STUDY OF PARTIAL REPLACEMENT OF FINE AGGREGATE BY OYSTER SHELL AND PARTIAL REPLACEMENT OF CEMENT BY RICE HUSK ASH

A

PROJECT REPORT

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

CIVIL ENGINEERING

Under the supervision

of

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(Assistant Professor- Grade II)

by

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to

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY

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STUDENT'S DECLARATION

I hereby declare that the work presented in the Project report entitled **"Study of partial replacement of fine aggregate by Oyster shell and partial replacement of cement by Rice Husk Ash "** submitted for partial fulfillment of the requirements for the degree of Bachelor of Technology in Civil Engineering at **Jaypee University of Information Technology, Waknaghat** is an authentic record of my work carried out under the supervision of **Mr. Chandra Pal Gautam**. This work has not been submitted elsewhere for the reward of any other degree/diploma. I am fully responsible for the contents of my project report.

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CERTIFICATE

This is to certify that the work which is being presented in the project report titled **"STUDY OF PARTIAL REPLACEMENT OF FINE AGGREGATE BY OYSTER SHELL AND PARTIAL REPLACEMENT OF CEMENT BY RICE HUSK ASH"** in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Civil Engineering and submitted to the Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by **Abhinav Jamwal (151631), Shubham Kumar (151683)** during a period from July 2017 to June 2018 under the supervision of **Mr. Chandra Pal Gautam (Assistant Professor- Grade II)**, Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat.

Thea above statement made is correct to the best of our knowledge.

Date: ……

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ABSTRACT

Due to the excessive usage and consumption of the conventional building materials, these are not the sustainable or feasible source for building. Hence, we must provide the alternative building material. Some of the conventional building materials are sand, gravel, cement, etc.. It may seem difficult to provide replacements to these existent and traditional medium or to change the common notion about these conventional materials as human co-existed and practiced using them since early ages. But the provision of 'alternative materials' must be made feasible and widely usable by the designers and developers. For this, incentives like cost-effectiveness, resourcefulness and easier availability of the 'alternative materials' must be emphasized promptly. The use of waste product and agricultural byproducts are very constructive.

As per the current research and statistics, the precise amount of RHA has been used which is amalgamated with cement in meticulous quantity. After that the fine aggregate of above admixture is replaced by Oyster Shell. For regularly used concrete, Indian Standards (IS) methods are applied as the parameters for the mix design. As per the reference and basis of IS method, mix design has been as the replacement of alternative materials that is Rice Husk Ash and Oyster Shell. For the pragmatic usage of these new, unconventional and much needed materials, we need to create such meticulous model. Here, In this case we aim to cast the concrete in substitution of RHA in most advantageous way.

To develop this model, we replace cement with RHA at various levels of 5%, 10%, 15% and 20%. These are then studied with respect to the replacement method. Similarly, Fine aggregate/sand is replaced by Oyster Shell at different levels. After this, process of analysis is done, where we keep checking the strength of concrete after every replacement for desired value

Keywords: Concrete, Oyster Shell, Rice Husk Ash.

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RHA	Rice Husk Ash
OS	Oyster Shell
SSD	Saturated Surface Dry
OPC	Ordinary Portland Cement

CHAPTER 1

INTRODUCTION

In our nation, Concrete is the most widely and abundantly used as the source of nation's infrastructure as it provides utmost strength, support and durability. It is technically and economically progressive and thereby is readily utilized. However, with the increase in demand of these chemical products, it is adversely affecting our environment. In addition to this, it is also an expensive medium. Hence, designers and developers have come up with the 'alternative material'. These alternative green materials are usually the byproducts of agricultural wastes. Several green materials can be a replacement of cement partially, according to the studies and researches. For example, fly ash, groundnut shell ash etc... . India, being an agriculture-based country, producing such bioproducts abundantly

Studies have proved the cost effectiveness as well as the strength of the admixture when the cement is partially replaced with the Rice Husk Ash (RHA). It enhances the mechanical properties and reduces the cost of construction. For these reasons RHA is upcycled and abundantly used as supplementary cementitious material which gives considerable enhancement in strength of concrete. Rice Husk Ash (RHA) is the residue/waste product that is formed while the production of Rice. When we use RHA we not upcycle it but also utilize it effectively for increasing strength of cementitious material and decreasing the cost. Along with this we are choosing eco-friendly methods here to solve our purpose.

For using RHA as mineral admixture in concrete, it needs to burnt into ash to procure its chemical and physical properties as per our requirement. Using RHA ensures increase in strength of concrete and decrease in cost of construction.

RHA has the potential as a low-cost cement product and it has (SiO_2) content. RHA has been the subject of many studies where it has been proved that the stability of RHA has absorbent properties which are useful in industries. It requires less water demand. Use of RHA will reduce environmental waste management by upcycling procedures. Similarly, Oyster Shell (OS) have been a subject of research studies to assess its practical application as construction materials

To be precise, the prolonged Compressive, Flexural and Split Tensile Strength with OS partially altered with fine aggregate were investigated in the researches. Most of the time construction industries uses sand for their constructions.

Aim of our concept revolves around replacement of OS partially. OS is profusely available in the coastal areas.

Thus, it can be an efficient alternative of the conventional construction materials. Just as RHA,

OS too is a cost effective, eco-friendly, efficient strengthening alternative cementitious substance.

After the replacement of Oyster Shell and RHA we check the strength of resultant alternative admixture at the various levels of replacements (with the conventional materials).

CHAPTER 2

LITERATURE REVIEW

Eun-Ik Yang [1]

To assess the handy utilization of Oyster Shells as development resources, an exploratory investigation was perform dependent on equivalent resources extent & halfway substitution of Dry Surface sand with dry Oyster Shell. Unconscious properties and cement with OS incompletely substituted for fine total were researched. Results outcomes show that quality of cement with 10% Oyster Shell substitution is practically indistinguishable of ordinary cement. Notwithstanding, quality of cement with 20% Oyster Shell substitution is considerably poorer than that of typical cement. Consequently, higher OS substitution has the likelihood of adversely impacting the solid long haul quality addition. Versatile modulus of cement with OS substitution diminishes as the substitution blend proportion increments. In particular, the modulus is decreased
by roughly 10– 15% when OS are utilized for 20% of the fine total. Be that as it may, OS has no clear impact on carbonation and synthetic assault of cement. At long last, the quality, , solidifying & defrosting opposition, what's more, porousness are fundamentally influenced by expanded Oyster exchange, especially for Oyster Shell execution, while different property, for example, creep and carbonation, just as compound assault test results,
The impact of Oyster on the execution and strength of cement was inspected dependent on equivalent materials extent and direct supplanting of SSD sand with
dry OS. Huge amounts of OS are appropriated all inclusive. Notwithstanding, most OS winds up as mechanical waste without being reused. Until this point, there is a deficiency of common fine totals. To take care of these issues, OS can fill in as a fractional substitution of fine total. To be specific, concrete substituted with OS had some decent designing properties and demonstrated high obstruction against ecological assault. Creators wait for that different use potential outcomes of OS will were not generously influenced.

Seok-Hong Eo[2]

The point of this examination is to give fundamental test information to help forestall ecological contamination and to seek after asset reusing by looking at the utilization of waste clam shells (OS) as solid total. The potential outcomes of fabricating the loss into lightweight concrete and empty solid squares are likewise analyzed. The physicochemical qualities of OS are examined and the materials and mechanical attributes as indicated by age are assessed for new and solidified cements. New concoction responses and unusual substances from the blending of OS are found to be missing. In spite of the fact that issues in quality and functionality with expanded OS

substitution rate of characteristic totals are created, these can be established by utilizing admixtures and the mineral powder. Concerning quality also, functionality, 10– 13 mm is found be the ideal molecule estimate scope of OS as coarse total. Comes about because of surveying the nature of the empty cement created show that, regardless of whether half of the fine total is replaced partially with OS. Use of OS is along these lines estimated to be acceptable.

The consequences of tests executed to assess the utilization of OS as totals in cement are condensed underneath.

(a) Substance of sea shell climbed, quality as well as usefulness were decreased. Degree of this decrease was moderately more while replacing coarse totals. Regarding quality, the instance of twisting quality demonstrated a generally littler decrease contrasted with pressure quality. As far as usefulness, when substituting fine totals, the droop esteem was expansive because of the decrease of union between the constituent materials and the expansion in rubbing. Be that as it may, isolation created subsequently demonstrated a particular state of decrease in functionality.

(b) For the situation of replacing coarse totals, while the substitution rate was beyond half, unit volume weight of the solid was below 2.0 t/m^2, demonstrating likelihood to help by 10% contrasted with additional typical cement. Going with quality decrease issue could be settled by utilizing superplasticizers.

(c) while examining usefulness and quality as far as replacement of pounded sea shells for coarse total, usefulness didn't demonstrate at all huge contrasts as indicated by the grain breadth. Be that as it may, on account of solidarity, as the morsel breadth achieved 19 mm, it shows huge decreased in quality. Thusly, utilizing OS having grain distance across of 13 mm is considered to demonstrate great outcomes in wording of solidarity and usefulness.

(d) Superiority examination directed on quality and assimilation rate in the wake of creating empty solid squares, utilizing around half of OS substituting for fine totals demonstrated outcomes around of KSA norms, taken to be adequate for implementation.

(e) If the sea shell is taken or use as a solid stuff, advance study thinks about on toughness and financial plausibility shall be required sooner rather than later.

Paramveer Singh[3]

The examination was completed to contemplate the unconscious properties of cement halfway supplanting concrete with RHA fiery debris. M40 evaluation of cement was utilized to analyze compressive, split tensile and flexure following Seven days and Twenty eight days of restoring. The concrete is to be supplanted (by weight) with rice husk fiery remains by five%, ten%, fifteen% and twenty% to get streamlined outcomes. Techniques Analysis: In examination work, accentuation was through on looking at improved amount RHA utilized as supplanting concrete by the vehicle test examination. Since RHA has critical job in increment of compressive quality as contrasted and split rigidity and flexure quality. Concrete supplanting with RHA will lessen cost of development. From these tests work, the end can be drawn. RHA is condition well-disposed and effectively accessible thus it will give advantage whenever utilized for development reason. Concrete blend with ten% RHA as alternate of bond is ideal dimension as it has see to demonstrate huge increment in constriction at twenty eight days when contrasted and organize blend. The split elasticity additionally will in general increment with increment rates of RHA up to 5% blend yet marginally decline after 10 % substitution yet is more than control blend. On expanding the rate supplanting of bond with RHA past 5%, there is a decrease in the elasticity esteem. So 5% RHA substitution is ideal for part rigidity. Greatest flexure quality of joining RHA is accomplished for 5% RHA substitution yet at 10 % RHA substitution quality reduction somewhat from control blend quality. Ideal substance for compressive quality and flexure quality is 10% supplanting with concrete with rice husk cinder after that quality begin diminishing all of a sudden, for split elasticity ideal substance is 5% and after that is begin diminishing with increment of RHA content.

T.P. Meikandaan[4]

Rice husk is a waste result of rice plants. all characters of paddy can create 0.25 ton Rice Husk Ash. This had an exceptionally responsive pozzolanic admixture. The fineness is of the request of 50-60 m^2/gm. The incorporation of rice husk fiery remains in solid influence different parts of cement. As a piece of the composite that shapes the solid mass, Rice husk slag acts to a limited extent as fine total and inpart as a cementitious part. This trial study will confirm the quality and execution ampleness of the other of utilizing rice husk slag as an incomplete substitution of bond in M20 grade concrete with a similar material. Solid blends were set up with bond substitution dimensions of 0%, 5%, 10%, and 15% by rice husk fiery remains.

Seyed Alireza Zareei [5]

The fundamental and inescapable enthusiasm for the utilization of fractional substitutions or by items integral pozzolanic resources was generally initiated via implementation of atmosphere contamination manage come about because of bond generation business. increase husk ash is side-

effect in use from rice factory procedure, with around proportion of two hundred kg for every one thousand tons of rice, in elevated temperature it decreases to forty kg. This document present profit came about because of different proportions of Rice ash on solid pointers through blend plans with extents of five, ten, fifteen, twenty and twenty five% RHA by heaviness of concrete notwithstanding 10% miniaturized scale silica to be contrasted and a orientation blend with hundered% Portland made concrete. test consequences demonstrated the optimistic connection b/w fifteen% supplanting of RHA with increment in compressive qualities by twenty%. The ideal dimension of solidarity & hardiness property for the most part increases with expansion up to twenty%, history so as to is related with slight lessening in class parameter by on the subject of 4.9%. Similar outcomes got for irrigate retention proportions liable to exist horrible. Chloride particles infiltration expanded with increment in bond substitution by about 25% with respect to the underlying qualities (about short of what one fifth). Over the previous years, execution put together examinations with respect to cements by various added substances entered broad zones of test strategies. It is by and large felt that usefulness of added substances to concrete can dish up to make involuntary and expert involuntary parts of so as to can exist a wellspring of traditional & normal advantages, larger amounts of droop stream, attachment of new blend, what's more, quality amid solidified state. Theories perspectives prompts increasingly potential open doors be able to be comprehended in totally & misused to get better solid property. Here, plans differs in RHA extents by around zero-twenty% additionally a manage blend set. In malice of the fact that there is a noteworthy number of an investigation concentrated on request and functionality of fractional substitution of sandstone augmentation in cement, the in attendance study planned to bring in an test needy on profit coming about because of various substance of RHA.

N Kaarthik Krishna[6]

Increment in the interest of ordinary development resources & the requirement intended for giving aa supportable growth in the growth pasture has provoked the planners and engineers choose optional resources practical for make use of in development. For this goal, the utilization of modern misuse items and rural side-effects are creative. Modern squanders and horticultural results, for example, Fly residue, Rice case Ash, Silica smoke, what's more, Slag be able to be supplanted rather than concrete in sight of their pozzolanic behavior, which generally requires substantial area of terrains for removal. In the examination, Rice case Slag has utilize as an admixture bond in cement and its property has examine. Attempt was likewise complete to look at the excellence & functionality parameters of cement. Intended for normal solid, combine configuration is complete dependent on (IS) plan and compliant this as position, blend configuration has been made for substitution of Rice Husk Ash. Four unique switch level specifically five%, ten%, fifteen% and twenty% are chosen & concerted as for the substitution technique.

In attendance work investigate the appropriateness of utilize Rice case fiery debris as a exchange of bond halfway. The suitability of rice husk fiery remains as a cementations stuff was evaluate by direct the study of the fixings with the blow of RHA on hard property. As of the matter test directed on RHA it was exposed that it contains approximately Eighty% silica. To review the brittle phase property, the value esteem as far as Slump and compaction issue for variable RHA point of hard blend at a temperature were done and the outcomes were examine. solidify assets like compressive class, split strictness & flexural class properties were assess. To check the efficiency of test as far-off as water drinking, a water preservation think about was intended for. As of the testing assessment it was exposed that model switch of Rice Husk leftovers in tie was shut to ten% as distant as functionality & excellence. The use in concrete of Rice husk Slag as a exchange for concrete reduce the release of green-house gases to a better amount which of course expand the probability for rising increasingly.

Ms. V. Mohanalakshmi[7],

Concrete is the broadly utilized material on the planet. This naturally makes a colossal interest for element of solid (Fine Total, Coarse Aggregate and bond). From nature perspective, the colossal extraction of the total makes exhaustion and assembling of bond causes contamination. This situation influences the world's environmental equalization. As a structural specialist, we have intended to supplant the waterway sand which is generally utilized in development via ocean shell. Sea shell is the deceased survive from the aquatic life form. We supplanted ocean shell in the wake of pounding it to most extreme dimension of 4.75 mm. The code which was pursued for the blend structure grade M20 concrete following that streamlining of bond is finished is IS 10262-2009. Ocean shell that is utilized in cement affirming to zone II according to IS 383-1970. At that point solid shapes were casted for the 5 parts of incomplete substitution as 20%, 40%, 60 %, 80%, and 100 %. Every one of the examples are utilized for 7 and 28 days. The extreme replacement of sea shell was of 80% with great values in strength of concrete.

The undertaking of substitution of ocean shell as fine total have at long last brought about the expansion in the quality of cement to a high expand. The quality increment is found in pressure in flexural quality. Steady increment in strength is seen in every one of this 20 percent, 40 percent, 60 percent, and 80 percent, after this there is decrement of quality in the 100 percent creating Concrete utilizing Sea Shell as a Fine Aggregate substitution. The most extreme level of effective substitution is found in 80% which mark the greatest quality incentive on the whole three types of solidarity (viz) pressure, split-malleable, flexural. This expansion in quality obviously demonstrates to us the ocean shell started to react among the other elements of solid which there by increment in the warmth of moisture in concrete as far observed from nuts and bolts of solid innovation. We presume that the use of oyster shell in replacement process with fine aggregate is

very important in near future and better environment. The expansion in the use of oyster shell in field of concrete as well as civil engineering needs more study and learn the use of this material. We at last presume that seashell increment the solidarity to most extreme expand.

Abhilash Shukla [8]

Over the previous years, present has saw an increasing figure of investigate on the use and use of contemporary, agrarian increase in the age group of cement. Diverse resources with pozzolanic property, for example, cinder, dense rage, impact heater slag & rice case fiery leftovers played an important part inside the formation of best cement.

In the use of sandstone admixture through the connection & hard business. The charge is relied ahead to increase. The increasing attention for bond and cement is met by the halfway concrete substitution. Significant vitality and cost investment funds can result when modern side-effects are utilized as a fractional swap for the energy escalated Portland concrete. The nearness of mineral admixture and mineral admixtures in cement is recognized to present critical development in functionality and strength. In the middle of the diverse accessible buildups and by substance, the probability of utilize fiery debris inside the formation of essential cement is important. Second biggest rice paddy rising nation on the planet is India. Together the particular point of attention obtainable by supplementary cement contain rice husk

cinder and the communal compensation recognized with the refuse in number of issue of slag transfer in the earth have reproduce the progression of study into the potential of this textile. The target of the here test is to charge one sort of technologically easy to get to RHA as increase cementitious stuff for connection and to review the edge furthest reaches of substitution of concrete. The chief position of this job is to make a decision the ideal rate as an incomplete trade of bond intended for M30 also, M60 assessment of cement and also the blow of great plasticizer on unconscious property. The corporal property of concrete has to be determined and will be confidential as known under. Usual Portland bond (OPC) of 53grade acquired from single source is to be utilized in this examination. The property of attachment try according to IS:4031-1988 are given in table 2 and is found to fit in with different particulars of IS: 12269:1987. Nearby waterway sand is in the direction of utilized as fine total and furthermore decide its particular gravity and fineness. Tests deciding to check the Mechanical properties of cement are to be resolved utilizing rice husk cinder with various rates.

The variety of tests were performed to ensure the execution of rice husk slag:

1. Present was a of note development in Compressive excellence of the Concrete powder substance of ten% for a variety of evaluation to be exact M30 & M60 at typical ages for sample seven days and twenty-eight days.

2. The growth in Compressive excellence was of the demand of 4.27% to 10.95% for numerous assessments and at various ages.

3. Here was similarly enormous development in Flexural excellence of the Concrete with fiery debris substance of ten% for the numerous evaluations in particular M30 and M60 at the phase of twenty-eight days.

4. Here increase in Flexural excellence was of the appeal of 1.87% to 8.98% for numerous assessments and at the time of twenty-eight days.

5. Here was reduction in Split springiness for twenty-eight days at each rice husk gratified. Here was marvelous reduction in split rigidity by way of the level of rice husk cinder prolonged excellence reduced hugely from six% to twenty-six% for both the assessments and at the time of twenty-eight days. As the solid is a delicate material and can't grip ductile concern according to Seems to be: 456-2000 turned out to be to be correct and that is the reason as the level of rice husk powder expanded quality diminished. So it tends to be closed that Split rigidity test has a little meaning for plan viewpoints.

Md. Abu Noaman [9]

The objective of this research was to determine the mechanical properties, including among others compressive strength of concrete (f'_c), tensile strength of concrete (f_{sp}), flexural strength of concrete (f_r), modulus of elasticity (E_c), the partial replacement material which is used in this is RHA with cement. Cylinders of 100 mm diameter and 200 mm height of concrete were cast using 0–25% RHA as a partial replacement of cement with water-to-binder ratios of 0.45, 0.50, and 0.55, with a mix ratio of 1:1.5:3, and cured in water at room temperature. The experimental results indicated that f'_c and f_{sp} increased gradually with the increasing RHA up to 15%. However, the maximum values of these were observed with 10% RHA. By contrast, f_r of BAC containing up to 25% RHA was found lower than that of control concrete. E_c of BAC with RHA were higher than those of control concrete. It was observed that mechanical properties of BAC were influenced significantly due to the inclusion of 15% RHA as a partial replacement of cement.

The significant discoveries of this examination are condensed underneath. It might be referenced that the properties of solidified cement introduced here are just for a steady blend proportion of 1:1.5:3 and water-to-fastener proportion of 0.50.

• The RHA utilized in this examination was like Class F pozzolan in a nebulous structure and it contained certain measures of crystalline silica in the quartz stage.

• The functionality of BACR expanded because of an expansion in water-to-fastener proportion. From a compressive quality perspective, the ideal water-to-folio proportion for BACR without utilizing any substance admixture was found as 0.5.

• BACR yielded the most extreme increment in compressive quality following 7 days, and the comparing substitution of bond by RHA was observed to be 15% by weight of concrete.

• At 28 days, 15% RHA yielded the most astounding substitution limit for the f_{sp} of BACR, and Eq. (1) can be utilized to assess the f_{sp} of BAC containing RHA.
Following 28 days, the estimation of the fr of BACR diminished by about 5– 24% contrasted with that of the control concrete (0% RHA), and Eq. (2) can be utilized to compute the f_r of BACR.

• The E_c of BACR expanded with the expansion in RHA up to 25% substitution, while it demonstrated the most elevated estimation of 17.05 GPa for 15% RHA (e.g., 8% higher than that of control concrete) and Eq. (3) can be utilized to assess the E_c of BACR at 28 days.

• The Poisson's proportion (ν) of BACR expanded with the expansion in RHA up to 25% substitution of bond.

• Based on the test outcomes, 15% RHA is by all accounts the ideal farthest point of substitution of bond for BACR.

Moayad N. AI-Khalaf and Hana A. Yousif [10]

Rice husk powder was set up as a pozzolana by a unique method to such an amount that the most recent item suitable in with planning necessities as far as bodily and substance stuffs, and the silica stayed in a nebulous structure with a unimportant measure of less burnt carbon. consequences demonstrated that such a pozzolana can be delivered with differing pozzolanic action record contingent upon the level of crushing and the consuming temperature. The effect of rice husk cinder gratified as halfway replacement of concrete on compressive feature and volume alterations of several blends is explored. Test conclusions confirmed that aprox 40% replacing can be prepared with less variation in compressive excellence compared and the control blend. Be that as it may, the impact on volume changes is inside the farthest point determined in the American Standard.

1, The most helpful and practical consuming conditions required to change over rice husks into a homogenous what's more, all around consumed cinder, thinking about the quality of the created fiery debris and the vitality utilized in its planning.

2. The connection among granulating period and fineness of RHA consumed at different temperatures recommended that on behalf of a specified granulating time, there is a significant decrease in the particular external territory of RHA as the consuming heat increments.

3. In light of these investigations, Rice Husk Ash delivered can be classified as a fake pozzolana of siliceous sustance, the physical adjusting to the compound then physical necessities of class N pozzolan (ASTM C618). It has a specific gravity of 2.14.

4. For plaster blend with consistent RHA content, the water necessity diminishes as the fineness of the powder increments. The base pozzolanic movement of RHA required by class N canacquired when the fiery debris has a explicit surface of around 11 500 cm2/gm. The quality of bond RHA mortar approaches the quality of the comparing plain mortar of a similar consistency at the point when the particular surface of RHA is around 17 000 cm^2/ gm.

5. For 1:2 and 1:3 mortar of normal consistency, the level of rice husk ash can be supplanted by heaviness of concrete without the excellence being not as much as that of the likening plain mortar was thirty and forty% separately.

1. The higher the level of RHA, the higher are the volume change attributes contrasted and those of the comparing plain blends. Be that as it may, the rate increment in drying shrinkage of mortar bars is by all accounts inside the point of confinement determined by ASTM C618-80.

Muhammad Shoaib Ismail and A. M. Waliuddin [11]

High strength concrete (HSC) was produced using locally available materials. The effect of rice husk ash (RHA) passing #200 and #325 sieves as a lO-30% replacement of cement on the strength of HSC was also studied. The RHA was obtained by burning rice husk, an agro-waste material which is abundantly available in the developing countries. A total of 200 test specimens were cast and tested at 3,7,28 and 150 days. Compressive and split tensile strengths of the test specimens were determined. Cube strength over 70 MPa was obtained without any replacement of cement by RHA. Test results indicated that strength of HSC decreased when cement was partially replaced by RHA formaintaining same level of workability. In this study an effort was also made to evaluate the usefulness of using an agro-waste, known as rice husk ash (RHA) (where an appreciable amount of silica is present) as part re-placement of cement with locally available ingredients. Studies at the University of California Berkeley indicate that the silica of soil migrates in theplant in shape of monosilicic acid which concentrates

there by vanishing. Electron optical microscope trainings shown dispersal of silica through the cellular construction of rice husk. The unburnt rice husk comprises consists fifity% cellulose, twenty-five to thirty% lignin and fifteen to twenty% of silica. The preceding devices are disconnected by red-hot, good-bye evening silica ash. The burnt husk is grey in colour, while the partly burnt husk is black in colour. Instructions showed by the authors, while examining the biological possessions of RHA, designate eighty to ninety% silica with impurities of from forteen% in addition to oxides of Ca, Mg etc. These consequences positively liken with the educations showed.

1. Both the comprehensive objects of the investigation, option of attaining concrete asset over seventy MPa with nearby obtainable resources

2. The residents of concrete as obtainable close are adequate to crop concrete of seventy MPa or more than this.

3. In this education the extreme strength was got with ten% spare of cement by RHA but the writer thought that the best strength may lie with spare of RHA between 10% and 20%.

4. A durability education of High Strength Concrete made with spare of cement by RHA should be showed sideways with its economic topographies.

Siriwardena [12]

In the outdated retro growth effort was usually done with the assistance of mudstone as of manufacturing. Fiery leftovers is a consequence of spent firewood from power station and fiery leftovers is the side-effect of spent rice husk at advanced temp. from paper plant. Momentous activities are existence occupied universal to use shared left-over what's additional, consequence as valued founding resources to advance the possessions of bond concrete. RHA and Fly slag are such possessions. Rice husk powder is a deeply receptive pozzolanic physical shaped by skillful overwhelming of rice husk. It is excellently unglued shaped by coal ended power station. Fiery leftovers has pozzolanic possessions like usually trendy pozzolanic substantial. The point to point investigative inspection complete to contemplate the influence of slight replacement of promise with RHA and FA on cement. In this flawed switch of RHA has continued done at ten%, twenty% and thirty% separately to brand real and the outcomes were contrasted and plain bond solid which is with no substitution of RHA. The water need was experiential to be long-drawn-out and compressive superiority of paste was found slightly lessening, Initial and Final setting time were likewise postponed, Slump esteem expanded. The compressive quality of cement was observed to be 35.01Mpa for ten%, 30.31Mpa for twenty% and 24.3 for thirty% switch separately. From Complete inspection, seen that it inclines to be a dressed switch of concrete. E.g. ten% and twenty% which could be set for growth drives.

In the old time frame development work was for the most part finished with the help of mudstone from business. Glide ash leftovers is a outcome of spent coal after control station and rice husk cinder is the side-effect of consumed rice husk at advanced temperature. Important actions are being taken worldwide to use common waste what's more, side-effect as beneficial establishing resources to recover the possessions of bond concrete. Rice husk powder and Fly fiery are such resources. Rice husk slag is an intensely open pozzolanic material carried by skillful overwhelming of rice husk. It is excellently unglued shaped by coal ended control station. Fiery debris has pozzolanic possessions like usually happening pozzolanic material. The nitty determined trial inspection done to consider the impact of fractional substitution of bond with RHA and FA on cement. In this investigation the incomplete substitution of RHA has been done at ten%, twenty% & thirty% distinctly to brand concrete and consequences were contrasted and basic solid bond which has no switch of RHA. The water qualification was pragmatic to be extended and the compressive excellence of cement was found waning, IST & FST were moreover delayed, Slump regard prolonged. The compressive excellence of cement was experiential to be 35.02Mpa for ten%, 30.21Mpa for twenty% and 24.25 for thirty% exchange separately. From the examination, it was seen that it inclines to be a decent replacement of bond E.g. ten% and twenty% which can be agreed for progress purposes.

E. B. Oyetola and M. Abdullahi [13]

The compressive strength of commercial sandcrete hinders in Minna, Nigeria was able to examined. Rice Husk Ash (RHA) was prepared using Charcoal from overwhelming sticks. Important scrutiny of the Basic supplies of the conservative Portland Cement or Rice Husk Ash bare sandcrete squares were focused to sustain their correctness for square manufacture. Corporal experimental of the obviously decided mixture was moreover finished. 150mm×450mm unfilled sandcrete cubes were thrown reassured and crushed. Results consequences shows that the most commercial sandcrete in Minna town are underneath normal. The compressive excellence of the cement or rice husk sandcrete cubes increases with stage at dismissing and reduces as the equal of RHA gratified. The inspection affected dishonorable at an model replacement measurement of twenty%.

From the examinations led on cement or rice husk empty sandcrete hinders as showed in the dissimilar parts the supplementary trimmings are complete. The rice husk cinder brought using charcoal after tinder is pozzolanic and along these appearances is sensible for use in square creation. The Specific gravity fiery debris were observed to be 2.11, 459 Kg/m^3 and 529 Kg/m^3; For a given blend, the water need increases as the rice shell powder gratified increases The setting times of cement or RHA increases as the slag content increases. The thickness of cement or RHA is in the range for sandcrete cubes. The compressive class of the cubes for all blend increases with

the reinstating and reduces as the rice husk content increases. RHA is nearby in dangerous quantities as a left-over and can be used for making cubes. This will go far to reduce the amount of waste in disorder. The ideal supplanting measurement of cement with RHA is twenty%.

Arvind Kumar [14]

In India rice processing produces a side-effect which is known as Husk. This rice husk is utilized as fuel in rice factories to delivered steam for bubbling procedure. This husk contain close around 75 % natural issue and the staying 25% of this rice husk is adjusted into Ash amid the terminating procedure which known as rice husk powder (RHA). The rice husk burning wreckage (RHA) contain close around 85 % to 90 % nebulous silica. By utilizing rice husk fiery remains in solid, we can improve the properties of cement. The present examination and trial examination were taken to ponder the properties of cement made with Rice husk powder. the substitution is done mostly in the extent of 0% ,20% and its impact on functionality of cement made with rice husk powder were explored for the 20% rice husk cinder substitution, the solidified properties, for example, compressive quality watched were great as contrast with 0 % RHA . The compressive quality test was directed at 0% and 20% rice husk fiery remains substitution and the most astounding compressive quality at 20 % RHA substitution when contrasted with 0% RHA substitution at 14 ,21 and 28 days.

In perspective on the limited investigation did on the quality lead of Rice Husk soot, the going with ends are drawn.

1. The bond substitution dimensions of Rice husk red hot flotsam and jetsam; there is moderate addition in compressive superiority from 3 days to 7 days. Anyway, there is colossal extension in compressive superiority from 7 days to 28 days acquired after by moderate addition from 28 days.
2. By using this Rice husk red hot trash as a piece of concrete as replacement the announcement of nursery gasses can be lessened to be a progressively vital degree. Accordingly, there is progressively noticeable believability to gain amount of carbon recognitions.
3. The particular and money related central purposes of melding Rice Husk Ash in bond should be abused by the advancement, rice business endeavors, even additional so for the rice creating nations of Asia.

Wan Ahmad Soffian Bin Wan Mohammad [15]

The author in this paper emphasis on numerous sea shells ash such as oyster, snail, and green mussel shell ash as partial cement spare and its impartial is to reduce the difficulties of the global warming. Cement manufacturing give huge influence to environment in each phase. These comprise air pollution in form of dust and, gases, sound and vibration through quarry severe and crushing. The changed cement is a cementitious material that surpasses the OPC performance by

optimizes the recycle and wasted materials. Therefore, the spare of cement in concrete by various sea shell ash may create great saving of energy and also mains to profits to the environment. When we replaced the fine aggregate by oyster shell then the results show that the optimum percentage of seashells as cement replacement is between 4.1 – 5.2%.

we can roughly say that the improvement of ocean shell powder as incomplete concrete substitution could be produced as a concrete like material wherever the molecule extent will be the equivalent or improved than concrete. Concrete with seashells as bond substitution resolve deliver improved cement in term of compound synthesis, compressive quality, flexural quality elasticity. It could be researched by utilizing distinction kinds of ocean shells to diminish natural subjects. Verifiably, this exertion will make improved profit in future monetary incentive to the neighborhood network and ventures and furthermore, give better arrangement in solid innovation. Great qualities on building up the eventual fate of solid industry ought to be consume finished quality research amongst industry players and higher learning creations to include all gatherings into economical circumstance. Other than that, cooperation with neighborhood specialists through guidelines and laws will make better chance to partners to think of projects on leftover minimization and use. Accordingly, using of leftover materials for example, ocean shell in creating green cement ought to be investigated, exhausted and upheld through center examines. Advancement of green cement ought to be demonstrated through execution on solidified state and new state to comprehend the conduct of every material moreover in elongated or momentary impact.

2.2 Parameters of Structural Evaluation

- Specific Gravity of Cement
- Specific gravity of Rice Husk Ash
- Compression testing machine
- Flexural testing machine
- Universal testing machine

Fig. 1 Compression testing machine

Fig.2 Universal testing machine

Fig. 3 Flexural testing machine

2.3 OBJECTIVES

- Study the compressive strength, Flexural Strength and Split Tensile Strength of the concrete by partial Spare of cement with rice husk ash (RHA).
- M30 grade of concrete were used to determine the compressive strength, Split tensile Strength & Flexural Strength after the curing of 7 days and 28 days.
- The cement is to be changed (by weight) with rice husk ash (RHA) by five%, ten%, fifteen% and twenty% to get optimized results.
- Then we study the Compressive, Split Tensile & Flexural Strength of concrete at partial spare of fine aggregates by Oyster Shell at optimum RHA.

2.4 LIST OF CONCRETES CASTS

Eighteen concretes are casted.

i. three cubes, three cylindrical and three beams at 0% RHA.

ii. The dimensions of cubes are 150*150*150, the dimensions of beam are 100*100*500 & the Rad. of cylinder is 5 cm and ht. are 13 cm.

2.5 Casting Procedure

Concrete cubes, beams and cylinder are prepared of Mix design 30 .

Fig.4 Constituent materials mixing

CHAPTER 3

MATERIALS & METHODOLOGY

3.1 Materials Used

1. Concrete

In our project, we are using amalgamation of the following substances as the concrete: -

Cement

Coarse aggregate

Fine aggregate

Water

These are same ingredient as used in the conventional cement concrete. However, we have replaced the fine aggregate and cement partially. To ensure the strength of concrete in our project we carefully monitor the selection control and proportioning of all the ingredients in optimum quantities.

2. Cement

To make durable and strong concrete the strength of cement must be monitored carefully. Therefore grade 43 OPC is preferred. From the previous studies usage of 43 grade OPC is optimum for a strong concrete.

3. Fine aggregates

This particular constituent is majorly procured from the nature. It is majorly composed of the sand which is found in the river which is formed from the natural breakdown of rocks. This is mostly collected of silica and it is chemically inactive inert material. It is necessary that it should pass through 4.75 IS sieve.

4. Coarse aggregates

This ingredient is also naturally occurring material for e.g. gravel or the remains obtained after disintegration of rocks. Here, the particles are in angular shape. The size is greater than 4.75mm and in our concrete we have used the coarse aggregate of maximum size of 20mm.

5. Rice Husk Ash

Table 1

SiO_2	77.58
Al_2O_3	0.34
Fe_2O_3	0.76
CaO	1.10
MgO	0.30
Na_2O	0.09
K_2O	2.58
C	7.73

Chemical Composition of Rice husk in %

Figure 5 Rice Husk Ash

6. Oyster Shell

Oyster shells are readily placed along the coast by tides and waves of the oceans. These are the dead leftovers of living beings of family Mollusca and Lamella branch. We use bi-valve shell but sometimes uni-valved shells are also used. The shells are rinsed several times to remove chlorine ions on the shells. After grinding the shells, we get and use particles of size below 4.75mm. The final color is dirty white and it has a flaky and rough texture.

Table 2

$CaCO_3$)	97.2
(Na_2O)	0.532
(MgO)	0.480
(SO_3)	0.474
(Al_2O_3)	0.446
(SiO_2)	0.424
(SrO)	0.194
P_2O_5)	0.173

Chemical Composition in %

Figure 6 Oyster Shell

3.2Testing of construction materials

We find the specific gravity of cement & rick husk ash

3.2.1 Specific gravity of cement: The test of determining the specific gravity of cement was according to IS 4031 (11) – 1988. The equipment we used to performed this test was Pycnometer. Capacity of Glass jar that is fitted at its top by a conical cap which is made of brass. It has a screw type cover as shown in figure.

MATERIAL & APPARATUS

1. OPC (ordinary Portland Cement)
2. Pycnometer (100 ml)
3. Kerosene

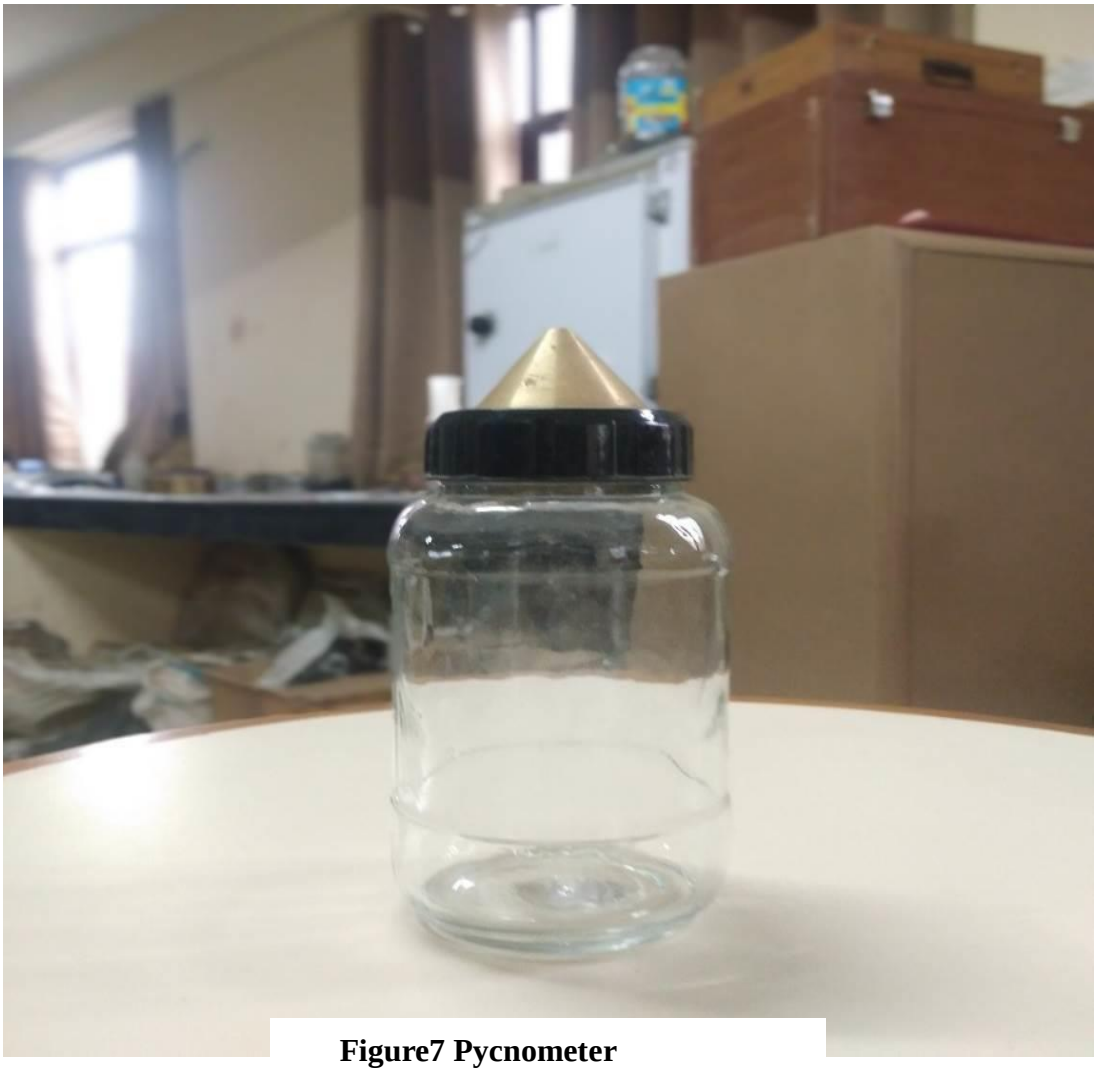

Figure7 Pycnometer

PROCEDURE OF TEST:

1. Measure the weight of empty dry flask (A1).

2. Fill half of the flask with cement (about 50 gm) and measure the weight with its stopper also (A2).

3. Then fill the flask with kerosene up to the top level of the flask. Mix cement and kerosene properly to remove air bubble from it. Weigh the flask with cement and kerosene (A3)

4. Now empty the flask and again fill it with kerosene up to the top of the flask. Weigh the flask (A4).

CALCULATION:

Specific Gravity = (A1- A2)/((A1-A2) –(A3-A4)) * 0.79

3.2.2 Specific gravity of Rice Husk Ash:

The test of determining the specific gravity of cement was according to IS 4031 (11) – 1988. The equipment we used to performed this test was Pycnometer. Capacity of Glass jar that is fitted at its top by a conical cap which is made of brass.

MATERIAL & APPARATUS

1. OPC (ordinary Portland Cement)
2. Pycnometer (100 ml)
3. Kerosene
4. Rice husk ash

PROCEDURE OF TEST:

1. Measure the weight of empty dry flask (A1).

2. Fill half of the flask with Rice husk ash (about 50 gm) and measure the weight with its stopper also (A2).

3. Then fill the flask with kerosene up to the top level of the flask. Mix Rice husk ash and kerosene properly to remove air bubble from it. Weigh the flask with Rice husk ash and kerosene (A3)

4. Now empty the flask and again fill it with kerosene up to the top of the flask. Weigh the flask (A4).

CALCULATION:

Specific Gravity = (A1- A2)/((A1-A2) –(A3-A4)) * 0.79

3.2.3 Specific Gravity of Coarse Aggregate

Procedure: -

Around 2 kg of total example is washed altogether to expel fines, depleted and put in wire container and drenched in refined water at a temperature between 22-32º C and a front of in any event 5cm of water over the highest point of crate. Following drenching the captured air is expelled from the example by lifting the crate containing it 25 mm over the base of the tank and enabling it to drop at the rate of around one drop for every second. The container and total ought to remain totally drenched in water for a time of 24 hour a short time later.

The bin and the example are gauged while suspended in water at a temperature of 22° – 32°C. The weight while suspended in water is noted = W_1

Cool the Sample and weight it as W_2.The unfilled crate is then come back taken surface dried total is then= W_3 g

The bin and totals are expelled from water and permitted to deplete for a couple of minutes, after Cool the Sample and weight it as W_2.The unfilled crate is then come back taken surface dried total is then= W_3 g off by this material. At that point the total exchanged to the second dry total is then gauged.

Specific Gravity = $W_3/(W_2-W_1)$

3.2.4 Specific Gravity of Fine Aggregate

Procedure

1. Take about 500g of sample and place it in the pycnometer.

2. Pour distilled water into it until it is full.

3. Eliminate the entrapped air by rotating the pycnometer on its side, the hole in the apex of the cone being covered with a finger.
4. Wipe out the outer surface of pycnometer and weigh it (W)
5. Transfer the contents of the pycnometer into a tray, care being taken to ensure that all the aggregate is transferred.
6. Refill the pycnometer with distilled water to the same level.
7. Find out the weight (W1)
8. Drain the water from the sample through a filter paper.
9. Place the sample in oven in a tray at a temperature of 100ºC to 110º C for 24±0.5 hours, during which period, it is stirred occasionally to facilitate drying.
10. Cool the sample and weigh it (W2)

Specific Gravity = = **W2/ (W2- (W-W2))**

3.3 Concrete Mixture

The procedure of selection of suitable ingredients of concrete & determination of their relative amounts with the purpose of producing a concrete of necessary strength is termed as concrete mix design. Ratios of Concrete mix design (Cement: Sand: Aggregate) is 1:1.5:3. This table represents mix proportions of concrete for varying RHA replacements by weight of cement. The control concrete without RHA was also fabricated along with above mixes.

3.3.1 M30 DESIGN MIX QUANTITY PER CUBIC METER OF CONCRETE

The design mix of M30 grade of concrete mix was done with conformance to IS 10262: 2009. OPC 43 grade of cement, fine aggregate and 20 mm coarse aggregate up to 4.75mm was used to prepare mix design with w/c ratio 0.45. The mix design is described below:

Grade Description	-	M30
Type of cement	-	Ordinary Portland Cement 43 grade conforming to IS 8112
Specific Gravity of OPC 43 cement	-	3.14
Max. cement content	-	440 kg/m^3
Min. cement content	-	318 kg/m^3
Max. nominal size of aggregate	-	20 mm
SG of Coarse Aggregate (20 mm)	-	2.7

Type of CA	-	Angular Type
Type of FA	-	Zone II
SG of FA	-	2.5
Workability	-	50 mm to 100 mm
Exposure Condition	-	Severe

1. Target Mean Strength:

   $f_{ck}' = f_{ck} + 1.69\ SD$

   where, f_{ck}' = target compressive strength at 28 days

   f_{ck} = charac. compressive strength at 28 days

   SD = standard deviation

   Target MS = 30 + 1.65 x 5

   = 38.25 MPa

2. Selection of w/c ratio:

   Water cement ratio = 0.43 (From table 5 of IS 456 : 2000)

3. Selection of water content:

   Extreme water content for 20 mm CA = 185 litre (From table 2 of IS 10262 : 2009)

4. Selection of cement content:

   Water/cement ratio = 0.43

   Hence, Cement content = 185/0.43

   = 430.23 kg/m^3

   (From table 5 of IS 456 : 2000 minimum cement content for 'severe' exposure condition is 320 kg/m^3)

   430.23 mm kg/m^3>320 kg/m^3, hence ok.

5. Quantity of volume of CA and FA content:

   From table 3 of IS 10262 : 2009, volume of CA and FA (Zone II) corresponding to 20 mm size aggregate = 0.63

   Volume of CA/Volume of FA = 0.63

Volume of fine aggregate/Volume of fine aggregate = 1 – 0.63

= 0.37

Hence, Mix Calculations:

a) Vol of concrete = $1m^3$

b) Vol of cement = $\frac{Mass\ of\ cement}{Specific\ gravity\ \ of\ cement} * \left(\frac{1}{1000}\right)$

= 430.23/3.14 x 1000

= 0.137 m^3

c) Vol of water = $\frac{Mass\ of\ water}{Specific\ gravity\ \ of\ water} * \left(\frac{1}{1000}\right)$

= 185/1 x 1000

= 0.185 m^3

d) Vol of total aggregate = [Vol of cement – (Vol of water + Vol of cement)]

= [1 – (0.137 + 0.185)]

= 0.678 m^3

e) Mass of CA = Volume of total aggregate x Volume of CA x Specific gravity of CA x 1000

= 0.678 x 0.63 x 2.8 x 1000

= 1195.992 kg/m^3

f) Mass of FA = Volume of total aggregate x Volume of FA x Specific gravity of FA x 1000

= 0.678 x 0.37 x 2.6 x 1000

= 652.23 kg/m^3

g) Hence, the quantity of mix = Cement: FA: CA

= 1 :1.51: 2.77

Table 3

Replacement percentage of RHA	Coarse aggregate in Kg/m^3	Fine aggregate in Kg/m^3	Cement in Kg/m^3	Rice husk in Kg/m^3	Water in Kg/m^3
0%	1195.992	652.23	430.23	0	185
5%	1195.992	652.23	409.58	20.65	185
10%	1195.992	652.23	388.93	41.3	185
15%	1195.992	652.23	368.28	61.95	185
20%	1195.992	652.23	347.63	82.6	185

Mix proportions of concrete for varying RHA Replacements

3.4. Testing of concrete samples

To get the strength of the concrete, you have to perform basic concrete tests. These tests include compressive strength of concrete, flexural strength of concrete, & split tensile strength of concrete.

Compressive strength of concrete:

Compressive strength of concrete gives an idea about the characteristics of concrete. By this test we judge that whether concreting has been done properly or not. It depends on many factors such as water-cement ratio, cement quality, material quality, quality control during production of concrete etc.

Test for compressive strength is carried out by cube.

The test for the compressive strength of concrete cubes can be checked by compression testing machine after 7 days of curing. The dimensions of the concrete cubes are 150 mm x 150 mm x 150 mm were prepared. Before casting the cubes, you should have to cleaned the mould properly and coat inside with oil.

Figure 8 Compressive Strength of Concrete

Flexural strength of concrete:

Flexural strength identifies the amount of stress and force can withstand such that it resists any bending failures.The test for the flexural strength of concrete blocks can be checked by flexural testing machine after 7 and 28 days curing. The concrete beams are of dimensions 100 mm x 100 mm x 500 mm were prepared. It is performed to determine the modulus of rupture, which is given by

$$\text{Modulus of rupture} = Pl/bd^2$$

Where, P = maximum applied load applied to specimen.

l = length of span on which specimen is supported.

b = width of specimen.

d = depth of specimen.

Fig.9 Finding Flexural Strength

Split tensile strength of concrete:

This method determines the tensile strength of the concrete by using the cylinder which splits across the vertical diameter.

The test for split tensile strength of concrete can be checked by universal testing machine after 7 days of curing. The concrete cylinder is of dimension 100 mm diameter & 200 mm long were prepared. The split tensile strength is given by

$$T = 2P/\pi DL$$

Where, P = maximum load applied in N to specimen.

D = diameter of specimen in mm.

L = length of specimen in mm.

Fig.10 Finding Split Tensile Strength

CHAPTER 4

RESULTS

The results obtained from the various testing which we discuss below in this Chapter. The Result consists of various testing like Compressive, Flexural and Tensile Strength.

4.1.1 Material testing results:

Specific gravity test was performed for testing the Specific gravities. The results are included in the following table:

Table 4

S. NO.	Experiment (Specific Gravities)	Experiment Values
1.	Cement	3.15
2.	Rice Husk Ash	1.95
3.	Coarse Aggregate	2.8
4.	Fine Aggregate	2.6
5.	Oyster Shell	2.61

Specific gravities

4.1.2 Concrete testing results:

Using compression-testing machine after 7 and 28 days, the compressive strength of concrete RHA samples was calculated. The result are as follows:

Table 5

Compressive Strength after Replacement of Cement by rice husk ash at different percentages in 7 Days of Curing	**Results**
0%	12MPa
5%	12.4MPa
10%	13MPa
15%	12.7MPa
20%	12.4MPa

Compressive strength Test Result in 7 days

Table 6

Compressive Strength after Replacement of cement by rice husk at different percentages in 28 Days of Curing	**Results**
0%	31.05MPa
5%	31.11MPa
10%	28.88MPa
15%	28.1MPa
20%	27.7MPa

Compressive strength Test Result in 28 days

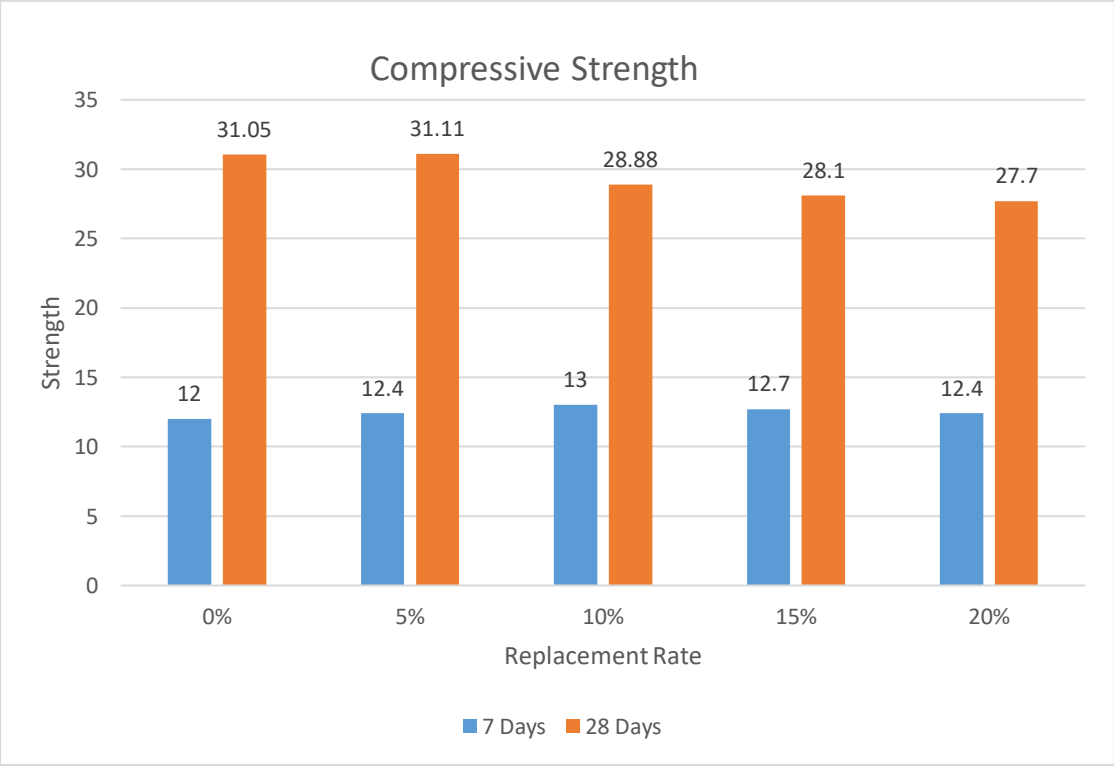

Figure 11 Graph of Compressive Strength in 7 and 28 Days

Flexural testing results:

Using flexural testing machine after 7 and 28 days, the flexural strength of the concrete RHA samples was calculated. The results are as follows:

Table 7

Flexural Strength after Replacement of cement by rice husk at different percentages in7 Days of Curing	Results
0%	2.31MPa
5%	2.34MPa
10%	2.42MPa
15%	2.38MPa
20%	2.29MPa

Flexural strength Test results in 7 Days

Table 8

Flexural Strength after Replacement of cement by rice husk at different percentages in 28 Days of Curing	Results
0%	3.90MPa
5%	3.904MPa
10%	3.76MPa
15%	3.71MPa
20%	3.68MPa

Flexural strength Test results in 28 Days

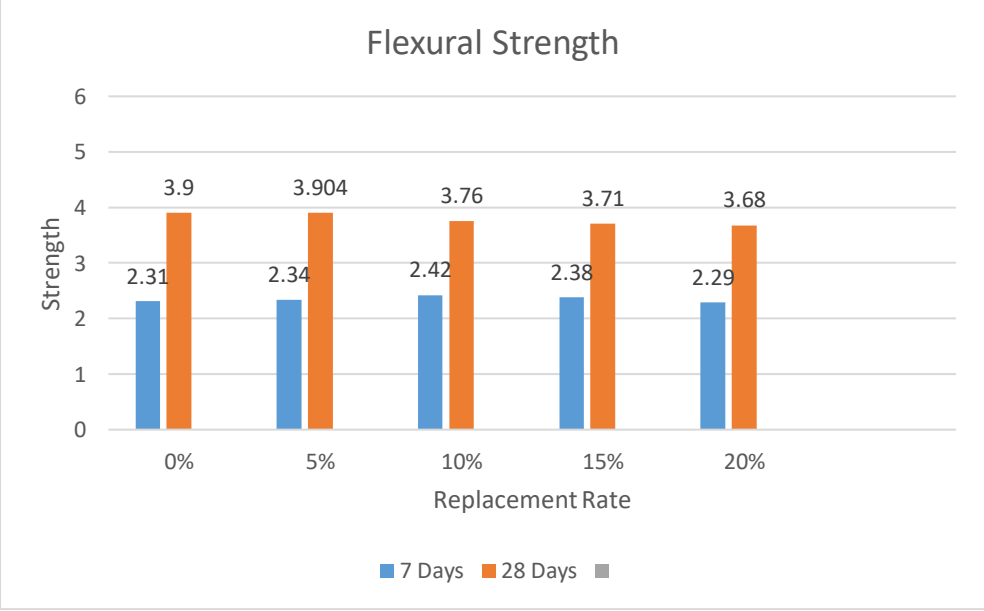

Figure 12 Graph of Flexural Strength in 7 Days & 28 Days

Split tensile results:

Using universal testing machine after 7 and 28 days, the split tensile strength of concrete RHA samples was calculated. The results are as follows:

Table 9

Split Tensile Strength after Replacement of cement by rice husk at different percentages in7 Days of Curing	**Results**
0%	2.16MPa
5%	2.19MPa
10%	2.29MPa
15%	2.08MPa
20%	2.02MPa

Split tensile strength Test Results at 7 Days

Table 10

Split Tensile Strength after Replacement of cement by rice husk at different percentages in 28 Days of Curing	**Results**
0%	3.88MPa
5%	3.90MPa
10%	3.76MPa
15%	3.71MPa
20%	3.64MPa

Split tensile strength Test Results at 28 Days

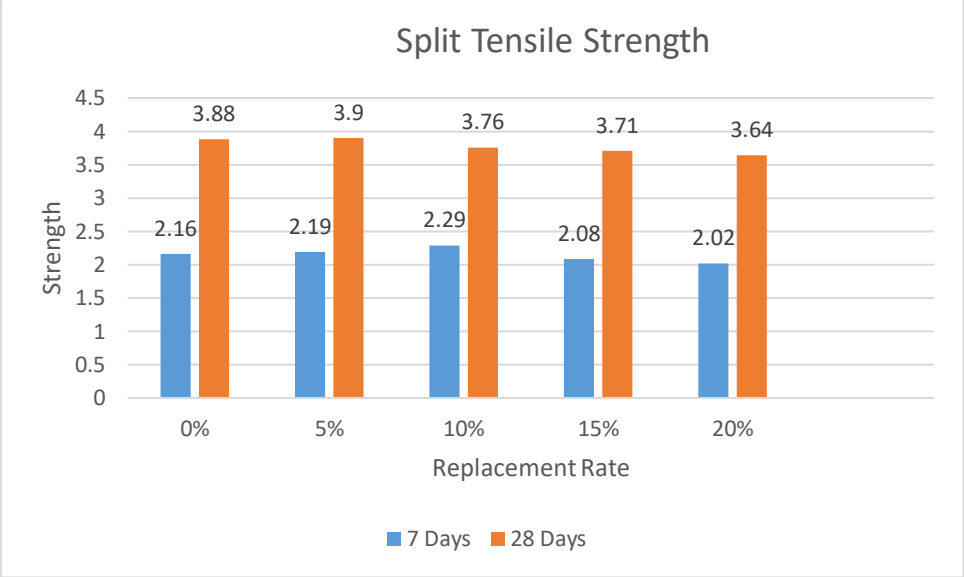

Figure 13 Graph of Split Tensile Strength in 7 Days & 28 Days

After that we get max. compressive strength, max. flexural strength & max. split tensile strength at different RHA's, we take maximum RHA's as optimum & replace fine aggregates with the Oyster Shell.

Compressive Strength Testing Results: -

Using compression-testing machine after 7 and 28 days, the compressive strength of concrete samples was calculated. The results are as follow

Table 11

Compressive Strength after Replacement of cement by rice husk at optimum percentage in 7 Days of Curing	**Compressive Strength after Replacement of Fine aggregates by Oyster shell different percentages in 7 Days of Curing**	**Results**
10%	0%	13MPa
10%	5%	16.8MPa
10%	10%	19.2MPa
10%	15%	18.8MPa
10%	20%	15.6MPa

Compressive strength Test Results at 28 Days

Table 12

Compressive Strength after Replacement of cement by rice husk at optimum percentage in 28 Days of Curing	**Compressive Strength after Replacement of Fine aggregates by Oyster shell different percentages in 28 Days of Curing**	**Results**
5%	0%	31.11MPa
5%	5%	31.7MPa
5%	10%	34.6MPa
5%	15%	32.5MPa
5%	20%	31.6MPa

Compressive strength Test Results at 28 Days

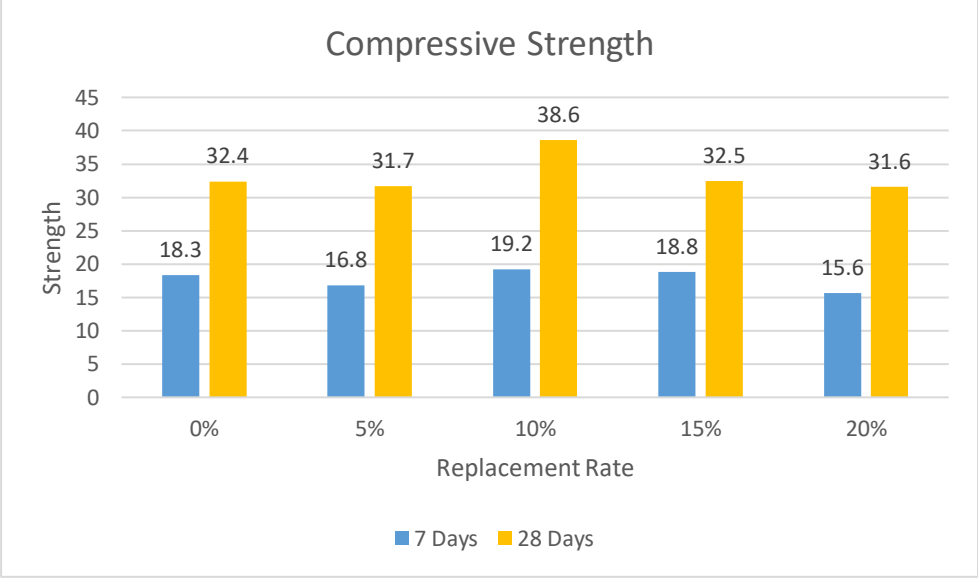

Figure 14 Graph of Compressive Strength in 7 Days & 28 Days

Flexural testing results:

Using flexural testing machine after 7 and 28 days, the flexural strength of the concrete samples was calculated. The results are as follows:

Table 13

Flexural Strength after Replacement of cement by rice husk at optimum percentage in 7 Days of Curing	Flexural Strength after Replacement of Fine aggregates by Oyster shell different percentages in 7 Days of Curing	Results
10%	0%	2.42MPa
10%	5%	2.35MPa
10%	10%	2.67MPa
10%	15%	2.38MPa
10%	20%	2.33MPa

Flexural strength Test Results at 7 Days

Table 14

Flexural Strength after Replacement of cement by rice husk at optimumpercentage in 28 Days of Curing	Flexural Strength after Replacement of Fine aggregates by Oyster shell different percentages in 28 Days of Curing	Results
5%	0%	3.904MPa
5%	5%	3.94MPa
5%	10%	4.11MPa
5%	15%	3.99MPa
5%	20%	3.93MPa

Flexural strength Test Results at 28 Days

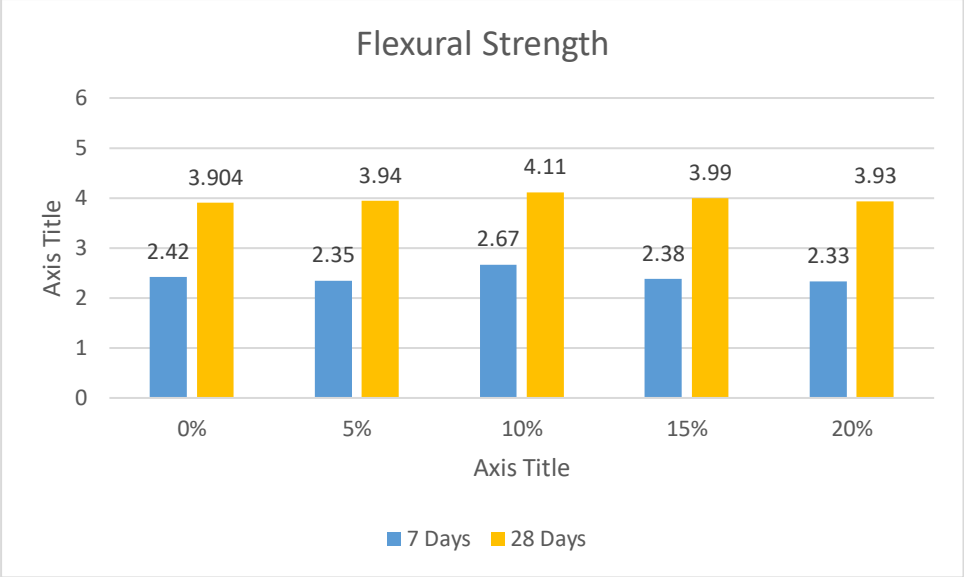

Figure 15 Graph of Flexural Strength in 7 Days & 28 Days

Split tensile results:

Using universal testing machine after 7 and 28 days, the split tensile strength of concrete samples was calculated. The results are as follows:

Table 15

Split Tensile strength after Replacement of cement by rice husk at optimum percentage in 7 Days of Curing	**Split Tensile Strength after Replacement of Fine aggregates by Oyster shell different percentages in 7 Days of Curing**	**Results**
10%	0%	2.23MPa
10%	5%	2.17MPa
10%	10%	2.26MPa
10%	15%	2.06MPa
10%	20%	2.01MPa

Split Tensile Strength Test Results at 7 Days

Table 16

Split Tensile Strength after Replacement of cement by rice husk at optimum percentage in 7 Days of Curing	Split Tensile Strength after Replacement of Fine aggregates by Oyster shell different percentages in 7 Days of Curing	Results
5%	0%	3.89MPa
5%	5%	3.54MPa
5%	10%	3.91MPa
5%	15%	3.48MPa
5%	20%	3.34MPa

Split Tensile Strength Test Results at 28 Days

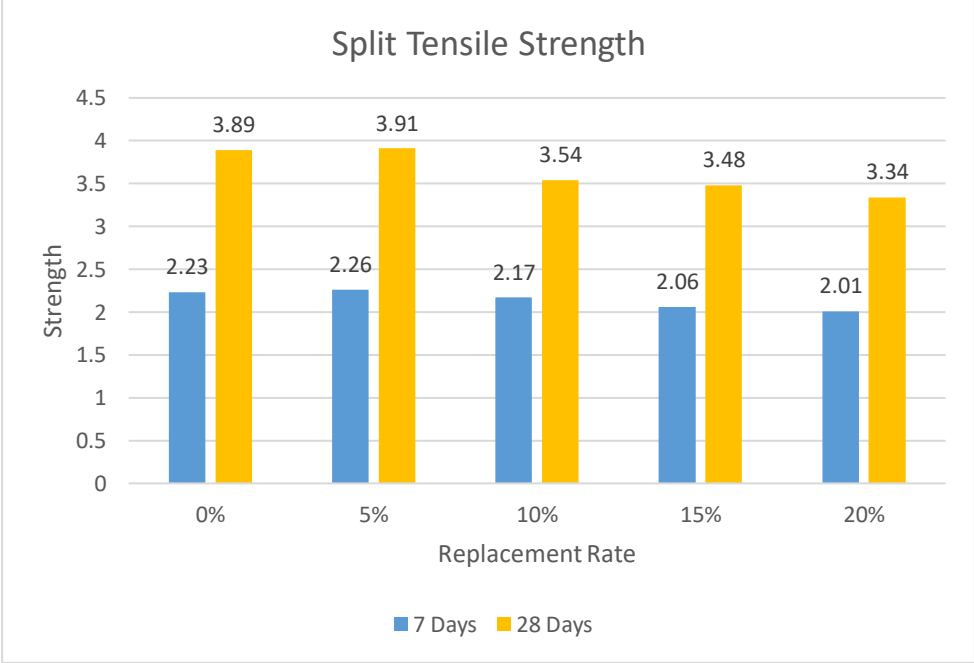

Figure 16 Graph of Split tensile Strength in 7 Days & 28 Days

CHAPTER 5

DISCUSSION AND CONCLUSION

DISCUSSION

Our interest is to use the RHA of casting concrete by replacing it partially with the cement. RHA has the potential to give the desired strength. The silica content, crystallization phase, size and surface area of RHA particles determine the Pozzolanic activity of RHA. RHA has absorbent and insulating properties which are useful in industrial applications. So, using this material is beneficial for us for getting a desirable result. Oyster shells (OS) are the dead remains of living being of sea. Every year a large amount of oyster shell is deposited on coastal areas. Many studies and properties of Oyster shell can also be used as the replacement material. After grinding the oyster shell for getting the desirable particle size so we can use it as the replacement of fine aggregate.

CONCLUSION

Based on the results of our experiment we conclude that

1. Compressive, flexural and split tensile strength is increasing with partial replacement of RHA.
2. Compressive Strength, Flexural Strength & Split Tensile Strength increased at 5% replacement of cement by RHA at 7 days & 10% at 28 Days and start to decrease.
3. After taking 5% for 7 Days &10% for 28 Days as optimum value we mix the Oster shell partially by fine aggregate.
4. Strength increased at 10% replacement of Oyster shell and start to decrease.
5. This shows that the strength increased at 10% replacement of RHA and Oyster shell simultaneously.

RECOMMENDATIONS

1. Oyster shell and Rice Husk Ash can be used as the replacement material in casting the concrete.
2. Even after the use bot the replacement materials simultaneously there is no adesre effect on the strength of concrete.
3. These replacement materials are very economical and we can use it without affecting the environment.

FUTURE SCOPE

1. More tests can be conducted using appropriate technologies.
2. Rice Husk Ash combustion process can be examined to find the vital source of RHA in concrete.
3. By using different W/C in design mix can show the effect on the strength of the concrete.
4. Replacement can be done with PPC also.
5. Oyster Shell is economical & it provides better strength to the concrete, So it can be used as a replacement material in future.

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