# An Experimental study Concrete used Waste Tyre Material and Hair Fibre: A Review

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**ABSTRACT**

The aim of this review paper is to provide the comprehensive details about concrete which is making with the use of waste rubber tyre and human hair. In the present scenario, 190 million used tyres are generated in India every year and billions of tyres are generated in the world every year from which only 10% are recycled, 30% are exported for reuse processing or as a tyre derived fuel. The remainder are stockpiles, legally dumped in landfills or illegally dumped. Scrap tyres are worldwide major waste and environmental health issue. Now-a-days human hair are also considered as a waste material and a non-degradable matter. In this review, we have shown the study of effect of human hair and waste rubber tyre on basis of increasing in compressive strength, tensile strength and reduce environmental problem.

**Keywords**

landfills, non-degradable matter, compressive strength, tensile strength

## Introduction

Concrete is a Composite Material and hence it is a mixture of cement, and water, coarse aggregate and fine aggregate. Rubberized concrete is a concrete in which rubberized concrete is used as a partial aggregate substitute scrap tyre rubber is used. Various researches have used human of content about 0-10%. Rubber, reinforced hair mixed with concrete, provides a practical and efficient technique for overcoming micro cracks with identical types of inadequacy [4]. Concrete is one of the construction materials used most frequently in the world. It has been estimated that about One Thousand million tyre reach the end of their useful lives every year, which creates a major barrier to the removal of this vast quantity of waste rubber that poses a risk to the environment [6]. Therefore, it is necessary to develop new techniques for recycling waste tyre and to introduce a new technology that is used in concrete mixing. Some desirable applications are foundation pads, traffic barrier and railway buffer with high toughness, good impact and abrasion resistance. Concrete is a brittle material and with high stiffness. Disposal of used rubber tires is a global problem. The addition of rubber particles from scrap tires into concrete is the subject of current investigation. A characteristic attribute was developed to measure decreased strength for rubberized concrete mixes. It may also be useful for the purposes of mixed architecture. Beton strengthened hair combined with rubber [3]. It provides a realistic and effective way to overcome mini cracks and related forms of inadequacy [3]. Fibers are typically used in concrete to manage plastic shrinkage & dry shrinkage cracking and also to reduce the permeability of concrete [3]. It is also important to create new strategies for the recycling of waste tyre [12]. A variety of novel strategies that resolve the problem of tyre disposal include the use of waste matter as an additive to cement-based materials [12]. Recycling of the ‘End of Life tyre (ELT) is one of the main issues shared by the scientific industry and the scientific community as well as the environmental organization because of their large volume of production and non-biodegradable properties. It is estimated that worldwide, about one billion end of life tires are produced annually. Rubberized concrete mixes, such as lightweight concrete walls and architectural units, may be ideal for non-structural uses. They may also be used under compact or elastic pavements as cement aggregate bases. Fire risks are of general interest and must be carefully studied before guidelines are drawn up for different functional application. When they are partly replaced with coarse or fine concrete aggregates, a very small number of waste rubber tyre fragments will also do some wonders. The advantages include making the concrete rigid, extremely ductile and adding improved properties of shock absorption and isolation. Use of waste tire rubber provides great potential as a fine and

coarse aggregate replacement material, it possesses a significant challenge in the performance of its bond behavior within the cement matrix.

## Literature References

In the course of this review, follow-up paper in the form of literature review has discussed below:

1) **Piti Sukontasukkul in (2004)-** He proposed paper on a waste rubber tyre concrete crumb. In their analysis, they agreed to replace the coarse aggregate with the fine in Beton for the mould of pedestrian bricks. They contend that concrete acts as a binder material with crumb rubber tyre would make concrete blocks more flexible & soften the surface. In this study, the crumb rubber pedestrian blocks performed very well in skid and abrasion resistance. In this study, it was observed that pedestrian blocks of crumb rubber tyre worked very well in skid resistance and abrasion resistance. In this study, the production method is cost-effective due to the ease of the production process.

2) **Pillai Renju. R. & Ramanaham Ayothiraman (2012)–** IIT (Delhi) presented the paper "An Revolutionary Strategy to Enhance Soil using Hair Fiber" It was in 2012. It demonstrates a lab scale analysis of the effects of soil matters on the use of hair as a fiber. In the method of soil stabilization as a reinforcement that can supplement traditional fibre matters. Reinforcement criteria, i.e. fibre content on kaolinite clay, have been established in a number of lab studies, such as consistency limit tests, compaction test and unconfined compression tests.

3) **Sandeep Yerabati* et al. (2017)-** Hair reinforcement mixes with tyre rubber is a practical and cost-effective way to resolve micro-cracks and associated deficiencies. Fibers are commonly used for plastic shrinkage control in concrete and dry shrinkage cracking and also to reduce the permeability of concrete.

4) **Meikandaan (2017)-** "Studied the effect of steel fibre on concrete with addition of fibres 0%, 1%, 2%, 3%, and 4% by weight of concrete. By using steel as fibre reinforcement, there is an improvement in the different properties and hardness of concrete."

5) **Ucol Ganiron Jr (2014)-** He concluded that with addition of small percentage of human hair into the asphalt cement mixture with percentage of hair 3%, 6% and 8% by weight of bitumen. It is observed that the asphalt cement mixture with hair 2% to 6% by mass of bitumen is much stronger than asphalt cement mixture without hair.

6) **Zheng L., X. Huo Sharon, and Y.Yuan in 2008 -**The study of concrete using rubber tyre designed to replace rubber tyre coarse aggregate of usual mixtures of asphalt with rubber crumb tyre. The goal of this analysis was to investigate the influence of crumb tyre and tyre material on strength with some of the properties of deformation. The compressive strength and elasticity modulus were tested and studied.

7) **Ozbay Erdogan ; Lachemi Mohamed ; Sevim Umur Korkut in (2010)** studied, To evaluate the compressive power, abrasion resistance and energy absorption potential of concrete combined with crumb and ground rubber with and without ground granulated blast furnace slag, an experimental programme was performed (GGBFS). For this purpose, the water binder ratio is 0.4, 4 specified levels of crumb rubber content were 0, 5, 15 and 25 % by fine aggregate volume and 3 tiers of GGBFS material at 0, 20 and 40 % were considered experimental programme. Test results indicate that the use of rubber with ground and crumb rubber aggregate decreases the strength of compressive and abrasion resistance, but increases the strength of compressive and abrasion resistance.

8) **Parul Mangal CE (2015)-** He observes that rubberized concrete is a partial replacement in which scrap rubber tyres are used for rough aggregates. An estimated 1,000 billion recycled tyre have been taken out over the year which is very detrimental to the atmosphere in the event of pollution in landfills. To protect the world from this issue, researchers are increasingly investigating the ideas of using this rubber is used as a substitute to substitute natural goods, such as stone aggregates, which will also meet the

growing demand for sustainable construction materials. In the present study, the experiment is based on compressive power, flexural strength and tensile strength split for grade M30, replacing 15 percent, 25 percent, and 35 percent of the gross aggregate by rubber and fine aggregate by foundry powder.

9) **Anujeet Jain, Prof. Rupali Goud in (2017)-** He tells that there is a need of the hour at this stage is to protect the atmosphere in as many respects as possible. In our research, we use waste materials, such as hair fibres and lathe fragments, to assess their beneficial impact on the properties of concrete. The use of the above materials will not only minimize the expense of the plant, but will also reduce the environmental effects and the risks created by these items. In the present experimental study, concrete mix was conducted in which we use M20 and study the behavior of mechanical strength of concrete after partial replacement of hairs and lathe scrap. Cement was first change with hair fibre in the range of 0 percent (no hair fibre), 1.5 percent and 2.5 percent by weight of cement in the M20 mixture, and then with lathe scrap in the range of 1 percent by weight of cement in the M20 mixture. The concrete mixtures produced have been tested as well as compared in terms of compressive strength with the nominal M20 grade concrete mixture.

## Conclusion

The following conclusions were made by the experimental works discussed in this review article.

1) This is found that there are positive result and decreases in the properties of M-25 grade of concrete according to the percentages of rubber by weight the gross aggregate.

2) The experimental analysis showed that the optimal content of rubber to be applied in the M-25 grade of concrete was 0%, 2.5%, 5%, 7.5% and 10%. As M-25 concrete is combined with 3 per cent Rubber (i.e. with 1.5 per cent hair) it is contrasted with pure concrete.

3) Crushed rubber resulted in a larger reduction in these 3 material properties than ground rubber. Rubberized concrete had an incremental cylindrical/cube strength ratio relative to standard concrete [9].

4) With the increment in compressive power the modulus of elasticity of ground rubber increased significantly more slowly than that of crushed rubber [9].

5) The inclusion of rubber particles has resulted in the decrement of flexural strength of the mortar mixtures. The decrease in strength relied on the content of the rubber granules or shreds and the form of the shredded rubber [18].

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