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PARTIAL REPLACEMENT OF COARSE AGGREGATE WITH RUBBER TYRE CHIPS & CEMENT WITH RICE HUSK ASH IN CONCRETE

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ABSTRACT

The objective of this research is to determine the fresh and hardened properties of concrete under the influence of rubber and mineral admixtures. The results of the experiments showed a reduction in compressive strength as tire rubber content increased when compared to control mix. However, the tire rubber treated in NaOH solution yielded slightly better compressive strength results overall. Furthermore, as the tire rubber content increased a reduction in the workability and weight of the concrete was observed and recorded. The results revealed that the optimal replacement ratio is 8% rice husk ash + 10% tire rubber, yielding the highest compressive strength among all specimens tested irrespective of the rubber tire.

Keywords Cement Concrete, flexural strength, Strength parameters, water absorption, Workability.

1. INTRODUCTION

Rubber concrete has been researched for over twenty years. Rubber aggregate is mainly sourced from the increasingly discarded end-of-life tyres, which is known as black pollution because they are not readily degradable, posing a potential fire hazards to the environment and providing breeding grounds for mosquitoes . They are usually used to substitute part of natural aggregates or as additive of concrete mixture. A general consensus is that the ductility, impact resistance and dynamic energy dissipation capacity increase and compressive strength decreases with a rising proportion of rubber phase in concrete due to the elastic and soft nature of rubber material. However, conclusions on some other properties such as workability, flexural strength, freeze-thaw resistance do not come to an agreement and even the same property reported by different researchers varies significantly. From the aspect of rubber aggregate itself, this is attributed to the various rubber aggregate used by different researchers. It is stated that research is required to optimize the size, shape, grading, density, amount, and methods of pre-treatment of rubber particles on the properties of rubber concrete. The waste problem considered as one of the most crucial problems facing the world as a source of the environmental pollution. It is contributing as a direct form in pollution that includes the negative effects on the health by increasing the diseases, diseases vector, percentage of mortality and lowering the standard of living. The waste usually defined as the all remains things resulted from production, transfer and uses processes, and in general all transmitted things and resources that the owner or the producer wants to dispose or must dispose to prevent the risk on the health of the human and save the environment in general

2. OBJECTIVES

Following are the objectives of this work

- To Design a mix for M 30 grade of concrete as per the is code 10262:2019 having cement replacement 8%,16%, 24%& 32% with rice husk ash & coarse aggregate replacement 5%,10%, 15% & 20% with Rubber Tire Chips.
- To evaluate strength parameters like compressive strength and flexural strength of concrete with different configurations.
- To study the workability of concrete with rice husk ash & Rubber Tire Chips.
- To study the effect of dose of super plasticizer on slump values of mix.
- To obtain suitable percentage of replacement of cement with rice husk ash & coarse aggregate with recycled aggregate for the production of concrete.

3. METHODOLOGY ADOPTED

As stated earlier concrete mix design is required to be done if admixtures or additional cementing materials are added with partial replacement of cement in concrete is done. The behaviour and properties of green and hardened concrete totally depends on its ingredients ie. Cement, aggregates, cementing material and water to cement ratio. Properties of green concrete like workability and of hardened concrete like compressive strength, flexural strength, weight density etc. totally depends on the proportion of ingredients used in mix design, apart from this ratios of fine aggregate to coarse aggregate, water to cement, admixture to cement also plays and important role in different properties of concrete. For concrete mix design initially the lab tests on all the ingredients need to done and based

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on the lab results weather the ingredients are suitable to use or need to be changed need to be checked. Also properties like specific gravity, fine ness modulus, cement grade and required grade of concrete with have impact on proportions of ingredients in final concrete matrix. Concrete mix design is done based on the requirement of designer stating the requirement compressive strength, workability, which need be achieved based on the raw material available at site for concreting. Alteration in the materials tested in laboratory and material available on site may lead to concrete of undesirable properties. If ingredients are changed due to non-availability at site or it change due to source of excavation, concrete mix design need to be rechecked from time to time. Concrete mix design is a trial and error process and its results totally depends on the lab results of its constituents thus a through and detailed lab test need to be done on ingredients before proceeding for mix design.

4. TEST RESULTS

Table-1 slump value on varying cement replacement

for 100 % cement	for 92 % cement with 08 % rice husk ash	for 84 % cement with 16 % rice husk ash	for 76 % cement with 24 % rice husk ash	68 % cement with 32% rice husk ash
78 mm	75 mm	72 mm	68 mm	64 mm

Table-2 slump value on varying aggregate replacement

for 100 % Coarse Aggregate	for 95 % Coarse Aggregate with 5 % Rubber Tire Chips	for 90 % Coarse Aggregate with 10 % Rubber Tire Chips	for 85 % Coarse Aggregate with 15 % Rubber Tire Chips	for 80 % Coarse Aggregate with 20 % Rubber Tire Chips
78 mm	74mm	71 mm	65 mm	60 mm

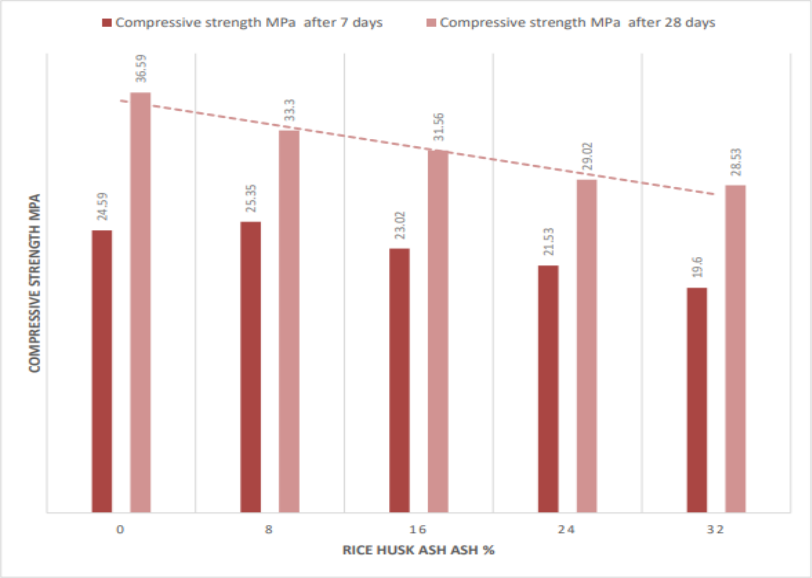

Figure -1 Compressive Strength Contain of RHA

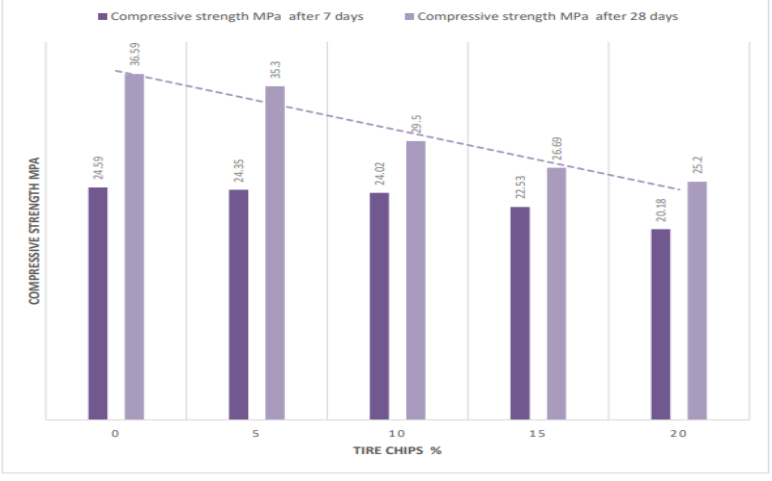

Figure – 2 Compressive Strength Contain of Rubber Tire Chips

5. CONCLUSION

On the basis of experimental investigation of the present research study, the following conclusions have been drawn.

- Slump shows that the Workability of concrete was decreased as the percentage replacement of coarse aggregate with Waste Rubber Tire Chips was increased.it may be due increase in water demand on increase in specific surface area of aggregate. However, workability of all concrete mixes up to 20% replacement was suitable in structural uses.
- When the replacement of cement is increased up to 32% by rice husk ash in concrete mix there is decrease in slump value, which shows the workability of the concrete is reduced. rice husk ash is considered as a pozzolanic material which provides an increased cohesiveness in concrete due to its high fineness modulus which consequently results into a high amount of water requirement to maintain the desired workability
- If Single-doped rice husk ash replaces part of the cement, then for the same curing time, the compressive strength increases in the early level and at higher percentages it is relatively less. When the content of rice husk ash 8 %, the performance of concrete reaches the best.

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