

A Study on Plastic Road

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Abstract— Plastic road is such an invention which is changing the earth's future it is such a solution which will finish off the problem of plastic disposal. Plastic roads are roads made either entirely of plastic or of composites of plastic with other materials. Plastic roads are different from standard roads in the respect that standard roads are made from asphalt concrete, which consists of mineral aggregates and asphalt. Currently, there are no records of regular roads made purely of plastic.

Key words: Plastic Road

I. INTRODUCTION

Plastic has slowly become an integral part of all human requirements. Plastic carry bags, packaging material, bottles, cups, and various other items have slowly replaced everything made of other material due to the advantages of plastic. Plastic is durable, easy to produce, lightweight, unbreakable, odourless, and chemical resistant.

Plastic roads are a relatively new idea, construction processes may vary. In Jamshedpur, India, roads are created from a mix of plastic and bitumen. In Indonesia roads are being built using plastic-asphalt mix in many areas including Bali, Surabaya, Bekasi, Makassar, Solo, and Tangerang. The plastics involved in building these roads consists mainly of common post-consumer products such as products such as Some of the most common plastics used in packaging are polyethylene terephthalate (PET or PETE), polyvinyl chloride (PVC), polypropylene (PP), and high and low density polyethylene (HDPE and LDPE).

Plastic garbage is commonly seen around the country and has started causing several problems. Plastic waste clogs drains, causing floods. It chokes animals who eat plastic bags, etc. Plastics found in fields blocks germination and prevent rainwater absorption.

II. LITERATURE REVIEW

A. Plastic Man of India [Prof. R. Vasudevan]

Rajagopalan Vasudeva is known as the "Plastic Man of India" for devising an innovative way of disposing of plastic waste – by using it to build roads. He received several awards for his work, including the Dr APJ Abdul Kalam Memorial award for Innovation in Governance earlier this year. His research was showcased on the television talk show Satyameva Jayate as an innovative solution to the growing problem of plastic. Rajgopalan Vasudevan invention completed both SWACHH BHARAT ABHIYAN & MAKE IN INDIA MISSION. He was honoured with Padma shri award in 2018 he said that, "Plastic is the poor man's friend. In villages, where 70% of people live, they use plastic mats, plastic chairs, plastic carry bags... without it, they cannot live. So we cannot ban plastics, but we have to find a better method to dispose of it. Vasudevan credits his innovation to his love for chemistry. He started his career as a teacher in

1972, when he joined a polytechnic institute in Tamil Nadu. He was 26 then. after getting a PhD in chemistry, he was working in a polytechnic institute," After working there for three years, he understand the importance of chemistry to mankind." Vasudevan joined the Thiagarajar Engineering College in 1975. In the 2000 as he neared the end of a long career in teaching, he started working on his idea of plastic roads and waste management. He retired from the college in 2003 at the same time, he worked as a consultant to several firms.

Vasudevan's innovation was patented in 2006 and it generated interest among civic bodies in the country and in Japan and China as well. The professor, however, chose to share the technology with the Indian government for free. It has since been used to build over 100,000 km of roads in at least 11 states, including Tamil Nadu. Since 2013, India has been generating around 15,342 tonnes of plastic waste daily, or 5.6 million tonnes a year, according to a report released by the Central Pollution Control Board. Only a fraction of this is recycled or reused. a plastic road needs only 9 tonnes of bitumen and one tonne of plastic, unlike normal roads that need 10 tonnes of bitumen per kilometre," he said. "The plastic road's life is not less than 10 years. no potholes will be formed during monsoon." To lay one kilometre of road, you need one tonne of plastic i.e. 10 lakh plastic carry bags. Today, India has 41 lakh km of road, and we do not have enough plastic to convert all of them into plastic roads. So we should not have any problem in disposing of plastics in the future using this technology."

III. RESEARCH METHODOLOGY

A. Construction:



IV. MATERIALS USED

A. Aggregate:

Aggregates used in surface course can be divided into two types according to their size: coarse aggregates and fine aggregates. Coarse aggregates are generally defined as those retained on the 2.36 mm sieve. Fine aggregates are those that

pass through the 2.36 mm sieve and are retained on the 0.075 mm sieve. Aggregates required for the research work will be procured from the local market.

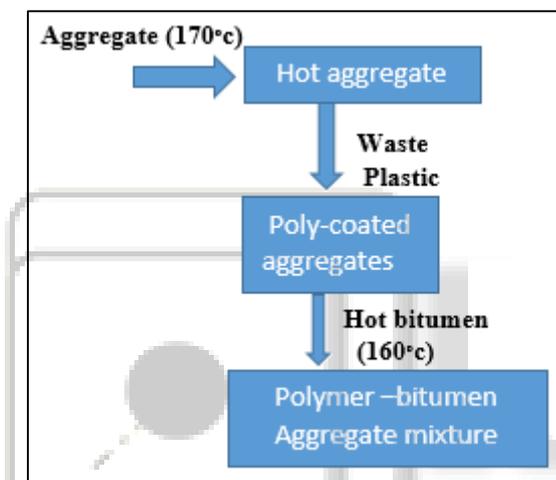
B. Bitumen:-

Bitumen acts as binding agent for aggregates in bituminous mixes. Generally in India bitumen used in road construction of flexible pavement is of grades 60/70 or 80/100 penetration grade. Both the grade of bitumen conforming to BIS standards will be used for the present studies

C. Waste Plastic Modifiers:-

Modifiers are generally used to enhance the properties of bituminous concrete mixes by reducing the air void present between the aggregates and also to bind them together so that no bleeding of bitumen will occur. For the present study plastic waste such as carry bags, water bottles, milk packets, glasses, cups, etc will be used as a modifier.

D. Plastic Road Process



E. Dry Process

1) Step 1

plastic waste like bags, bottles etc. are cut into a size between 2.36 mm & 4.75 mm using shredding machine.

2) Step 2

The aggregate mix is heated to 170°C & then it transferred to mixing chamber

3) Step 3

Similarly the bitumen heated up to a maximum 160°C

4) Step 4

At the mixing chamber, the shaded plastic waste is added over the hot aggregate

5) Step 5

The plastic waste coated aggregate is mixed with hot bitumen.

F. WET PROCESS

1) Step 1:

Waste plastic by direct mixing with hot bitumen 160°C

2) Step 2:

Mechanical stirrer is needed since the wet process require a more investment & bigger plants so not commonly used



V. ADVANTAGE OF PLASTIC ROAD

- [1] Better resistance towards rainwater and water stagnation
- [2] No stripping and no potholes.
- [3] Increase binding and better bonding of the mix.
- [4] Reduction in pores in aggregate and hence less rutting and traveling.
- [5] No effect of radiation likes UV.
- [6] The strength of the road is increased by 100%.
- [7] The load is withstanding property increases. It helps to satisfy today's need for increased road transport.
- [8] For 1km X 3.75m road, 1 ton of plastic (10 lakh carry bags) is used, and 1 ton of bitumen is saved.
- [9] Value addition to the waste plastics (cost per kilogram increased from Rs 4 to Rs12).
- [10] The cost of road construction is also decreased.
- [11] The maintenance cost of the road is almost nil.
- [12] Disposal of waste plastic will no longer be a problem.
- [13] The use of waste plastics on the road has helped to provide the better place for burying the plastic waste without causing disposal problem.
- [14] Employment for unskilled labourers will be generated.
- [15] Resistance to water
- [16] Reduced cost of maintenance
- [17] Reduced stress on bitumen which is not an unlimited resource either.
- [18] Best use of plastic waste. This thin plastic is not recyclable and the only ways of disposing them are incineration or landfilling.
- [19] Completely eco-friendly.
- [20] Inculcation of waste segregation culture. If every other country can do it, nothing should be stopping India from making a start somewhere

VI. DISADVANTAGE OF PLASTIC ROAD

- [1] Cleaning process- Toxics present in the co-mingled plastic waste would start leaching.
- [2] During the road laying process- in the presence of chlorine will releasenoxious HCL gas.
- [3] Most challenging task to be collected good quality of plastic waste, availability and segregating of unique objects.
- [4] After the road laying- It is opined that the first rain will trigger leaching. As the plastics will merely form a sticky layer, (mechanical abrasion).

- [5] The components of the road, once it has been laid, are not inert.



VII. CONCLUSION

Constructing a road would take days instead of months & road would last three time as long. Plastics will increase the melting point of the bitumen. Hence, the use of waste plastics for pavement is one of the best methods for easy disposal of waste plastics. The use of the innovative technology not only strengthened the road construction but also increased the road life as well as creating a source of income. Plastic roads would be a benefiting for India's hot and extremely humid climate, where temperatures frequently cross 50°C, and to heavy fall of rains create damage, leaving most of the roads with big potholes (a deep natural underground cave formed by the erosion of rock, especially by the action of water. 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.

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