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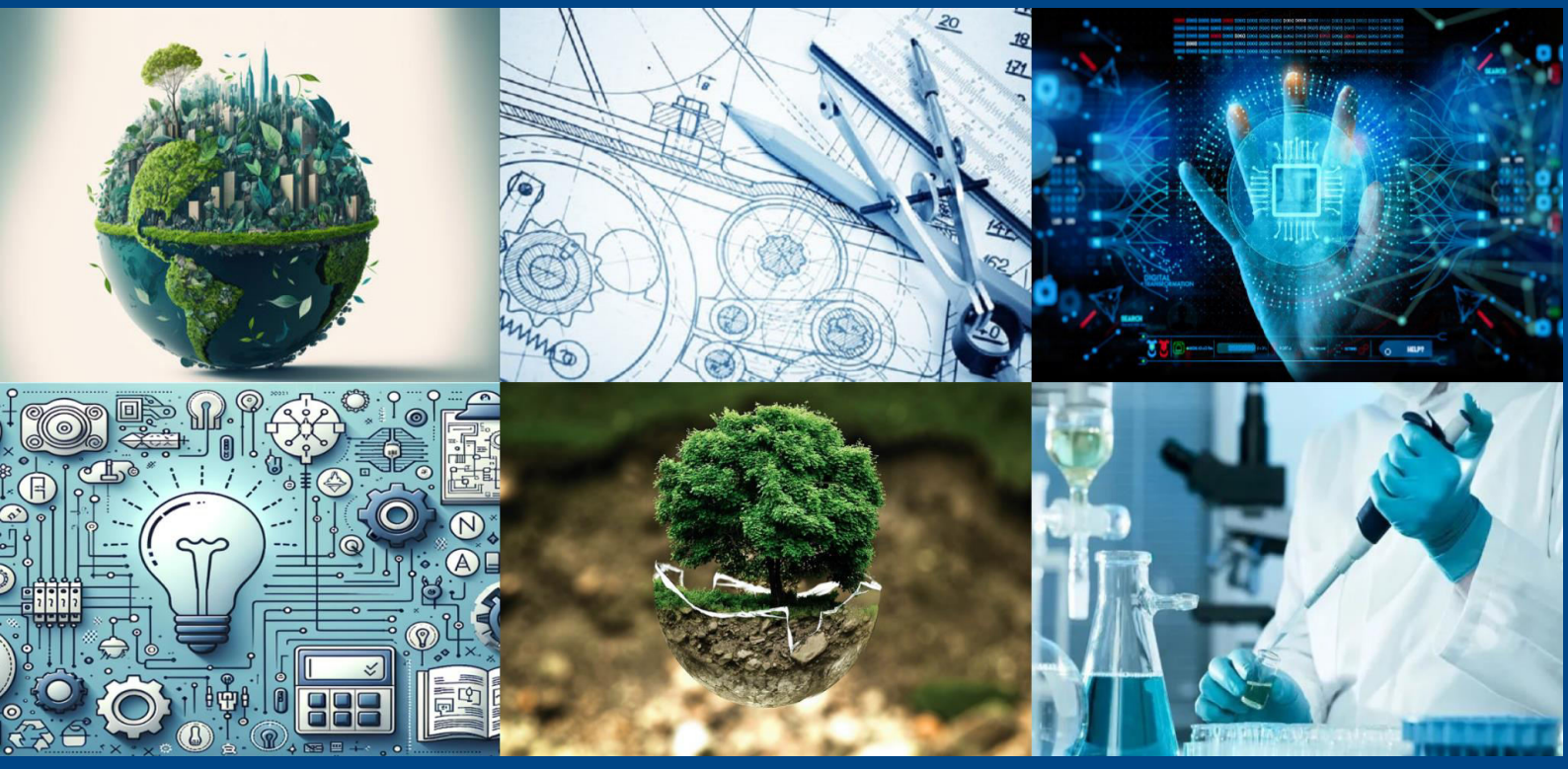

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Partial Replacement of Cement With Coconut Shell Ash in Concrete

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ABSTRACT: Now a Day's The Cost of Cement Used in Concrete Work Is Increasing and Unaffordable. Yet The Need for Housing And other Construction Requiring This material keeps Growing with Increase Population. The Need to Find Alternative Binding Materials That Can Be Used Solely or In Partial Replacement of Cement Agricultural Waste Materials, In This Case, Coconut Shell, Which Are Environmental Pollutants Are Collected and Burnt in Open Air to Produce Coconut Shell Ash (CSA). Which is Used as a Partial Replacement for Cement in Concrete Production. Concrete Cube Are to Be Produced Using Various Replacement Levels of 0%, 5%, and 7% Percentage of Ordinary Portland Cement with Coconut Shell Ash. A Total of 18 Cubes Are to Be Produced and Cured For 7 And 28 Days Respectively. Properties Such as Compressive Strength and flowability.

The coconut shell was sun-dried for 48 hours to remove moisture from it. It was then subjected to uncontrolled combustion using open-air burning for 3 hours and allowed to cool for about 12 hours. The burnt ash was collected and sieved through a BS sieve (75 microns). The resulting ash, which has the required fineness, was collected for use. Coconut shell Is One of The Most Important Natural Filler Coconut shells are The Waste of Agriculture Waste That Is Eco-Friendly. Coconut shell Ash Is the Candidate for New Composite Because They Have High Strength.

I. INTRODUCTION

Concrete is widely used as a construction material for various types of structures due to its durability. but day by day increase in cost and pollution in building concrete structures and it contributes to reducing the consumption and natural resources. as per above the coconut shell is the feasibility of partially replace of cement in concrete with coconut shell ash. To minimize the waste, we can utilize the waste materials for some positive activity. South India Produced 95% Of Coconut Production and Tamil Nadu Stand No 2 Position After Kerala. The coconut shell was sun dried for 48 hours to remove moisture from it. It was then subjected to uncontrolled combustion using open air burning for 5 hours and allowed to cool for about 24 hours. The burnt ash was collected and sieved through a BS sieve (60 microns). The resulting ash, which has the required fineness, was collected for use.

II. LITERATURE REVIEW

2. 1 Rajesh Kumar (2020)

The expense of concrete utilized in solid works is on the expansion and exorbitant, yet the requirement for lodging and different developments requiring this material continues developing with increasing the cost of concrete utilized in solid works is on the increment and unreasonably expensive, yet the requirement for lodging and different developments requiring this material continues developing with expanding populace, consequently the need to discover elective restricting materials that can be utilized exclusively or in fractional substitution of concrete. Farming waste material, for this situation, coconut shells, which is an ecological contamination, are gathered and consumed in the outdoors (uncontrolled burning) for three hours to deliver coconut shell ash (CSA), which thus was utilized as pozzolana in fractional substitution of concrete in solid creation. Solid 3d squares were delivered utilizing different substitution levels of 0, 5, 10, 15, 20 and 25 percent of CSA with OPC. An aggregate of 30, 3d squares were delivered and restored by drenching them in water for 7 and 28 days individually. Properties, for example, compressive quality, thickness, setting times and pozzolanic movement file were resolved. The outcomes indicated that the densities of solid 3d shapes for 10 - 15% substitution was over 2400 kg/m^3 the compressive quality expanded from 17.85 n/mm^2 7days to 33.46n/mm^2 at 28 days relieving along these lines meeting the necessity for use in both substantial weight and light weight cementing. Along these lines, 10 - 15% supplanting of OPC with CSA is suggested for both overwhelming weight and light weight solid creation.

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2.2 PV Asanthi S Senthil Selvan, P Murthi I Rajasri Reddy and K Poongodi (2020)

India is the third largest coconut cultivating country in the world. South India states are the predominant coconut cultivating area in India. Coconut shell (CS) and coconut shell ash (CSA) are unavoidable by-products from agricultural industry. As a part of solid waste management, the investigation was carried out to evaluate the effect of replacing cement by CSA and coarse aggregate by CS. The replacement level was considered as 5%, 10%, 15%, 20%, 25% and 30% in both cement and coarse aggregate by CSA and CS respectively. Normal strength concrete was considered in this investigation. The density and mechanical properties of concrete such as 28 days cured compressive strength and flexural strength were determined. Using 3D graphical analysis, the optimum replacement of cement and coarse aggregate was predicated in this investigation.

III. MIX DESIGN

3.1 Mix proportion of M20 Grade Concrete at 0% replacement for trial

Step 1: Selection of Cement Content

Water-cement ratio =0.5
Corrected water content = 194.92 kg/m3
Cement content 194 92/0.50 = 389.84Kg/m3 from table no. 5 of IS code 456:2000
Minimum cement content for mild condition = 300 Kg/m3 389.84 > 300kg/m3 Hence ok.

Step 2: Estimation of Coarse Aggregate proportion

From Table 3 of IS 10262-2009,
For Nominal maximum size of aggregate = 20mm,
Zone of fine aggregate = Zonell
For w/c = 0.5

Volume of coarse aggregate per unit volume of total aggregate = 0.62
For pumpable concrete this value should be reduced by 10%

Therefore, volume of coarse aggregate = 0.62 x0.9 = 0.558
Volume of fine aggregate content =1-0.558=0.442

Step 3: Estimation of the mix ingredients

The mix calculations per unit volume of concrete shall be as follows
Volume of concrete =1m3
Volume of cement = (mass of cement/ specific gravity of cement) x1/1000 = (389 84/3/15) x 1/1000=0.123 m3
Volume of water = (mass of water/specific gravity of waters) x 1/1000 = (194.92/1) x 1/1000 = 0.194 m3
Volume of all in aggregate = a-(b+c) =1-(0.123+0 194) =0.683 m3
Mass of coarse aggregated = d x volume of coarse aggregate x specific gravity of coarse aggregate x 1000
=0.683 x 0.558 x 2 56 x 1000 =975.65 Kg
Mass of fine aggregate = d x volume of fine aggregate x specific gravity of fine aggregate x1000
= 0.683 x 2.70 x 0.442 x 1000 =815.00 Kg

Step 4: Mix proportion for trial

Cement = 389.84Kg/m
Fine aggregate = 815.09Kg/m
Coarse aggregate=975.65Kg/m³
Water Cement Ratio=0.50
Water = 194.92Kg/m

3.2 Mix proportion of M20 Grade Concrete at 5% replacement for trial

Step1: Selection of Cement Content

Water-cement ratio=0.5
Corrected water content = 194.92 kg/m3
Cement content =194.92/0.50 =389.84Kg /m3 from table no. 5 of IS code 456:2000
Minimum cement content for mild condition = 300Kg /m3, 389.84 > 300 kg/m3 Hence ok.
Cement Content = 95%

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Coconut ash content =5% by weight of cement = 5/100 x 389.84 = 19.492 Kg/m3

Step 2: Estimation of Coarse Aggregate proportion

From Table 3 of IS 10262-2009,
For Nominal maximum size of aggregate = 20mm,
Zone of fine aggregate = Zone ll
For w/c = 0.5

Volume of coarse aggregate per unit volume of total aggregate = 0.62
For pumpable concrete this value should be reduced by 10%

Therefore, volume of coarse aggregate = 0.62 x0.9 = 0.558
Volume of fine aggregate content =1-0.558=0.442

Step 3: Estimation of the mix ingredients

The mix calculations per unit volume of concrete shall be as follows
Volume of concrete =1m3
Volume of cement = (mass of cement/ specific gravity of cement) x1/1000 = (389 84/3/15) x 1/1000 = 0.123 m3
Volume of water = (mass of water/specific gravity of waters) x 1/1000 = (194.92/1) x 1/1000 = 0.194 m3
Volume of all in aggregate = a-(b+c) =1-(0.123+0 194) =0.683 m3
Mass of coarse aggregated = d x volume of coarse aggregate x specific gravity of coarse aggregate x 1000
= 0.683 x 0.558 x 2 56 x 1000 =975.65 Kg
Mass of fine aggregate = d x volume of fine aggregate x specific gravity of fine aggregate x1000
= 0.683 x 2.70 x 0.442 x 1000 =815.00 Kg

Step 4: Mix proportion for trial

Cement = 370.35 Kg/m
Fine aggregate = 815.09 Kg/m
Coarse aggregate =975.65 Kg/m³
Water Cement Ratio =0.50
Water = 194.92Kg/m

3.3 Mix proportion of M20 Grade Concrete at 7% replacement for trial

Step 1: election of Cement Content

Water-cement ratio=0.5
Corrected water content = 194.92 kg/m3
Cement content =194.92/0.50 =389.84 Kg /m3 from table no. 5 of IS code 456:2000
Minimum cement content for mild condition = 300Kg /m3
389.84 > 300 kg/m3 Hence ok.
Cement Content = 93%
Coconut ash content =7% by weight of cement = 7/100 x 389.84 = 27.28 Kg/m3

Step 2: Estimation of Coarse Aggregate proportion

From Table 3 of IS 10262-2009,
For Nominal maximum size of aggregate = 20mm,
Zone of fine aggregate = Zonell
For w/c = 0.5

Volume of coarse aggregate per unit volume of total aggregate = 0.62
For pumpable concrete this value should be reduced by 10%

Therefore, volume of coarse aggregate = 0.62 x0.9 = 0.558
Volume of fine aggregate content =1-0.558=0.442

Step 3: Estimation of the mix ingredients

The mix calculations per unit volume of concrete shall be as follows
Volume of concrete =1m3
Volume of cement = (mass of cement/ specific gravity of cement) x1/1000 = (389 84/3/15) x 1/1000=0.123 m3

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Volume of water = (mass of water/specific gravity of waters) x 1/1000 = (194.92/1) x 1/1000 = 0.194 m3
Volume of all in aggregate = a-(b+c) =1-(0.123+0 194) =0.683 m3
Mass of coarse aggregated = d x volume of coarse aggregate x specific gravity of coarse aggregate x 1000
= 0.683 x 0.558 x 2 56 x 1000 =975.65 Kg
Mass of fine aggregate = d x volume of fine aggregate x specific gravity of fine aggregate x1000
= 0.683 x 2.70 x 0.442 x 1000 =815.00 Kg

Step 4: Mix proportion for trial
Cement = 362.55 Kg/m3
Fine aggregate = 815.09 Kg/m3
Coarse aggregate=975.65 Kg/m³
Water Cement Ratio=0.50
Water = 194.92Kg/m

IV. RESUL AND ANALYSIS

- Partial replacement of Cement in percentage of 0%, 5% and cement Compressive Strength test Machine Conduct test for 7 days Average compressive strength is 22.41 N/mm2 and 22.57 N/mm2 increase the compressive strength with the adding Coconut Shell ash.
- A 28 days average compressive strength of cube of 0%, 5% and 7% is 26.46 N/mm2, 27.48 N/mm2, and 26.46 N/mm2 is very hight strength.
- The OPC 43 grade of cement M20 (1:1.5:3) is give maximum strength for 28 days.
- The slump test result is 150mm 170mm and 135mm.
- The addition of coconut shell ash increased the water absorption capacity.

V. CONCLUSION

India has a vast resource of coconut waste material across the country. This material if segregated, collected, and used properly can solve the major problem can solve the major problems of coconut waste material disposal and reducing he use of cement in the form of coconut shell ash, which consumes lot of energy and natural resources Especially in India many organizations are putting their efforts to promote the awareness of coconut shell ash in concrete and its advantages.

The experimental exercise has helped to study the various properties of the coconut shell ash to develop the mix design curves for concrete mix proportioning with various percentages of coconut shell ash Based on the studies conducted by authors following conclusion are drawn on coconut shell ash are followed.

1. Use of coconut shell ash improves the workability of concrete. This phenomenon used either the unit water content of mix or to reduce the admixture.
2. Density and air content of concrete mix are generally unaffected with the use of flash
3. Normally use of coconut shell ash slightly retards the setting time of concrete but it compensated by reduction in the admixture dosage to maintain the same workability.
4. Bleeding in coconut shell ash concrete is significantly reduced and other properties like cohesiveness pumping characteristics and surface finish are improved
5. Rate of strength development at various ages is related to the W/Cm and percentages only ash in the concrete mix
6. Coconut shell ash concrete is more durable as compare to OPC Concrete. The time has come for fact without any reservation that fly ash can be gain fully used in Making concrete strong, durable Eco-friendly and economical.

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