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Feasibility Study of Rubber Mix Concrete Cubes in Construction

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Abstract: ***Waste rubber tyre is one among the many environmental problems worldwide because of increase in auto mobile production huge amounts of waste tyre got to be disposed. and due to this Pollution problems occurred Due to rapid depletion of obtainable sites for waste disposal, many countries banned the disposal of waste rubber tyre in landfill hence, effort are taken to spot potential application potential application of waste rubber tyre in engineering projects. Rubber tyre chips are a waste that's ideal to be used in concrete applications. This has a further advantage of saving in natural aggregates utilized in production of concrete which are getting increasingly scarce. During this Assembly, In this seminar the study aims is to use of waste rubber tyre as partial replacement of coarse aggregate to supply rubberize concrete in M20 grade of mix. Different partial replacements of rubber chips (0, 10, 20, 30, 40 and 50%) by volume of coarse aggregates so there is a possible usage scope of doing the experimentation work using the waste material in efficient way in construction.***
Keywords: Rubber concrete, Sustainable Concrete

I. INTRODUCTION

A. Aim

Strength Determination of waste tyre rubber mixed concrete material.

B. Objective

1) To Study Demand and supply of cement.
2) To Study various construction wastes and its impact on environment.
3) To Study Innovations in concrete.
4) To Study Sustainable construction technology.
5) To Study Green rating system.
6) To Study Mix design.
7) To Study Sustainable construction.
8) To Study Tyre waste concrete material.

C. Need

Innovation as per literature is that the ability to compile ideas that are original in nature and helps in application of solutions that meets the requirements of pollution control. Adoption of an innovation is feasible if it's having relative advantage over subsequent best choice and therefore the users are convinced that it improves their present situation. Improvements or changes as a results of innovation might be in any of the functions, which ends up in effective after-Economy service, integration of varied functions, local adaptation, increasing the life, enhancing the productivity, ensuring that the impact on environment is minimum, reducing completion time and enhancing quality.

In recent treads a good range of building materials is out there for the development of engineering structures. the entire cost of materials could also be up to 60% or more of the entire cost incurred in construction project dependent upon the sort of project. Effective construction materials management may be a key to success for a construction project. Construction waste is another significant issue in housing industry. an outsized and various sorts of construction waste with different characteristics are created in the least the stages of construction. Construction industries have a bigger part in contributing environmental problems. The economic, environmental benefits must be gained from construction waste minimization.

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II. LITERATURE REVIEW

Shubhagata Roy et al. (1) The author says Recycled waste tire rubber has been used in this study to replace coarse aggregate by weight using different percentages. It has been mainly compressive strength & tensile strength of an selected numbers of rubberized concrete cube has been investigated by author. The change in workability along with the failure mode also has been observed during the study. Finally an it is recommended to use of such waste tire in concrete construction, thereby minimizing cost and risk of pollution. Anwar Khitab et al (2), "Use of Waste Rubber Tyre in Concrete "The Author presents the concrete using waste tyre.In this paper author says Discarded vehicle tyres constitute one important is part of solid waste, which had historically been disposed of into landfills. It an emerging reuse is the production of concrete, in which waste-tyre rubber particles in part replace the natural aggregates. This is an additional advantage of saving the natural aggregates used in concrete making. The Recycled waste-tyre rubber is a rising material in the construction industry due to its low weight, elasticity, energy absorption, heat and sound proofing characteristics.The waste-rubber tyre particles cut into 20mm size. The benefits are numerous such as reduction of the cost of aggregates and disposal, prevention of environmental degradation, and increase in life span of landfill areas . Concrete pavements are made of high strength mixtures, which lack sufficient flexibility. So By partial replacement of fine and coarse aggregates with rubber, sufficient flexibility can be achieved and thermal changes can also be reduced. It has reported that use of waste-rubber tire particles as partial replacement of aggregates in concrete leads to loss of its strength. However in such concrete can be used for non-load bearing purposes such as insulation.

Also the lost strength can be compensated by other factors e.g. by the use of magnesium ox chloride in concrete, strength can be enhanced by 2.5 times. strength are gaining by addindg materials and admixtures/additives. Also it has higher compressive strength, rubber particles can be made rougher for better bonding with the surrounding mix. Nikolaos Oikonomou et al (3),"The use of waste tyre rubber in civil engineering works " The author Research on cement-based products modified with tyre rubber – such as concrete and mortar had been carried out for many years in order to examine the potential utilization of waste tyres in concrete production. Waste tyres are used to partially replace the aggregates in mortars and concrete.

In This section deals with the properties of either mortar or concrete modified with waste tyre rubber. Mazyad Al-Fadhl (4) "Advantages of Concrete Mixing with Tyre Rubber "The Author Since the past few decades, concrete is used in asphalt for road paving works to replace aggregates.

About 20% of the volume of shredded rubber or 'rubber crumb' is used in several highways surfacing work. In the constructional uses there are some advantages including safe safe disposal of scrap rubber types that are non-biodegradable, increase in the water resistance of roads, and considerable savings in use of aggregates. So, the use of shredded rubber as a replacement for aggregates and sand in concrete is not widely practiced. It has been Considering that construction uses very large amount of sand and aggregates, successful use of rubber in concrete can not only save the environment but also reduce construction costs. The author found that the partial replacement of shredded rubber is advantages and economical. Zunaithur Rahman.D.et Al (5) , "Study on Waste Rubber Tyre in Concrete for Eco-friendly Environment "In this Author study, the rubber aggregates are prepared mechanically by cutting the tyres to the maximum nominal size equal to 20 mm and after cleaning with portable water kept for air drying. From this paper we can idealized the physical properties of rubberized concrete. The Compressive strength of concrete mix using different percentage replacement in water and acid curing.

The Comparing and discussion of test results obtained from rubberized concrete with the normal concrete in various mixes. Sai Samanth Anuma Reddy (6) "Waste Rubber as Construction Material "In this paper the objectives of the author is Use of tyre rubber in civil works without altering their properties and uses is the main objective. So Therefore replacing sand as fine aggregate partially with rubber up to which there is no change in conventional properties of concrete, bricks and tiles and use of rubber as coarse aggregate in ballast of railway helps in solid waste treatment. Neela Deshpande et al (7) "Experimental investigation on strength characteristics of concrete using tyre rubber as aggregate in concrete" The author objectives are to analyze the compressive strength, split tensile strength and flexural strength of concrete made by utilizing the waste tyre rubber.

Recycled waste tyre rubber has been used in this paper to replace the fine and coarse aggregate by weight by different percentage. An attempt is also made by pretreating the rubber with sodium hydroxide solution and using same of concrete only by percentage replacement to aggregate content the author divided the study in three parts first concrete made with 1 %, 5% , 10% replacement of shredded rubber without NAOH Treatment of total aggregate content second concrete made with 1 % replacement of shredded rubber with NAOH treatment of total aggregate content. Third concrete made with 1 %, 2%, 5% replacement with crumb rubber of total aggregate content without treatment.

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III. DETAILED STUDY

A. Innovations in Concrete

Now The current and future focus for construction industry and human society, in general, is on sustainable construction. This new age demand is requires minimum harnessing of nature resources as well as recycling of materials for constructions. To achive this requirement, fundamental changes are required in concrete technology which we having been using so far. Moreover, modern concrete is required not just for RCC and Prestressed construction but for numerous modern applications like Industrial applications, Highway pavements, landscape development, extreme weather/environment etc. Concrete also has to improve its aesthetic appearance to look slim, designer and colorful. In this paper we focus on waste tyre rubber used in concrete material because of that material requirement is quite reduces and we make our pollution free country & this is a best innovation in concrete.
A lot of innovations have been done world over and in India in concrete technology to meet above demands of the human society.

The new age concrete shall have following features:

1) It is Slim and Sleek Concrete
2) Good Concrete
3) The Concrete with minimum water need to reduce water demand.
4) The Concrete with no Cement to reduce carbon emission.
5) The Concrete with Alternative raw material to reduce need of natural raw materials
6) Durable the concrete for longer life of structures and lesser reconstruction.

Recycling can be a good option in the waste management of many materials. Noting the increasing volumes and difficulty in the disposal of wastes discusses test results of use of recycled tyres in concrete for possible application in the construction industry. In 2008, around one billion end-of-life tyres (ELTs) were being produced globally every year. Tyres is cut into pieces with maximum size of 20 mm to use as coarse aggregate, and crumb rubber tyres used as fine aggregate. These replacements of the rubber tyres aggregates in concrete was done in three phases.
In the first phase, fine rubber tyres aggregates are used to replace 50% of the normal sand. Secondly, The coarse rubber aggregates tyres were used in the replacement of 50% of the normal gravel. Lastly, both fine and coarse rubber tyres aggregates were used to replace the sand and gravel by 25, 50, 75 and 100%. Compressive strength, splitting tensile and flexural strength tests is carried out according to BS codes.
Although concrete made from tyres had lower strength than the normal concrete, it had elastic failure behavior. It did not collapse completely when tested. In this paper also demonstrated the variation in the compressive strength of the non-conventional concrete when the BS and ACI methods are used in the design of the mix. A waste tyre rubber is thought to be a potential material for use in concrete technology.
It is considered as an alternative to the natural aggregates, used as filler in concrete mix. Because of lower strength, the rubberized concrete is recommended for non-load bearing structures and structural members.

B. Sustainable Construction Technology.

Now a day it is very essential to concentrate on sustainable construction technology because of lot of demand of construction material currently, researches on sustainable development on concrete have been carried out on following aspects: The extension of service life of concrete structure and development of low-carbon concrete material and structure. Fig 3.1 shows India has third largest country in CO_2 Emission.
The Sustainable development is the organizing principle for sustaining finite resources necessary to provide for the needs of future generations of life on the earth. It is a process that envisions a desirable future state for human societies in which living conditions and resource-utilization continue to meet human needs without undermining the "integrity, stability and beauty" of natural biotic systems. The Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: * The concept of 'needs', in particular, essential needs of the world's poor, to which overriding priority should be given; and These idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.‖

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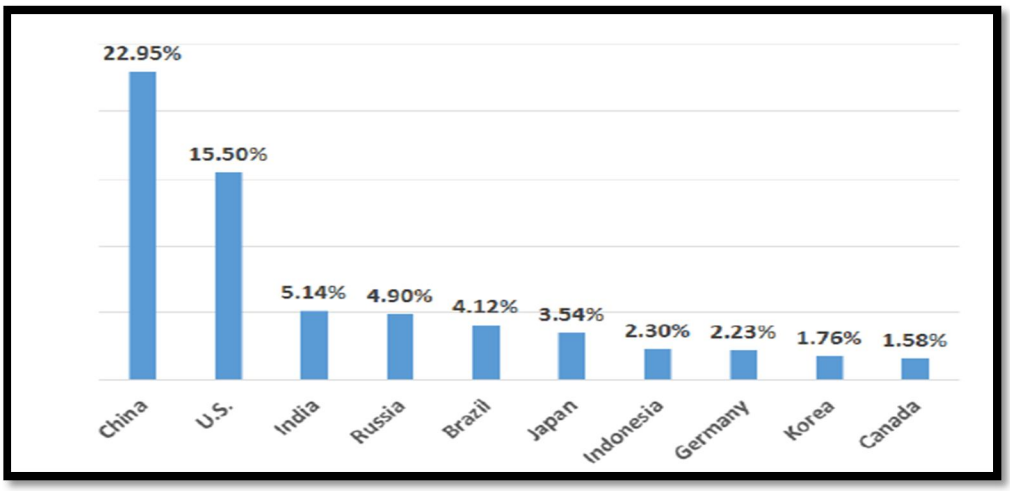


Figure 1.1.The 10 Largest CO2 Emitters 2014

C. Green Rating System.

The Green rating systems are basically evaluation tools to measure the different environmental related issues. TERI is also introduced GRIHA, a rating system in 2006 to adjudge the 'greenness' of buildings, which has now been adopted by the Ministry of New and Renewable energy,. It has been designed according to Indian climatic conditions and in particular usage of non-AC Government of India as a national rating system. GRIHA is the National Rating System followed in India buildings GRIHA addresses the Issues in three stages Pre-construction, during construction and Post construction.

1) *Need of Rating System:* The Globally has, buildings account for : 40% energy use, 42%water consumption, 40% solid waste, 50% raw material use, 50% of air pollution, 42% GHG emission, 50% water pollution, Total energy use in buildings is growing rapidly owing to economic development, increasing urbanization and improved lifestyles, predominantly due to increased space conditioning load. India has the world's second largest population and continues to grow at 1.34% per year during the years 2007 and 2008. India has a among the 10 fastest growing economies in the world with an average growth rate in the GDP of 5.8 percent during the first decade of economic reforms (1992-2001). The continued annual GDP growth was affected by the global financial crisis over the past two years (Source: Sustainable building and infrastructure, 2012). There was a need for setting up or supporting institutions for the promotion of energy efficiency services. They include industry associations such as Confederation of Indian Industry (CII), the Indian Green Building Council (IGBC), Financial Institutions (FI), such as the Indian Renewable Energy Development Agency (IREDA), Industrial Development Bank of India Limited (IDBI Bank) and ICICI Bank, as well as the National Productivity Council (NPC) and research institutes, such as The Energy and Resources Institute TERI - (The Energy and Resources Institute), a dynamic and flexible organization with a global vision and a local focus, were established in 1974.

D. Tyre Waste Concrete Material.

1) *Case Study:* The disposal of waste tires is becoming a waste management problem in the world including India particularly in big city. The Management of waste-tire rubber is very difficult for municipalities to handle because the waste tire rubber is not easily biodegradable even after long-period of landfill treatment. A melting tires also produce large quantity of oil, which cause contamination of soil and ground water. Recycled waste tire rubber is good material in the construction industry due to its properties like lightweight, elasticity, energy absorption, sound and heat insulating properties that's why we can replace coarse aggregate by volume using 10%, 20%,30 %, 40%, & 50% percentages. Recycled waste tire rubber has been studied in this paper finally it is recommended to use of such waste tire in concrete construction, thereby minimizing cost and risk of pollution. From the papers study it has found that there was a significant reduction in the compressive strength and tensile strength of concrete containing waste tire rubber than normal concrete. It percentage of rubber increased slump value is reduced. But the important fact is that unlike plain concrete, the failure state in rubberized concrete occurs gently and uniformly indicating the ductile behavior. lastly it is recommended to use waste tires for making non-structural Portland cement concrete, such as mass concrete, partitions, back stone concrete, concrete blocks, and other non-structural uses. from the study we found some Advantages & Disadvantages.

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a) Advantage Of Rubber Concrete

- A rubber concrete is affordable and cost effective.
- It reduces the high pressure, impact and temperature.
- They are good water resistance with low absorption, improved acid resistance, low shrinkage, high impact resistance, and excellent sound and thermal insulation.
- If we use magnesium ox chloride cement instead of Portland cement it gives more compressive and tensile strength.

b) Disadvantage Of Rubber Concrete

- The rubberized concrete are sometimes weak in compressive and tensile strength.

c) Application Of Rubber Concrete

- In non-load bearing members as well as lightweight concrete walls.
- In highway constructions as a shock absorber.
- In sound barriers as a sound absorber.
- In buildings as an earthquake shock-wave absorber.
- It may also use in runways and taxiways in the airport, industrial floorings and even in structural member



Figure 1.2. Waste tyre rubber chips

IV. CONCLUSION

In this Paper it can be concluded that there are possible alternatives which can be utilized in concrete as an percentage replacement material without losing its strength properties and utilizing waste as a mix in innovative way to reduce material consumption & impact on environment. Its use in concrete reduces its density, workability and strength. The strength can be reduced by a number of other factors. It enhances the ductility and air content of the concrete. It can be used in special circumstances, such as non-load bearing structural members, noise reduction, earthquake resistant structures, foundations for machineries and railways etc. The Use of rubber particles in concrete can be useful against its environmental impacts.

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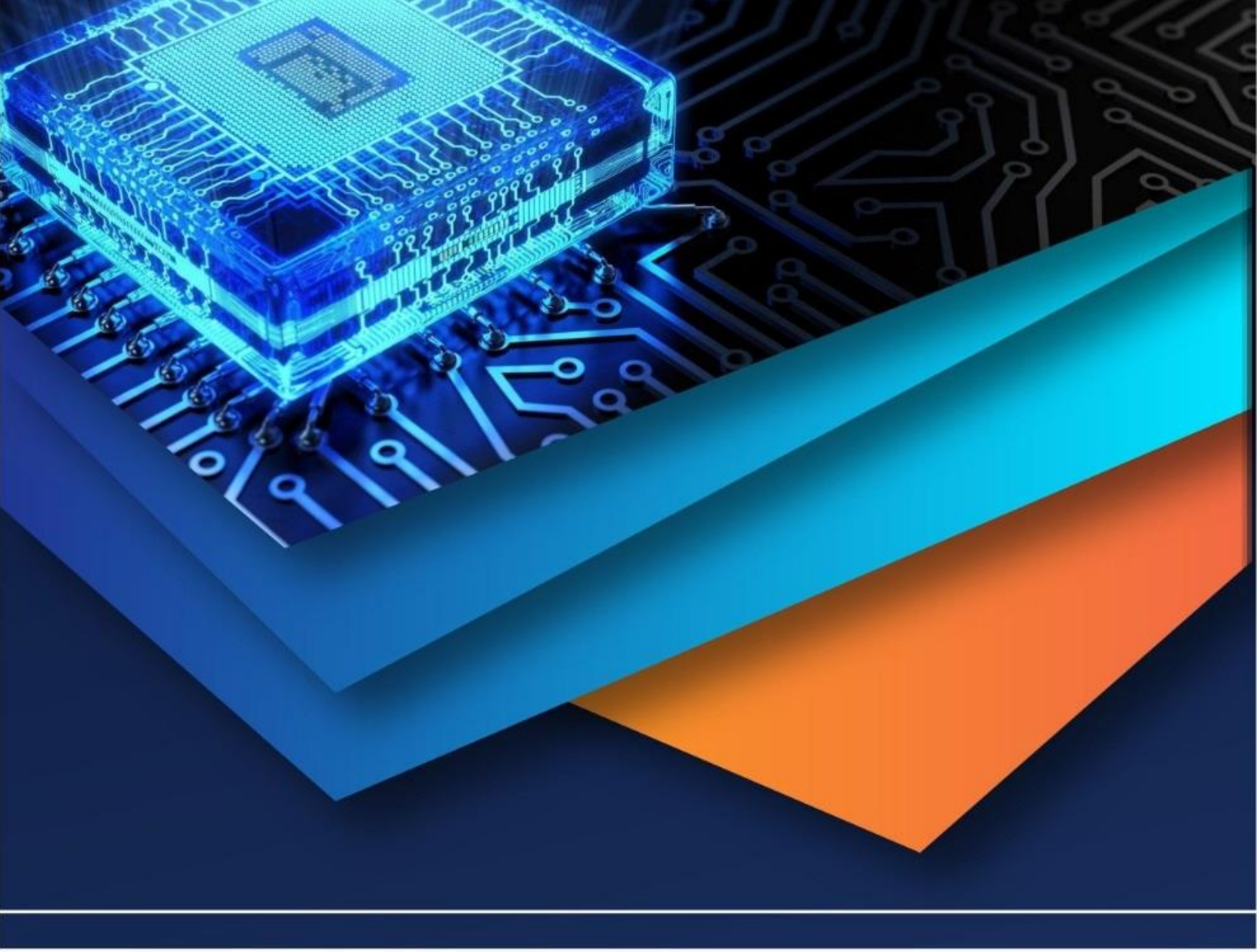
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