"UTILIZATION OF COCONUT SHELL AND OTHER FIBER FORMS OF MATERIALS IN CONCRETE A REVIEW"

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ABSTRACT

Concrete is the most widely used construction material in civil engineering because of its high structural strength and stability. To find a suitable and effective material from the waste product that would considerably minimize the use of material and ultimately reduce
the construction cost.

Coconut shell is one of the principal supporters of contamination issue as an agrarian waste. Coconut shell utilized as coarse total in concrete supported reasonable and earth accommodating material in the development field for the creation of lightweight underlying cement. The substantial with ground coconut shell was viewed as sturdy concerning its opposition in water, acidic, basic and pungent. Thickness of coconut shell is in the scope of 550 - 650 kg/m3 and these are inside as far as possible for lightweight total. Thickness, usefulness, compressive strength and split rigidity of the cements diminishes with
expansion in percent of Coconut shells. Penetrable voids, retention and sorption are expanded with expansion in coconut shells percent. Supplanting of coarse total with identical load of fly debris had no impact when it is contrasted and properties of coconut shell supplanted concrete.

In this paper present literature review related to utilization of coconut shell and GGBS in concrete.

Keyword: GGBS, Coconut shell, Workability, Mechanical Property, Durability Property.

1. INTRODUCTION

Concrete is the most world widely used construction material. Concrete has basic naturally, cheaply, and easily available ingredients as cement, sand, coarse aggregate and water. After the water, cement is the second most used material in the world but the use of cement alone as a binder material produce large heat of hydration. During the production process of the cement creates CO2 emission is very harmful to environmental. As there is no alternative binding material which totally replaces to cement so the utilization of partial replacement of cement is well accepted for concrete. The effective way of reducing CO2 emission and cost minimizing by use of industrial by product such as GGBS. When GGBS is added to the concrete, the concrete becomes improves its properties such as strength,
durability, workability, and also concrete becomes impermeable. GGBS particles have a very glassy texture that makes them to increase the workability. This can help in reduction of water as well as super plasticizer. Working with GGBS is easier because of its mobility characteristics. Use of waste materials as a construction material has several benefits
such as decrease in cost, saving in energy, and protection of environment.

2. LITERATURE REVIEW

K. Raja et.al (2021) objective of the exploration paper was to figure out the outcomes utilizing two substances viz., squander foundry sand (WFS) and coconut shell (CS) substitute for waterway sand and

coarse total. The swap levels for squander foundry sand were shifted, between 10%, 20%, and 30%, and for CS, it was 10% and 20%. A proportionate blend proportion for M20 grade of cement was utilized to discover the strength, with various rates of disposed of foundry sand for regular waterway sand and coconut shell for coarse total and assessed the substantial shrinkage conduct with different proportions of foundry sand and coconut shell according to ASTM norms.

A straight relapse condition was outlined to concentrate on the different relationship boundaries, like %FS versus compressive strength, split elasticity, flexural strength, and furthermore compressive strength versus flexural strength with high relationship levels (above 90%). Through the miniature underlying portrayal, the explanation for the expansion in mechanical properties was found. The expansion of CS of in excess of a specific limit prompts a lessening in the strength properties because of the smooth surface and delamination between the layers of cement. The expansion of FS showed preferred attributes over CS concrete. Besides, CS-FS concrete showed better properties over individual substitutions due than the development of a thick network.

Kaniz Fatema et.al (2021) in the research paper, GGBS and Fly Ash were utilized to replace cement in the concrete mix partially. GGBS and Fly ash have replaced 5%, 10 %, 15 %, and 20 % of the Portland cement and fly Ash, respectively. All combinations used to have water to cementation materials ratio of 0.45. The compressive strength and water absorption of the concrete block were utilized to determine its strength. These tests were done three, seven and twenty-eight days after curing and twenty-eight days after testing for water absorption.

Results showed that as GGBS and Fly ash content increased, the compressive strength of the resulting concrete block compositions increased, but water absorption decreased.

After reaching an ideal level of around 25% GGBS and 25% fly ash in the overall binder content, further additions of GGBS and Fly Ash had little effect on compressive strength. The optimal value is 50% of the total binder content to increase compressive strength by 59.21% and reduce water absorption performance by 2.81%. The results indicated that adding GGBS and Fly Ash to the concrete block increases its workability and compressive strength, which results in enhanced mechanical properties.

Ramkumar. K et.al (2021) Research paper presented comparison of compressive strength and flexural strength of the coconut shell and bamboo stick concrete to the conventional concrete of M25 grade mix. From the partial replacement of coarse aggregate by using the coconut shell and bamboo is 10% and 20%, and combination of 10% CS+10% BS and 20%CS + 20%BS replacement. The strength of concrete was evaluted for 7, 14, 28 days.

In the investigation coconut and bamboo replaced separately and combined the analysis of replaced 10% of coconut shell is increased compressive strength and flexural with comparatively conventional concrete and other percentages. More than 20%CS, 10%BS, 20%BS replacement decreases in strength in seen. And the combinations of 10%CS + 10%BS replacement coconut and bamboo is good. For the optimum result 10% replacement of coconut shell and bamboo sticks is good.

S. Azhagarsamy et.al (2021) research paper aimed at using agro waste products in concrete by replacing fine aggregates. Four different types of mix proportions were designed with different percentages of rice husk ash and coconut shell as replacement for fine aggregate. Six cubes were casted for each mix of size 150mm x 150mm x 150mm and tested for compressive strength.

Results stated that the optimum mix can be obtained by replacing 15% of fine aggregate with rice husk ash and 5% with coconut shell. As the percentage of rice husk ash increases, the final strength of concrete also increases.

Yusuf Jamal et.al (2021) author aimed at analyzing flexural and compressive strength characteristics of concrete produced using crushed, granular coconut as substitutes for conventional coarse aggregate with partial replacement using M30 grade concrete. Beams are casted, tested and their physical and mechanical properties determined.

Results stated that in terms of strength, 20% crushed stone chips can be replaced with coconut shells to produce structural lightweight concrete as per the requirements provided by American Concrete Institute. It was clear that the with CS percentage increase the 7 days strength gain also increased with the corresponding 28 days curing strength. Workability of concrete was increases as the replacement increases. Specific gravity of the concrete reduces as the replacement of coarse aggregate increases. The density of concrete decreases as the replacement increases. Density of concrete should not be less than 2000 kg/cum.

Ayyappa R A et.al (2020) the experimental program was designed to study the properties like strength and workability of concrete by casting the cube of size 150 mm x 150mm x 150 mm and cylinder of size 30 cm height and 15 cm diameter by using M20 grade. This experimental study consists of testing compressive strength of three cubes and split tensile strength of three cylinders of conventional concrete and the comparative cubes and cylinders are made by using different proportions of coconut shells (i.e., 2%, 4%, and 6%) replacement in coarse aggregate and replacement of eggshell powder (i.e., 5%, 10%, and 15%) in place of cement at optimum strength obtained by proportions of coconut shells replaced in coarse aggregate.

Results stated that the strength and workability of the concrete continuously decreased with increasing the partial replacement of Coconut shells in place of coarse aggregate and got the optimum strength value at 6% and strength and workability of the concrete again decreasing with replacement of eggshell powder at optimum strength of coconut shell (6%).The weight of cubes decreased with increasing the percentage of eggshell powder and coconut shells, it means that the density of the concrete is decreasing. Strength and density parameters indicating that the material was used for the construction the compound walls not for the massive construction works.

Deepak Kumar et.al (2020) research paper represented the influence of (CSA) and egg shell powder. (CSA) and egg shell powder mixed in cement concrete for the workability and strength for concrete, adding few percentages of (CSA) and egg shell powder into ordinary Portland cement with removing that much percentage of ordinary Portland cement 5% to 25% by total weight of OPC. Total twenty-four trial mix, control mix and variation mix were prepared for and M45 of concrete to find out Compressive strength 7 days and 28 days by cube, Flexural strength 28 days by beam & Splitting Tensile strength 28 days by Cylinder, then strength was found on the basis of result (CSA) and egg shell powder concrete compared to normal concrete.

Results stated that Slump was higher (Partial Replacement of CSA and egg shell powder)compare to control mix M45. Density was Higher (Partial Replacement of CSA and egg shell powder)Compare to control mix M45. Compressive strength in Partial replacement 5.4% was greater then control mix M45. Flexural strength in Partial replacement 15% was greater then control mix M45.

M.Vignesh et.al (2020) in the research paper, cement was replaced with Hypo sludge and Egg Shell powder with varying percentages of 0%, 5%, 10%, 15% and 20% (in the ratio of 1:3) by weight of cement. Experimental study demonstrated the strength features such as compressive strength, split tensile strength and flexural strength of M30 concrete mix which are investigated at 7 and 28 days and the results were compared with the conventional concrete.

Conclusion stated that Hypo sludge and Egg Shell Powder has potential utilization as partial replacement of cement in concrete. Use of Hypo sludge and Egg Shell Powder in concrete will eradicate the disposal problem of these wastes, reduce emission of harmful pollutants by cement manufacture industry into our environment and thus prove to be environment friendly, paving way for greener concrete. Thus partially replacing the above wastes in concrete enhanced the reduction of cement usage in concrete, thereby reducing the production cost of cement. Hence it is found to be economical.

S. Prakash Chandar et.al (2020) research paper dealt with the mechanical properties of partial replacement of cement by GGBS and Fly-Ash in M40 grade concrete. Cement was replaced as partially in the form of 5%,10%,15% and 20%. As per IS 456:2000 [1] the tests were conducted on 3,7 and 28th days after curing condition.

Results stated that the possible replacement to cement by GGBS was 10% and fly ash 15% used in the concrete, which helps in minimizing the consumption of cement and environmental problems also.

Mukkannan et. al (2019) in the research paper, M25 grade of concrete was made. Concrete mix of 10%, 20%, 30% and 40% replacement of coconut shell as coarse aggregate and constant replacement of 30% of fly ash were made. Water cement ratio of 0.45 was maintained for all the mix proportions. Properties like compressive strength, split tensile strength and flexural strength were investigated at 7, 14, 28 days of curing period and results are analyzed and compared with the regular (conventional) mix. Test for grade as per specified procedure of IS codes. The materials were proportioned by their weight. The proportion used in the study was 1:1.49:3.03 and water cement ratio was 0.47.

Results stated that without addition of fly ash; only by replacement of coconut shell strength had decreased at 10% and 20% when compared to normal concrete. When fly ash was replaced for cement along with coconut shell as coarse aggregate replacement the strength property was improved. Light weight concrete can be produced by using coconut shell as coarse aggregate. Coconut shell with 20% replacement shows a higher strength than normal concrete.

M. Thamarai Selvi et.al (2019) in the research paper, experimental investigation was carried to find out the workability and strength, Durability characteristics of M40 grade

concrete with different replacement level of cement as (i.e.,5%, 10%, 15%, 20%) and coarse aggregate as (i.e.,0%,5%,10%,15%). The tests were conducted to determine the performance level of GGBS and coconut shell in concrete. The specimen was subjected to compressive strength, split tensile strength at 7, 14, 28 days and flexural strength at 7, 28 days of curing period.

Workability of concrete increased by combination of GGBS and coconut shell. In this project GGBS is used to increase the strength of the coconut shell concrete. GGBS along with cement and Coconut shell with coarse aggregate indicated an increase in strength with 20 % GGBS and 5% CS at 28 days. From the durability test, the weight loss due to acid attack and sulphate attack of concrete was lower than the conventional concrete.

Vipul Mhatre et. al (2019) in the research paper, coarse aggregates of concrete was partially replaced by coconut shell as 10%, 15%. All the tests of cement, sand, aggregate and concrete was done as per IS code. The concrete blocks with coconut shells of grade M20 were examined for compressive strength, water absorption and compared with conventional concrete of same grade and the cost was compared.

Conclusion stated that concrete shells were more suitable as a lightweight aggregate when used to replace common coarse aggregate in concrete production. The slump value of conventional concrete was 110 mm and that of coconut shell concrete for 10% and 15% was 80mm and 60mm respectively. The 28 days compressive strength of conventional concrete was found to be 24.74 MPa and of coconut shell concrete was found to be 22.5MPa and 21.9 MPa for 10% and 15% replacement by coconut shell aggregate.

K. Omprakash et. al (2018) research paper focused on the proportions GGBS and Rice husk ash (RHA) with Synthesis Egg shell powder (ESP). Two categories of by products such as GGBS, rice husk ash with five distinct contents of 0%, 5%, 10%, 15% and 20%, in terms of weight were performed for the substitution of cement and addition of a persistent 5% egg shell powder in every substitution. At first, the physical and chemical attributes of

fly ash, rice husk ash and egg shell powder were evaluated. The restraints considered for analysis included compressive strength, splitting tensile strength, flexural strength, sorptivity, total charge passed acquired from swift chloride permeability test (RCPT) and tempo of chloride ion diffusion according to the diffusion coefficient.

Results stated that Compressive strength increases with increase of percentage of GGBS in

concrete along with ESP constant proportions of ESP is added for the specimens (5%) Compressive strength increases with increase of percentage of RHA in concrete along with ESP constant proportions of ESP is added for the specimens (5%). Compressive strength the mix increases with increases in GGBS by weight in concrete up to 20%. Compressive strength the mix increases with increases in percentage of RHA in concrete by weight in concrete up to 15% then after it starts decreases.

Lavanya B.A et. al (2018) in the research paper, M25 grade of concrete was made where the concrete mix of 10%, 20%, 30% and 40% replacement of coconut shell as coarse aggregate and constant replacement of 30% of fly ash were made. Water cement ratio of 0.45 was maintained for all the mix proportions. Properties like compressive strength, split tensile strength and flexural strength were analysed at 7, 14, 28 days. Steel fibres were used to increase the flexural and tensile strength of concrete. Admixture was used to minimum the water cement ratio and to achieve the workability.

Results stated that without addition of fly ash; only by replacement of coconut shell strength has decreased at 10% and 20% when compared to normal concrete. When fly ash was replaced for cement along with coconut shell as coarse aggregate replacement the strength property was improved. Light weight concrete can be produced by using coconut shell as coarse aggregate. Increase in percentage of coconut shell, decrease the densities of concrete. Coconut shell with 20% replacement shows a higher strength than normal concrete.

P. Deepa and M. Arul Kumar (2018) autor investigated the effect of using GGBS and M Sand as a partial replacement of cement and fine aggregate along with optimum percentage of polypropylene and steel fiber using M30 grade concrete. Partial replacement of cement with GGBS was made for varying percentages such as by weight 0%, 10 %, 20% and 30%, along with M Sand as fine

aggregate and with optimum fibre percentage as polypropylene (0.4%) and steel fiber (0.6%) respectively.

The compressive strength results shows a 13.73% increase in strength for 28 days curing by the hybrid fibre concrete along with 20% of GGBS and 40% of M Sand.the split tensile strength results shows a6.60% increase in strength for 28 days curing and the flexural strength results shows a 4.2% increase in strength for 28 days curing.

B. Sandeep Reddy et.al (2017) in the examination paper, the coconut shell was utilized as a light weight total in concrete, the properties of coconut shell concrete were inspected, Control concrete with typical total and CS concrete with 10 - 30% coarse total supplanting with CS were made, and steady water to cementitious proportion of 0.5 was kept up with for every one of the cements. Properties like compressive strength, consistency, functionality were explored in the research center.

That's what the outcomes showed, thickness of the cements diminishes with expansion in CS percent. Usefulness diminished with expansion in CS substitution. Compressive qualities of CS cements were lower than control concrete. The ideal substitution is gotten as 15% was utilized as coarse total in the development of light weight concrete.

Kalyanapu Venkateswara Rao et.al (2015) objective of the exploration paper was to research the properties of coconut shells, similarity of coconut shells with concrete and to deliver coconut shell total cement with 28-day compressive strength in excess of 20 N/mm2 and strength properties of cement in substitution of coarse total and supplanting of fly debris with concrete. The substitution of the 10%coconut shells as coarse total will diminish the minor worth of 2.88% in pressure and 2.7% in split elasticity. The substitution of the 20%coconut shells as coarse total will diminish the minimal worth of 8.39% in pressure and 10.25% in split rigidity. The substitution of the 10%coconut shells as coarse total and 10%fly debris as concrete declines the minimal worth of 0.525% in pressure and increment of 4.05% in split rigidity.

Palak Patel et.al (2015) in the research paper, author has used coconut shell waste as replacement of coarse aggregate by different percentage for making concrete of different grade like M-20. Concrete made from coconut shell waste as coarse aggregate will be studied for compressive strength, tensile strength and flexural strength. The percentage replacement was 0%, 10%, 20% and 30% with natural coarse aggregates and replacement of 10% various size of coconut shell in concrete. The replacement 10% of coconut shell and added coir fibre on high temperature. Concrete cubes, cylinders, beams were prepared and finally slump test, tensile strength test, compressive strength test, split tensile strength test and flexural strength test was conducted to obtain the results.

The percentage of Cs increase as deceased compressive strength, split tensile strength and flexural strength as compared to conventional concrete. The replacement of CS up to 20% as to good result of compressive strength as compared to conventional concrete. The various sizes (8 mm, 10 mm and 12.5 mm) of 10% replace Cs in concrete. The sizes of Cs increase as decrease the split tensile strength, flexural strength and compressive strength decrease. Replacement of 10% CS and added fibre in concrete. After the replacement of 10% CS and added fibre in concrete on different high temperatures. By observing that replaced cs and added fibre in concrete to increase flexural test, split tensile strength and compression test as compared to Cs and added fibre on different high temperatures. The results showed compressive strength of percentage replaced of Cs concrete in H2SO4 and Hcl solution curing were partially greater than the normal water curing.

3. CONCLUSION:

In this paper it is observed that author in past perform experimental testing in concrete with different waste materials, fibres, plastic etc. Authors studied the variation in strength of concrete after curing of 7, 14, 28 days to observe the variation in strength as per normal concrete. Here authors stated that some materials are increasing strength whereas some are depleting the strength of concrete.

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