk ash and fly ash there is decrement in initial and final setting time of cement. The above change in final setting time is due to the particle size of rice husk ash and fly ash. The particle size of rice husk ash and fly ash is less as compare to cement, it help to make the cement paste less permeable which further decrease the setting time of paste.

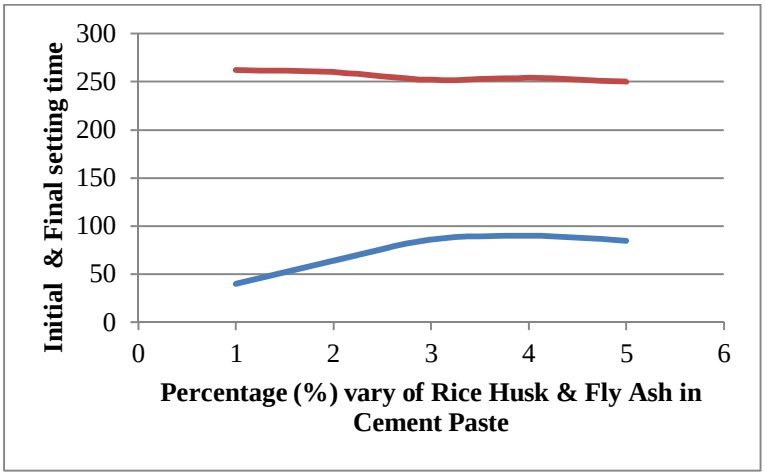


Figure 4: Initial & Final Setting Time Graph

C. Soundness Test

Soundness of cement is determined by Le-Chatelier method as per IS: 4031 (Part 3) – 1988.Test is conducted by replacing the cement paste with rice husk ash and fly ash at different percentage. The test results for soundness test for the fresh sample is 1 mm and it remian same for all other sample of fly ash and rice husk ash based.

The result shows no change in soundness in cement paste due to the particle size of rice husk ash and fly ash. Due to less particle size of rice husk ash and fly ash it help to make the cement paste less permeable which further decrease the setting time of paste.

D. Specific Gravity Test

The ratio of the density of a substance to a density of a standard substance, usually water for a liquid or solid and air for gas. Specific gravity of cement is depending upon the particle size of cement. The test is done as per IS: 2386. We find the specific gravity of rice husk ash and fly ash is 2.02 and 2.25 which is less then specific gravity of cement i.e 3.02. All these value are in permissible limit.

E. Compressive Strength Test

The compressive strength was conducted on various specimens as per the guidelines given in IS 516-1959. The specimens were surface dried before testing the same on Universal Testing Machine of 100 tonnes capacity. The compressive strength of plane mortar and rice husk and fly ash based concrete for various percentages has been illustrated in Table below which shows the compressive strength after 7 and 28 days respectively. The compressive strength of plane mortar has been obtained as 26.55 Mpa after 7 days. This strength has been obtained as 26.55 Mpa for fresh concrete and 27.57 Mpa, 28.44 Mpa, 29.76 Mpa and 23.54 Mpa for 10, 20, 30 and 40 % addition of rice husk ash and fly ash. It has been observed that the compressive strength of rice husk ash and fly ash based concrete is higher than the compressive strength of plane concrete as illustrated in given table below. The compressive strength of plane mortar has been obtained as 40.41 Mpa for fresh concrete after 28 days. This strength has been obtained as 41.38 Mpa, 42.43 Mpa, 43.75 Mpa and 38.34 Mpa for 10, 20, 30 and 40 percent addition of rice husk ash and fly ash. It has been observed that the compressive strength of rice husk ash and fly ash based concrete is higher than the compressive strength of plane mortar as illustrated in table below.

It can be seen that the incorporation of rice husk and fly ash resulted in increase in compressive strength of concrete up to 30 % at the curing age of 7 days and up to 30% curing age of 28 days respectively. Hence, these results show that rice husk ash and fly ash addition good compressive behavior and helps in improving the properties of the M40 concrete.

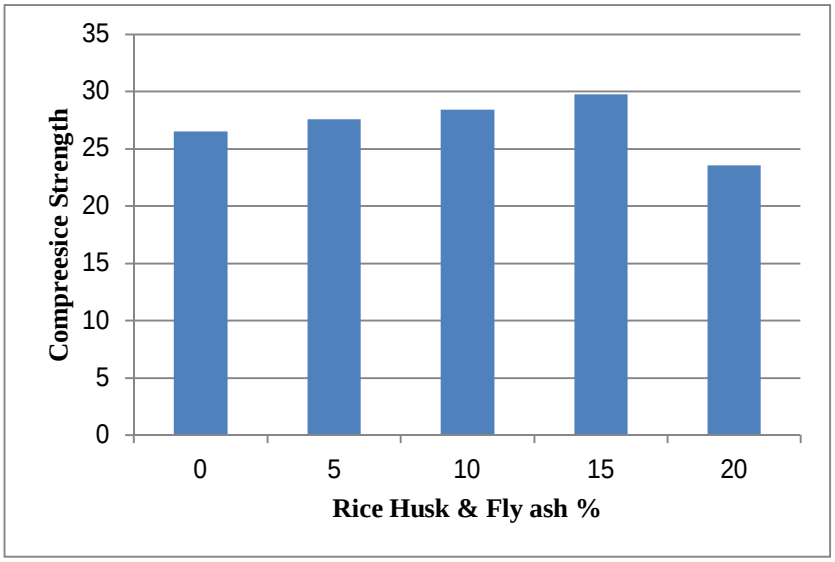


Figure 5: Compressive Strength at 7 Days

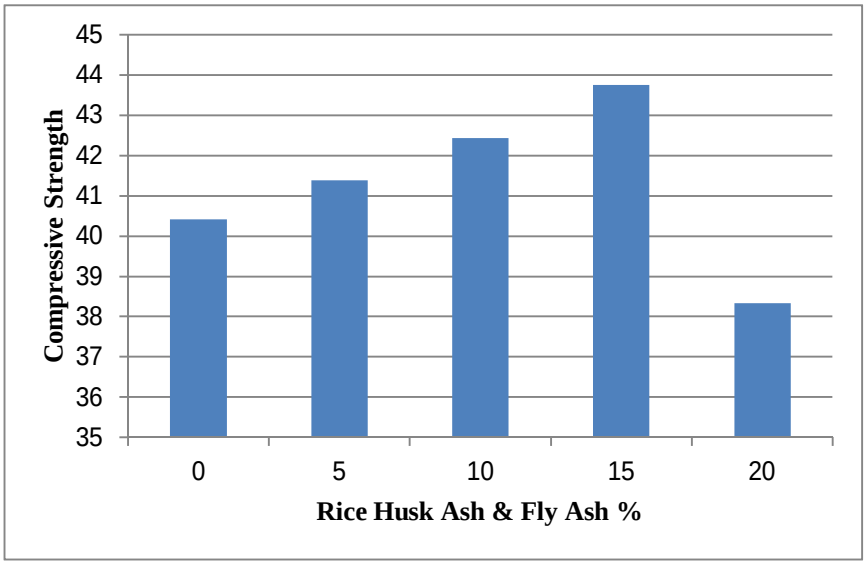


Figure 6: Compressive Strength at 28 Days

F. Workability Test

The test result of workability show that there is some increment in workability of concrete after addition of rice husk ash and fly ash. There is some increment in workability till 20 % addition of rice husk ash and fly ash after more addition of this waste decrease in concrete workability.

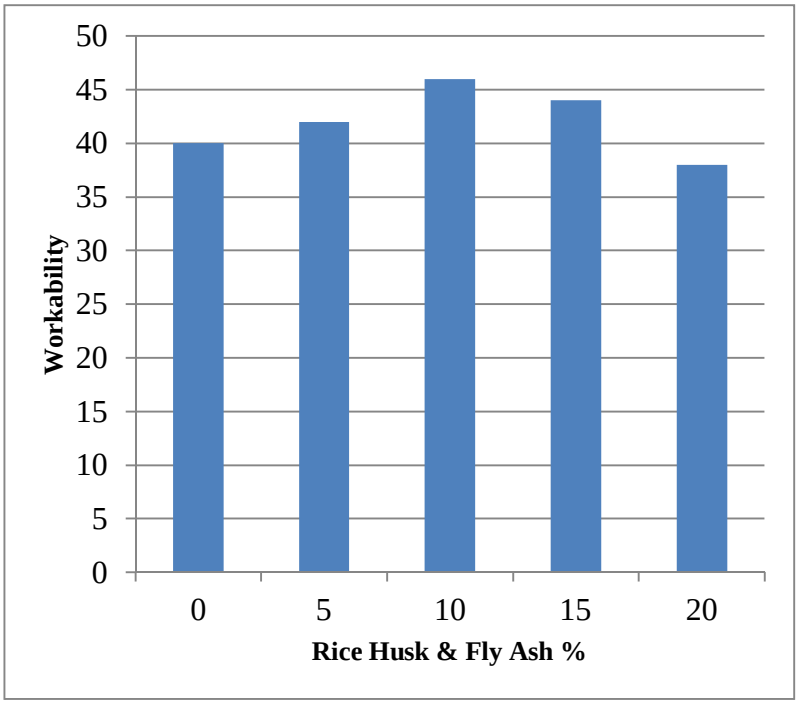


Figure 7: Workability Graph

V. CONCLUSIONS

A. General

Present investigation was undertaken to study the effect of rice husk ash and fly ash on strength characteristic strength of concrete. To achieve the objectives of the present study, the cement were replaced 10%, 20%, 30% and 40% respectively. The compressive strength and the flexural strength test were determined for the mixes at the curing age of 7 days and 28 days. The results obtained for the above mixes were compared to investigate the effects of partial replacement of cement by rice husk ash and fly ash on the above strength parameters of concrete. The conclusion drawn from this study is presented in this chapter.

B. Conclusions

Based on the results obtained in the present investigation, the following conclusion can be drawn. The results obtained in the present study indicates that it is feasible to replace the cement by rice husk ash and fly ash for improving the strength characteristics of concrete, thus the rice husk ash and fly ash can be used as an alternative material for the production of concrete to address the waste disposal problems and to minimize the cost of construction with usages of rice husk ash and fly ash.

1) The Experimental work shows that properties of concrete M40 gets improved due to incorporation of rice husk ash and fly ash.

2) M40 concrete produced from cement replacement upto 30% rice husk ash and fly ash leads to increase in compressive strength of concrete at the end of 7 & 28 days respectively. Beyond 30 %there is a decrease in compressive strength of concrete.

3) It can be concluded that the workability of fresh concrete is 40 mm and the workability of concrete is increased as the percentage of rice husk ash and fly ash increased upto 20 % after more addition there is decrement in workability of concrete.

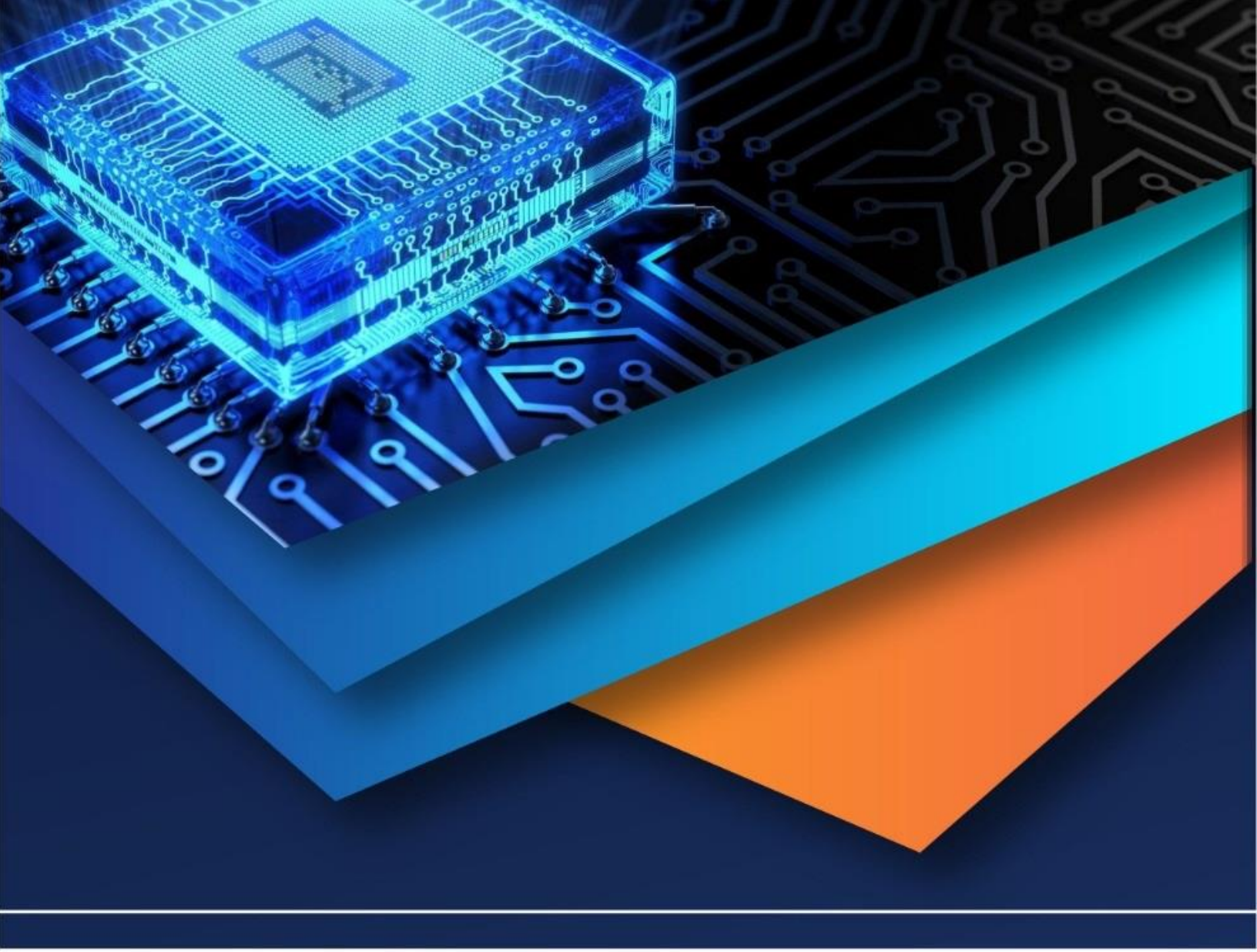
REFERENCES

[1] T.S.Ramesh Babu and D.Neeraja “Rice Husk Ash as Supplementary Material in Concrete –A Review” International Journal of ChemTech Research, CODEN (USA): IJCRGG, ISSN:0974-4290, ISSN (Online):2455-9555, Vol.9, No.05 pp 332-337.

[2] Koteswara Rao. D, Pranav, Anusha. M “Stabilization of Expansive Soil With Rice Husk Ash, Lime and Gypsum – An Experimental Study” International Journal of Engineering Science and Technology (IJEST) ISSN : 0975-5462 Vol. 3 No. 11 November 2011.

[3] Obilade, I.O. “Experimental Study On Rice Husk As Fine Aggregates In Concrete” The International Journal Of Engineering And Science (IJES), Volume 3, Issue 8, Pages 09-14, 2014. ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805.

[4] S. Nambirajan "An Experimental study on Effect of Rice Husk Ash and Glass Fibre on properties of Cement with Partial replacement of Fine Aggregate by Quarry Dust" ISSN: 2454-132X, Impact factor: 4.295, (Volume3, Issue1) , Available online at: www.ijariit.com
[5] M.R. Karim, M.F.M. Zain, M. Jamil, F.C. Lai and M.N. Islam "Strength of Mortar and Concrete as Influenced by Rice Husk Ash: A Review" World Applied Sciences Journal 19 (10): 1501-1513, 2012, ISSN 1818-4952, IDOSI Publications, 2012.
[6] S. D. Nagrale, Dr. Hemant Hajare, Pankaj R. Modak "Utilization Of Rice Husk Ash" International Journal of Engineering Research and Applications (IJERA), ISSN: 2248-9622, Vol. 2, Issue 4, July-August 2012, pp.001-005.
[7] Satish H. Sathawane,Vikrant S. Vairagade and Kavita S Kene "Combine Effect of Rice Husk Ash and Fly Ash on Concrete by 30% Cement Replacement" Chemical, Civil and Mechanical Engineering Track of 3r d Nirma University International Conference, Procedia Engineering 51 (2013) 35– 44.
[8] Nabi Yuzer, Zekiye Cinar, Fevziye Akoz, Hasan Biricik, Yelda Yalcin Gurkan, Nihat Kabay,Ahmet B. Kizilkanat "Influence of raw rice husk addition on structure and properties of concrete" Construction and Building Materials 44 (2013) 54–62.
[9] R. K. Sharma "Effect of Substitution of Cement with Rice Husk Ash on Compressive Strength of Concrete using Plastic Fibres and Super Plasticizer" KSCE Journal of Civil Engineering (2014) 18(7):2138-2142, 2014 Korean Society of Civil Engineers.
[10] Payam Shafigh, Hilmi Bin Mahmud, Mohd Zamin Jumaat, Majid Zargar "Agricultural wastes as aggregate in concrete mixtures – A review" Construction and Building Materials 53 (2014) 110–117.
[11] Julibn Salas, Marina Alvarez and Janer Veras "Lightweight insulating concretes with rice husk" The International Journal of Cement Composites and Lightweight Concrete, Volume 8, Number3 August 1986.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY