ISSN: 2347-6540

International Journal of Latest Research In Engineering and Computing (IJLREC)
Volume 5, Issue 2 , Page No. 1-6 March-April 2017
www.ijlrec.com

A REVIEW ON STUDIES AND RESEARCH ON USE OF PLASTIC WASTE

Prince Ghalayan[1], Er. Naveen Saharan[2]
M.Tech Scholar in GEC, Panipat, Assistant Professor in Civil Engineering, GEC, Panipat

ABSTRACT:- Now-a-days Plastic is everywhere in today's lifestyle. The disposal of plastic wastes is a great problem.These are non-biodegradable product due to which these materials pose environmental pollution and problems like breast cancer, reproductive problems in humans and animals, genital abnormalities and even a decline in human sperm count and quality. In recent years, applications of plastic wastes have been considered in road construction with great interest in many developing countries. The use of these materials in road making is based on technical, economic, and ecological criteria. Several million metric tons plastic wastes are produced in India every year. If these materials can be suitably utilized in highway road construction, the pollution and disposal problems may be partly reduced. Keeping in mind the need for bulk use of these wastes in India, it was thought expedient to test these materials and to develop specifications to enhance the use of plastic wastes in road making, in which higher economic returns may be possible. The possible use of these materials should be developed for construction of low-volume roads in different parts of our country.

Keywords: Plastic Waste Modified Bitumen, Bitumen, Aggregates, Plastic Roads.

INTRODUCTION

Now-a-days disposal of different wastes produced from different Industries is a great problem. These materials pose environmental pollution in the nearby locality because many of them are non-biodegradable. Traditionally soil, stone aggregates, sand, bitumen, cement etc. are used for road construction. Natural materials being exhaustible in nature, its quantity is declining gradually. Also, cost of extracting good quality of natural material is increasing. Concerned about this, the scientists are looking for alternative materials for highway construction, and industrial wastes product is one such category. If these materials can be suitably utilized in highway construction, the pollution and disposal problems may be partly reduced. In the absence of other outlets, these solid wastes have occupied several acres of land around plants throughout the country. Keeping in mind the need for bulk use of these solid wastes in India, it was thought expedient to test these materials and to develop specifications to enhance the use of these industrial wastes in road making, in which higher economic returns may be possible. The possible use of these materials should be developed for construction of low volume roads in different parts of our country. The necessary specifications should be formulated and attempts are to be made to maximize the use of solid wastes in different layers of the road pavement. Post construction pavement performance studies are to be done for these waste materials for construction of low volume roads with two-fold benefits: (a) it will help clear valuable land of huge dumps of wastes; (b) it will also help to preserve the natural reserves of aggregates, thus protecting the environment. Plastics are user friendly but not eco-friendly as they are non-biodegradable generally, it is disposed by way of land filling or incineration of materials which are hazardous. Plastic is versatile material and a friend to common man becomes a problem to the environment after its use. The better binding property of plastics in its molten state has helped in finding out a method of safe disposal of waste plastics. Road surface with neat bitumen can cause bleeding in hot climate, may develop cracks in cold climate, possess fewer loads bearing capacity and can cause serious damages because of higher axle load in present conditions due to rapid infrastructure development. Useful life of bituminous overlays has reportedly declined 7- 8 from average life of 5-6 years in the past to about 3-4 years at present as compared to average pavement life (5-6 years) in abroad. India has to raise transportation system to a higher level both in terms of length and quality. This study presents the use of waste in hot bituminous mixes to enhance pavement performance, protect environment and provide low cost roads. Polymer and plastic modified bitumen, often abbreviated as modified bitumen is obtained with the incorporation of selected thermoplastics and shredded plastic from discarded waste, natural plastic or any other suitable elastomers in bitumen.

POTENTIAL OF PLASTIC TAR ROAD IN DEVELOPING COUNTRIES

The Waste plastic roads absorb very less amount of heat compared to the ordinary flexible & rigid pavements. The durability of the roads laid out with shredded plastic waste is much more compared with roads with asphalt with the ordinary mix. Roads laid with plastic waste mix are found to be better than the conventional ones. The binding property of plastic makes the road last longer besides giving added strength to withstand more loads. While a normal 'highway

quality' road lasts four to five years it is claimed that plastic-bitumen roads can last up to 10 years. Rainwater will not seep through because of the plastic in the tar. So, this technology will result in lesser road repairs. And as each km of road with an average width requires over two tonnes of polyblend, using plastic will help reduce non-biodegradable waste. The cost of plastic road construction may be slightly higher compared to the conventional method. However, this should not deter the adoption of the technology as the benefits are much higher than the cost. Plastic roads would be a boon for India's hot and extremely humid climate, where temperatures frequently cross 50°C and torrential rains create havoc, leaving most of the roads with big potholes. Already, a kilometer long test-track has been tested in Karnataka using this technology. The government is keen on encouraging the setting up of small plants for mixing waste plastic and bitumen for 25 road construction. It is hoped that in near future we will have strong, durable and eco-friendly roads that will relieve the earth from all type of plastic-waste

LITERATURE REVIEW

Amit Kumar Sahu et al studied about the application of Waste Plastic Materials in Road Construction. It is generally found to be nearly 5% in Municipal Solid Wastes (MSW) which is a major environmental threat. Nowadays, plastics are used in our day-to-day life for enormous purposes viz. carry bags in various shops, plastic sheet materials for making roofs of temporary kutcha houses and hutments, packaging materials in LDPE & HDPE manufacturing industries, in drinking water supply and sanitary appurtenances, in electrical appliances, in manufacturing of various electronic appliances etc. in this study the performance of plastic tar road conclusively proves that it is good for heavy traffic due to better binding, increased strength and better surface condition for a prolonged period of exposure to variation in climatic changes Above all, the process helps to dispose waste plastics usefully and easily.

Prof.Dawale S.A studied the use of waste plastic coated aggregates in bituminous road construction. This study deals with the investigations of the use of waste plastic for coating of aggregates in the bituminous road construction. This paper presents the use of plastic which is collected from municipal solid waste for coating aggregates in bituminous road construction. Marshall Properties, impact values, specific gravity, abrasion test, water absorption, soundness and stripping value of the waste plastic coated aggregates were determined. Therefore it is necessary to utilize the wastes effectively with technical development in each field. Use of this waste mix for road construction helps to use plastics waste. Once the plastic waste is separated from municipal solid waste, the organic matter can be converted into manure and used.

Akanksha Yadav did the case study on the use of Waste Plastic in Flexible Pavement Construction. This case study represents the behavior of bitumen mix modified with waste plastic (OMFED). Various percentages of polythene are used for preparation of mixes with a selected aggregate grading as given in the IRC Code. The role of polythene in the mix is studied for various engineering properties by preparing Marshall Samples of BC mixtures with and without polymer. Marshall Properties such as stability, flow value, unit weight, air voids are used to determine optimum polythene content for the given grade of bitumen (80/100). From the study of the behavior of polythene modified BC it was found that the modified mix possesses improved Marshall Characteristics as mentioned below. It is observed that Marshall Stability value increases with polyethylene content upto 4% and thereafter decreases. We observe that the Marshall Flow value decreases upon addition of polythene i.e the resistance to deformations under heavy wheel loads increases. Also the values of the parameters like VMA, VA, VFB are within the required specifications.

Savita Devi et al studied the partial Replacement of Bitumen by using Plastic Waste in Bitumen Concrete. The objective of this work is to suggest the optimum percentage of bitumen that can be replaced by plastic waste .The approach is to find the replacement of the conventional material used in flexible pavement. Bitumen is used as a binding material in construction of flexible pavement, when waste plastic is mixed with bitumen it increases its water resistivity capacity and stability. Laboratory test has shown Plastic mix bitumen act as a better binding material. Plastic waste at different percentage in bitumen has to be check. Marshal stability test is considered to simulate with field conditions. The samples were made with bitumen concrete (asphalt) in which bitumen and plastic has been taken at different percentages in each sample. Test performed on initial sample has shown good result and indicate scope of further investigation. And the result shows that with increase of waste plastic in bitumen increases the properties of aggregate and bitumen and using of waste plastic in flexible pavements shows good result when compared with conventional flexible pavements.

Pratiksha Singh Rajput et al studied the effect of Plastic Waste on Properties of Road Aggregate. This study investigates the use of waste plastic for the modification of properties of road aggregates. The shredded plastic waste was thoroughly mix with heated aggregates forming a layer on the surface of the aggregates .These plastic waste coated aggregates are tested for impact value, crushing value, specific gravity and water absorption. It has been found that there is significantly improvement in the properties of plastic coated aggregates. The use of plastic waste in the construction of flexible pavement is one of the best methods for the safe disposal and better performance of the bituminous mix, if plastic coated aggregates are used. From the test conducted on aggregates coated with different amount of plastic, it is concluded that the coating of aggregates with waste plastic reduces the absorption of moisture.

CONCLUSION

Plastics will increase the melting point of the bitumen. The use of the innovative technology not only strengthened the road construction but also increased the road life as well as will help to improve the environment and also creating a source of income. Plastic roads would be a boon for India's hot and extremely humid climate, where temperatures frequently cross 50°C and torrential rains create havoc, leaving most of the roads with big potholes. It is hoped that in near future we will have strong, durable and eco-friendly roads which will relieve the earth from all type of plastic-waste.

REFERENCES

1. Mercy Joseph Poweth (2013) "Study on use of plastic waste in road construction", ISSN: 2319-8753. Vol. 2, Issue 3.
2. Devesh ojha (2014) "A Proposed Design of Flexible Pavement using Waste Plastic" Volume-4, Issue-5, ISSN No.: 2250-0758.
3. AJIM S. SUTAR (2014) "Experimental investigation on use of low density polyethylene (LDPE) in bituminous road construction" ISSN: 0975 – 6744, Volume 3, Issue 2.
4. Pankaj P.Shedame (2014) "Experimental Study of Bituminous Concrete Containing Plastic Waste Material" e-ISSN: 2278-1684,P-ISSN: 2320-334X, Volume 11, Issue 3 Ver. II.
5. Avula Vamshi (2013) "Use of waste plastic in construction of bituminous road", ISSN: 2325-0224 123 Vol. 2.
6. Shweta N. Rokdey (2015) "Use of Plastic Waste in Road Construction" International Journal of Computer Applications (0975 – 8887).
7. Amit Kumar Sahu (2016) "Application of Waste Plastic Materials in Road Construction" SNCESR.
8. Apurva J Chavan (2013) "use of plastic waste in flexible pavements", ISSN 2319 – 4847, Volume 2, Issue 4.
9. H. K. SHARMA (2015) "Utilization of Waste Plastic in Construction of Pavement" e-ISSN: 2348 - 4470, print-ISSN: 2348-6406.
10. Yash Menaria (2015) "Use of Waste Plastic in Flexible Pavements-Green Roads" Open Journal of Civil Engineering, 5, 299-311.
11. Vatsal Patel (2014) "Utilization of Plastic Waste in Construction of Roads", Volume 3, Issue 4 ISSN No 2277-8179.
12. S.Rajasekaran (2011) "Reuse of Waste Plastics Coated Aggregates-Bitumen Mix Composite for Road Application – Green Method", e-ISSN: 2320-0847, Volume-02, Issue-11, pp-01-13.
13. AMIT P. GAWANDE (2013) "economics and viability of plastic road: a review", Journal of current chemical & Pharmaceutical Sciences, Pharm. Sc.: 3(4), 231-242, ISSN 2277-287.
14. P.B.Rajmane, "Effective Utilization of Waste Plastic In Construction Of Flexible Pavement For Improving Their Performance" IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), ISSN: 2278-1684, PP: 27-30
15. Sangita (2011), "A novel approach to improve road quality by utilizing plastic waste in road construction", Journal of Environmental Research And Development, Vol. 5 No. 4, April-June 2011

