AN OVERVIEW ON PARTIAL REPLACEMENT OF COARSE AGGREGATE WITH WASTE TIRE RUBBER

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ABSTRACT

These days, the research community is paying close attention to solid waste management. Because they are non biodegradable, accumulating waste tires have emerged as a significant issue among other solid trash. The majority of discarded tire rubber is utilized as fuel in a variety of businesses, including brick and cement kilns, thermal power plants, and others. Regretfully, this type of use is expensive and harmful to the environment. In order to safeguard the environment, using leftover tire rubber to prepare concrete has been considered as an alternate method of disposing of such garbage. This study aims to systematically identify the various qualities required for the design of a concrete mix that uses coarse tire rubber particles as aggregate. The M20 grade concrete will be used as the reference concrete specimen in the current experimental inquiry. Rubber chips from scrap tires will be utilized in place of traditional coarse aggregate as coarse aggregate.

Keywords:*Coarse aggregate, Rubberized concrete, Management, environmental friendly, Non – biodegradable.*

I. INTRODUCTION

Introduction: Every year, products made of rubber gain popularity worldwide. The disposal of waste tires poses a significant environmental risk in many Indian cities. Nearly 1 billion discarded tires, or almost one tire per person, are produced in India annually. This poses a serious threat to the Earth and its inhabitants. In this case, the simplest and least expensive method of material degradation is burning rubber. This causes global warming as well as pollution from smoke and other harmful emissions. Sometimes, waste product recycling was the most crucial aspect of research, and researchers attempted to use as much waste product as possible for environmental benefit. In this investigation, we substituted 5% of typical coarse gravel with used tire rubber.

II. LITERATURE REVIEW

- A. Chandra - The improper disposal of worn tires is a serious environmental issue that affects the entire planet. It contaminates the soil and plants, creates uncontrolled fires, and serves as a mosquito breeding ground. Finding alternate uses for these tires is therefore desperately needed, with a focus on recycling the used tire. Excellent for structural purposes, concrete is regarded as a necessary component of human society and modern civilization. It is now theoretically possible to utilize used tires in concrete, and the resulting material is referred to as lightweight concrete. This study examines the viability of strengthening and safeguarding the environment by utilizing scrap tires as chips of varying sizes in concrete .In this work, we describe the application of rubberized concrete in structural and non-structural elements and demonstrate its suitability for the material, as well as its applications, drawbacks, and advantages for further research.

- Pravin Shelke, Rohan Kadam, Atul Naykodi, and Deepak Parakh - In recent years, the disposal of waste glass and worn-out tires has become a significant problem in India because these materials have limited uses and require melting and remoulding in order to be used to make new tires. In addition to increasing pollutants, this process emits hazardous gasses into the atmosphere that are bad for both the environment and living things. Since silica is the primary component of glass, it can aid in AAR, which occurs in all varieties of concrete. Quarries provide natural coarse aggregate, which means that if current usage trends continue, these quarries will likely run out of material in a few decades. This meant that a long-term solution to the ongoing issue was required. In light of this, this study has evaluated experimentally the viability of using waste tires in place of coarse aggregate and waste glass in place of fine aggregate for building new roads. On aggregates, simple mechanical and physical tests have been performed. Fine aggregates, on the other hand, were evaluated for compressive strength using cast blocks. The physical qualities of coarse aggregate have significantly improved, according to experimental data, when discarded tires are substituted for up to 15% of the coarse aggregate. The testing findings also showed that waste glass can replace fine aggregate by up to 10%.

- Shahid Rasool Tarry - The pre-treatment of rubber particles and their partial replacement of traditional rock aggregates are the main foci of this study endeavour. Before being employed in the concrete, the rubber aggregates are surface treated with cement paste and sodium hydroxide for optimal results. The concrete is M20 grade. Results: When treated rubber aggregates were added, the resultant concrete's compressive strength increased significantly. This can be deemed quite satisfactory given the easy and affordable availability of used tires and the fact that the concrete's 28-day compressive strength was recovered to over 90% when untreated rubber aggregates were used. This much compressive strength is enough for treated rubberized concrete for its use in different areas where compressive strength is not much important like in floors and concrete road pavements. Flexural and split tensile strength is found to be higher than that of the normal concrete but only when treatment is given to the rubber aggregates before using them. Workability is decreased. Flexibility gets increased and due to the lower unit weight of the rubber particles, it is also lighter than the normal concrete. These enhanced properties can be helpful in using this concrete in flexible slabs and as light weight concretes.

- Er. R.P. Mahla2-Rahul Mahla1 These days, the research community is paying close attention to solid waste management. Because they are not biodegradable, accumulating waste tires have emerged as a significant issue among other solid trash. The majority of discarded tire rubber is utilized as fuel in a variety of businesses, including brick and cement kilns, thermal power plants, and others. Regretfully, this type of use is expensive and harmful to the environment.In order to safeguard the environment, using leftover tire rubber to prepare concrete has been considered as an alternate method of disposing of such garbage. This study aims to systematically identify the various qualities required for the design of a concrete mix containing coarse tire rubber particles as aggregate. The reference concrete specimen for this experimental inquiry is the M20 grade concrete. Rubber chips from scrap tires have been substituted for traditional coarse aggregate as coarse aggregate.

- Ishtiaqalam, Umerammarmahmood, Noumankhattak - Every year, the world produces an enormous amount of rubber. Its slow breakdown and subsequent degradation of the environment make it difficult to dispose of in the environment. In this situation, it would be preferable to reuse the rubber. Rubber wastes were recycled by adding them to concrete as coarse aggregate, and their various qualities—such as ductility, compressive strength, and tensile strength—were examined and contrasted with those of regular concrete. Consequently, it was discovered that, in comparison to regular concrete, rubberized concrete is less ductile, more resilient to cracks, and has a lower compressive strength. A small amount of silica can be added to rubberized concrete to boost its compressive strength.

- Recycled tire rubber was employed by Biel and Lee in concrete mixes prepared with magnesium oxychloride cement, where fine crumb rubber was used to substitute aggregate up to 25% by volume. Tests on compressive and tensile strength showed that using magnesium oxychloride cement leads in improved bonding. The researchers found that if the aggregate's volume is restricted to 17% rubber content, structural applications would befeasible.

III. MATERIALS

MATERIALS TO BE USED

The different materials will be used in this investigation are

- 53 Grade Ordinary Portland cement
- Fine Aggregate
- Coarse Aggregate
- Rubber Crumb
- Water

Cement: Cement is a binder, a material that can bond other materials and sets and hardens on its own. For this investigation, regular Portland cement of grade 53 will be utilized. Sand: After appropriate sieving, use fine sand. The primary purpose of sand is to provide volume economy as an inert substance.

Fine aggregate: The fine aggregate conforming to zone II according to IS: 383-1970 will be used. The fine aggregate used was obtained from a crushed stone source. The specific gravity of the sand used was 2.52. The sand obtained was sieved as per IS sieves (i.e. 4.75mm, 2.36mm, 1.18mm, 600microns, 300 microns, and 150 microns).

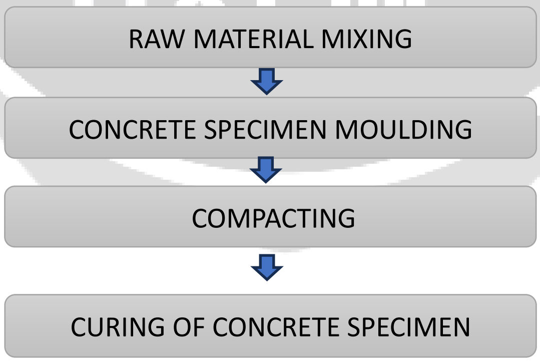
Coarse aggregate: Crushed granite will be used as coarse aggregate. The coarse aggregate according to IS: 383. 1970 will be used. Maximum coarse aggregate size used is 20 mm.

Rubber Crumb : Rubber crumbs will be used as partially replacement of the coarse aggregate in concrete.

Water: Potable water will be used in the experimental work for both mixing and curing purposes.

IV. MANUFACTURING PROCESS

The inclusion of rubber crumbs and coarse aggregate to the concrete mixture is the only distinction between conventional and traditional concrete manufacturing methods. Partially varying the percentage of rubber (0%, 1%, 3%, 5%)added to the concrete mixture.



V. SIGNIFICANCE OF CONCRETE

A complex strategy for improving performance and sustainability is presented when coarse aggregate is used in place of some of the rubber in concrete. This technique reduces tire waste while also enhancing the concrete's flexibility, sound absorption, and thermal insulation qualities by adding rubber from used tires.

VI. CONCLUSION

The general objective of this research is to evaluate the fresh and hardened properties of a concrete will be producing by replacing part of the natural coarse aggregates with an aggregate produced from locally available recycled waste tire and it will be subjected to local conditions.

1. The introduction of recycled rubber tires into, concrete might significantly increased the slump and workability
2. It may decrease in compression and flexural strength as per the literature reviews.

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