

Effect of Latex Modified Concrete with Partial Replacement of Fine Aggregate with Tannery Shredded Waste: A Literature Review

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ABSTRACT: The term waste means it is of no use to that particular production zone. Tannery waste is considered to be the one of the major industrial waste in the world. As we all know that there is massive production of leather which is increasing day by day so there is huge amount of waste which is coming out of these industries and is causing serious environmental problem in the world. It has been found that tannery waste is one of the good replacing material in the construction industry. If all these waste are utilized in the field of construction by partial replacement of fine aggregate with tannery shredded waste then there could be some reduction in the amount of waste which coming out of the industries. Fine aggregate is also reducing day by day due to increase in the construction therefore the requirement of fine aggregate is more. On other hand tannery waste is abundant in the world, if there is proper replacement of fine aggregate is made with tannery waste then the demand of the fine aggregate can be fulfilled. The concrete produced due to this replacement will have reduced weight as the density of tannery waste is lesser than the concrete so it will also result in light weight concrete. It was reported that 0-20% replacement of fine aggregate by tannery shredded waste decreases the density of the concrete from 2419kg/m³ to 1738 kg/m³[1]. Styrene-butadiene rubber (SBR), a general-purpose synthetic rubber, produced from a copolymer of styrene and butadiene. SBR is a mixture of approximately 75% butadiene (CH₂=CH-CH=CH₂) and 25% styrene (CH₂=CHC₆H₅).

KEYWORDS: Concrete, Compressive Strength, Tannery shredded waste, Styrene-butadiene rubber, Flexural Strength, Fine aggregate

I. INTRODUCTION

River sand is considered to be one of the unavoidable ingredients in construction. Due to increase in construction activities there is demand for the fine aggregate. The price of the fine aggregate is also increasing day by day. On the other hand tanneries in India are mainly located in Uttar Pradesh, Tamil Nadu, West Bengal and Punjab. About 900 tanneries are present in Tamil Nadu. It has been found that the amount of tannery waste produced from these industries is about 43 million ton/year and about 30% is from Tamil Nadu. The wastes produced from these industries are difficult in disposal [1].

SBR is a product of synthetic rubber research that took place in Europe and the United States under the impetus of natural rubber shortages during World Wars I and II. By 1929 German chemists had developed a series of synthetic elastomers by copolymerizing two compounds in the presence of a catalyst. This series was called Buna, after butadiene, one of the copolymer, and sodium, the polymerization catalyst. During the World War II, the United States cut off from its East Asian supplies of natural rubber, developed a number of synthetics, including a copolymer of butadiene and styrene. The use of SBR emulsions in concrete has been increasing in the construction field. SBR emulsion can be used as a bonding mortar layer between old and new concrete layers in a certain ratio with improving the compressive and flexural strength of concrete member repaired. Various researches have evaluated the influence of

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different contents (0%, 5%, 10% and 15% by cement) of SBR on the mechanical properties and found that it gives maximum strength at 10% by weight of cement.

The effect of latex on concrete with the partial replacement of fine aggregate with tannery shredded waste will increase the workability and decrease the permeability as SBR latex is having good adhesion property which can be used in concrete construction and also quite much helpful in repair works.

II. ADVANTAGE OF TANNERY SHREDDED WASTE IN CONCRETE

- Cost of Concrete production is reduced when Tannery waste is used as a fine aggregate in concrete.
- Due to less density of tannery waste, it can be used in earthquake prone zone as it results in light weight concrete.
- As tannery wastes have less capacity to absorb water they do not degrade easily.
- Tannery waste concrete can reduce the use of river sand in concrete.
- The bulking percentage of tannery waste and fine aggregate are nearly same.

III. REVIEWS OF ARTICLES ON EFFECT OF LATEX MODIFIED CONCRETE WITH PARTIAL REPLACEMENT OF FINE AGGREGATE WITH TANNERY SHREDDED WASTE

- **Sathish Kumar V et. al[1]** : has studied and identified the “Utilization of Tannery Shredded Waste as Fine Aggregate in Concrete” and concluded Tannery waste can be used effectively in the construction field.
 1. The disposal of tannery waste can be done safely without causing any pollution to the environment.
 2. Reduction in the cost of construction
 3. Increase in Tannery waste in concrete from 0% to 20% , decreases the density of the concrete from 2419 kg/m³ to 1738 kg/m³.
 4. Tannery waste concrete can reduce the use of river sand in concrete and results in light weight concrete. Compressive strength of the concrete is increased by 24% of the normal concrete mix for 15% replacement of tannery waste.
- **Rajaram. J. et. al (2009)[2]** : has studied “Preparation, Characterization and Application of Leather Particulate-Polymer Composites (LPPCs)” and concluded that polymer composites made from leather wastes with polymer such as NBR, SBR, neoprene provides good machinable and mechanical properties at particular combinations.
 1. The concrete components made with these materials showed effective utilization of these materials.
 2. The study comprises improved characterization of polymer composites using leather wastes.
- **Nitish Puriet. al[3]** : has studied “Utilization of Recycled Wastes as Ingredients in Concrete Mix” and concluded that leather waste and materials like construction debris and PVC scrap performed well as full or partial replacer of concrete aggregates.
 1. It has suitable application in construction industry.
 2. Good replacement for Concrete.
 3. Use of waste materials results in the formation of light weight concrete.
 4. There is a considerable increase in the compressive strength as well as flexural strength of concrete when fine aggregate has been replaced by leather waste product and other construction debris.

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- **A.Venkatachalamet. al[4]** : has studied “Design of High Performance Bituminous Mix Using Tannery Waste” and concluded that the mixture made of modified bitumen has improved performance indicators like density, stability, flow, tensile strength, fatigue, stiffness modulus and rut depth.
 1. The pavement laid using the mixture would perform well under various climatic conditions in India.
 2. This approach would give an effective solution for the problem of disposal of solid waste generated from leather industry.
 3. The use of warm mix additive in the preparation of bituminous mixture would bring down the fuel requirement and produce positive impact on the environment.
- **Ozgunay. H. et. al (2007)[5]** : has studied the “Characterization of Leather Industry Wastes” and concluded that the leather waste can be disposed by chemical analysis.
 1. Chromium traces found in sole leather shaving and buffing wastes were associated with the contamination of wastes, since chrome is not used as the main tanning substance in sole leather production.
 2. Tannery wastes normally contain only trivalent chromium. On the other hand, about 90% of hides/skins in the world are still tanned with chrome, because other tanning materials fail to give the leather a high hydrothermal stability and other useful properties that chrome provides.
- **KapilSoniet. al[6]** : “Performance analysis of SBR Latex on cement concrete mixes” has concluded that :
 1. By the addition of SBR latex, there is an increase in the workability of concrete as the polymer content increased.
 2. The presence of SBR-Latex is proved to be effective to reduce the ingress of water in concrete. However, for the mixes rich in cement, the dosage of SBR-Latex should be so adjusted that the workability of concrete should remain in controlled limits to avoid the highly flowable concrete due to plasticizing effect of SBR latex.
 3. The maximum increase in compressive strength at 15 % SBR latex content for concretes is 20.95%. However, the maximum increase in flexural strength is 36.35%.
 4. It has been observed from the test results that the optimum content of SBR latex for cement concrete mix is 15% by weight of cement.
 5. Due to the increase in compressive and flexural strength by mixing SBR latex, the thickness requirement of pavement should be comparatively less as compared to normal mix in same traffic conditions. Hence, the construction by SBR latex mix concrete can be more Economical.
- **Folic R.J. et. al[7]** : studied “Experiment Research on Polymer Modified Concrete”
 1. He tested concretes modified with 2.5%, 5% and 7.5% of polymer (Latex) admixture to the cement. The test results showed that the water absorption decrease with the increase of polymer - cement ratio. Although it was in the case of capillary water absorption, such a positive change is important as it influences the increase of concrete durability.
- **M. Angeline Swarnaet. al[8]** (2014) carried out a paper on “Manufacturing bricks using Tannery effluent sludge” and found that :
 1. Water treatment plant sludge can be a successful partial substitute for cement bricks.
 2. The research brick types were competitors to both the research control cement brick types and commercial clay brick types available in the market.
 3. The optimum sludge addition to produce brick from sludge was 20%.
- **P. C. Sabumona[9]** carried a paper on “Textile and tannery ETP sludge as cement replacement” and concluded that :
 1. Tannery waste can be used replacement of cement as well as fine aggregate.

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2. The life of proper treated tannery waste can be effluent in construction industry.

IV. CONCLUSION

- SBR Latex increases workability of concrete and decreases permeability.
- SBR Latex increases the compressive strength and flexural strength at 10% replacement of cement.
- Tannery Shredded Waste has less density than Fine Aggregate so there is decrease in permeability resulting in light weight concrete.
- Tannery Waste has less capacity to absorb water so they do not degrade easily.
- Tannery Shredded Waste is abundant in nature so its use will result in Economical as well as Environment friendly concrete.
- After reading all literature we find that there is no work on Tannery Shredded Waste and SBR Latex together.

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BIOGRAPHY



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