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USE OF AGRICULTURE WASTE IN CONCRETE PAVEMENT

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ABSTRACT:

Rice husk, an agricultural waste obtained from the milling process of paddy, makes up approximately 22% of the paddy's weight. This waste is used as fuel in the parboiling process, where 25% of the husk's weight is converted into ash, known as rice husk ash (RHA). Typically disposed of, RHA contains amorphous silica, which can be used as a pozzolanic material in concrete and cement. This utilization prevents waste disposal and maintains the properties of cement or concrete when RHA is used in specific proportions. In this study, ordinary Portland cement was partially replaced with RHA in varying proportions, from 5% to 15% at 2.5% intervals. The resulting concrete was tested for compressive strength at different ages. The results demonstrated that RHA-modified concrete exhibited comparable and satisfactory strength and properties to normal concrete of the same grade.

Keywords: Keywords are important word in paper Example Rice Husk Ash, Cement, Concrete, Compressive strength, Split tensile strength, RHA

Introduction:

Disposing of agricultural waste has become a significant problem in recent times. One such agricultural waste is rice husk. Annually, approximately 120 million tonnes of rice husk are produced by paddy fields. In many rice-producing countries, like India, the husk generated from rice processing is often either burned or dumped as waste. However, rice husk can be used as fuel when burned at high temperatures, resulting in rice husk ash (RHA). This ash is porous and can be ground into a fine powder. RHA is a pozzolanic material that contains about 85% silica. Using RHA as a substitute material in concrete can help mitigate environmental problems. Agricultural wastes used as fine aggregates in concrete include RHA, typically in proportions ranging from 10% to 50%. Using agro-waste in concrete pavement is a sustainable practice that enhances the durability and eco-friendliness of infrastructure. Agro-waste materials such as RHA, sugarcane bagasse ash, and palm oil fuel ash can be incorporated into concrete mixtures to partially replace cement. This not only reduces the demand for cement production, a significant source of carbon emissions, but also utilizes waste materials that would otherwise be discarded, thus promoting environmental conservation. Additionally, agro-waste-based concrete pavements exhibit improved properties such as increased strength, durability, and resistance to cracking, making them a viable option for sustainable construction projects.

The disposal of agricultural waste, including rice husk, poses a significant environmental challenge. With approximately 120 million tonnes of rice husk produced annually worldwide, finding sustainable ways to utilize this waste material is crucial. In many rice-producing countries like India, rice husk is often disposed of through burning or dumping, leading to environmental pollution and the wastage of valuable resources

By incorporating RHA into concrete mixes, several benefits can be realized:

Environmental Sustainability: Utilizing RHA in concrete reduces the need for traditional fine aggregates such as sand, thereby decreasing the demand for natural resources and reducing the environmental degradation associated with sand mining.

Waste Reduction: By converting rice husk into a valuable construction material, the amount of agricultural waste generated can be significantly reduced, mitigating the need for disposal through burning or dumping.

Improved Concrete Properties: RHA possesses pozzolanic properties, contributing to enhanced concrete strength, durability, and resistance to chemical attack. Additionally, the porous nature of RHA can improve the workability and permeability of concrete mixes.

Cost-Effectiveness: Incorporating RHA into concrete mixes can potentially lower production costs by reducing the reliance on traditional fine aggregates and enhancing the performance of concrete structures, leading to longer service life and reduced maintenance requirements

Methodology:

Material Preparation: Procure cement, rice husk ash (RHA), sand, and aggregate from reliable sources. Ensure the materials meet the required specifications and standards.

Mix Proportions: Determine the proportions of RHA to be used as a partial replacement for cement. Common replacement percentages range from 0% to 40%, depending on the desired strength and other properties. Prepare mix designs for different combinations of RHA and cement.

Sample Preparation: Calculate the quantities of each material required for the mix based on the proportions decided. Mix cement, RHA, sand, and aggregate thoroughly using a concrete mixer. Ensure uniform distribution of all components.

Testing and Analysis: After the curing period, carefully demold the cubes without causing any damage. Conduct various tests to analyze the properties of the cast cubes:

Compression Test: Determine the compressive strength of each cube using a compression testing machine. Concrete specimens are tested under compressive loading using a hydraulic testing machine. Compressive strength is a critical parameter that indicates the structural performance and durability of concrete in service conditions.

Water Absorption Test: Measure the water absorption capacity of the cubes to assess their durability.

Fineness Test: determines the particle size of cement, crucial for concrete strength. Weigh and spread cement on a sieve, shake it, then weigh residue. Calculate the percentage retained. Higher retention implies coarser particles. This quick test ensures quality cement for your project.

Slump Cone Test: Fill the slump cone with concrete, compact it, then carefully lift the cone vertically. Measure the slump, which is the difference in height between the top of the cone and the displaced concrete. A higher slump indicates a more workable concrete mix, suitable for pouring and shaping.

Data analysis: involves interpreting the results from compressive strength tests and other relevant assessments. Statistical methods are used to identify trends, correlations, and differences between concrete mixtures with and without rice husk ash (RHA). This analysis helps to understand the impact of RHA on concrete properties and to draw meaningful conclusions.

The conclusions are based on the data analysis and highlight the effectiveness of incorporating RHA in concrete mixtures. The findings are discussed in terms of improving sustainability, enhancing concrete properties, and addressing environmental challenges related to agricultural waste disposal. Recommendations for further research or practical applications may also be provided based on the findings.

Mix proportion without RHA

Grade of concrete	Water (kg)	Cement (kg)	Fine aggregate(kg)	Course aggregate(kg)
In m^3	1.53	382.5	482.46	1394.06
M-40	0.40	1	1.261	3.64

Mix proportion witht RHA

Mixture	RHA%	Cement (kg/m^3)	Sand (kg/m^3)	Aggregate (kg/m^3)	RHA (kg/m^3)	Water (kg/m^3)
Mix 1	0%	382.5	482.46	1394.06	0	153
Mix 2	10%	344.25	482.46	1394.06	38.25	153
Mix 3	20%	305.10	482.46	1394.06	76.53	153
Mix 4	30%	264.18	482.46	1394.06	114.58	153
Mix 5	40%	225.34	482.46	1394.06	153.23	153

Results

Test of OPC.

Particulars	Test results	Requirements of IS:1489-1991
Specific gravity	3.15	3.00-3.25
Fineness (m^2/kg)	369	300
Normal consistency	32%	24-32%
Setting time (min):		
Initial	220	30
Final	320	600

Physical properties of procured rice

Physical state	Solid non-hazardous
Appearance	Very fine powder
Particle size	25 microns -mean
Colour	Grey
Odour	Odourless
Specific gravity	2.3

Sieve analysis of Fine Aggregate (sand)

Sieve Size (mm)	Wt. Retained (gms)	Cum. Wt. Retained (gms)	% Retained	% Passing
10	0	0	0.00	100.00
4.75	48	48	3.31	96.69
2.36	372	420	28.97	71.03

Sieve analysis of Course Aggregate

Sieve	Wt. Retained (gms)	Cum. Wt. Retained (gms)	% Retained	% Passing	Specification Limit
12.5	0	0	0	100	100.00
10	84	84	2.8	97.20	85-100
4.75	2748	2832	94.40	5.60	0-20
2.36	142	2974	99.13	0.87	0-5

Compressive strength of M-40

RHA %	7 Days (Mpa)	28 Days (Mpa)
0%	28.5	42.70
10%	27.8	41.95

20%	**25.9**	**41.55**
30%	**24.4**	**38.35**
40%	**21.9**	**37.95**

Conclusion

Using agrowaste in concrete pavement offers a sustainable and cost-effective solution to various environmental and economic challenges. Key conclusions from studies and applications include:

Environmental Benefits: Utilizing agricultural waste in concrete reduces the environmental burden of waste disposal and minimizes the carbon footprint of concrete production, aiding in waste management and conservation of natural resources.

Economic Advantages: Agrowaste materials are often cheaper than traditional concrete ingredients, lowering production costs and enhancing the economic viability of concrete pavement projects.

Improved Properties: Certain agrowaste materials, like rice husk ash, can improve concrete's strength and durability due to their pozzolanic properties when used as a partial replacement for cement.

Challenges and Considerations: Incorporating agrowaste into concrete requires careful consideration of waste type, processing methods, and proportions. Variability in waste composition can affect concrete consistency and performance, necessitating thorough testing and quality control.

Sustainability and Circular Economy: This practice supports a circular economy by reusing waste products, promoting sustainable development in the construction industry.

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List all the material used from various sources for making this project proposal

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