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USE OF WASTE PLASTIC IN ROAD CONSTRUCTION IN INDIA

Prof. P.K. Patil [*1] Dr. A.W.Kharche [*2]

[1]*Assistant Professor, Department of Civil Engineering, Padmashri Dr. V.B. Kolte College of Engineering, Malkapur, India*
[2]*Professor, Department of Civil Engineering Padmashri Dr. V.B. Kolte College of Engineering, Malkapur, India*

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ABSTRACT

In India plastic consumes an estimated 28.5 million tonnes, as per this June 2022 report of Down to Earth. Additionally, according to industry body FICCI, 43 per cent of India's plastics are used in packaging and are single-use plastic. Consequently almost 80 percent of total plastic produced in India is discarded. Some of it is either burnt leading to air pollution, ends up in landfills or clogs drains. It chokes animals who eat plastic bags, etc. Plastics found in fields blocks germination and prevent rainwater absorption. Besides improving environment sustainability, roads made by Plastics are found more durable and cost-effective. Plastic and bitumen bond well together because both are petroleum products. This combination enhances the road's ability to carry weight, as well as its life. The roads also show greater resistance to damages caused by heavy rains. Particularly in India in metropolitan cities seen that use of plastic is increased day by day, but due to lac of waste management we used waste plastic in road construction. It is cheaper in rate also.

Keywords*: *Waste Plastic, Plastic Roads, Environmental Pollution, Consumption

1. INTRODUCTION

1.1 Economics of Use of Plastics for Construction in Roads:

In India waste plastic used in different works but in infrastructure development highway construction is widely used this waste plastic in large scale. So waste plastic is used in road construction also.It has been found that modification of bitumen with shredded waste plastic marginally increases the cost by about Rs. 2500 per tonne. However this marginal increase in the cost is compensated by increase in the volume of the total mix, thereby resulting in less overall bitumen content, better performance and environmental conservation with usage of waste plastic. In this paper we studied how waste plastic is used in road construction in large scale and cost of road construction is very economical.

Fig:1 Waste Plastic

The process of using plastics for road construction gained momentum in 2015, when Union government issued guidelines on plastic use with hot mixes for bitumen roads around urban areas.

Fig 2 Plastic road in Kerla

The Ministry of Road Transport and Highways has issued guidelines for use of plastic waste in wearing course of National Highways on pilot basis. The plastic waste has been used in the state of Tamil Nadu for about 11 Km length and about 1 Km length in the state of Kerala.

Subsequently, India has built one lakh kilometres of roads in at least 11 states using discarded plastic. The front runners have been following cities:

Chennai, Pune, Surat, Indore.

As of July 2021, 703 km length of National Highways has been constructed using waste plastic in wearing coat of flexible pavement. This information was given by Union Minister for Road Transport and Highways, Shri Nitin Gadkari in a written reply in the Lok Sabha. Additionally, Ministry of Road Transport and Highways has issued guidelines for mandatory use of waste plastic in Periodic Renewal with hot mixes and in wearing coat of service road on National Highways within 50km periphery of urban area having population of more than 5 lakhs. This thesis aims to look into the proper use of materials of different properties in buildings, inother to achieve thermal comfort.

2. METHODOLOGY

In order to carry out an effective study, the following objectives were highlighted, whichincludes:

Global plastic waste generation more than doubled from 2000 to 2019 to 353 million tones. Nearly two-thirds of plastic waste comes from plastics with lifetimes of under five years, with 40% coming from packaging, 12% from consumer goods and 11% from clothing and textiles.

Step-by-Step Process of Plastic Recycling:

The recycling of plastic is not as hard as manufacturing new plastic products. Nonetheless, plastic recycling is not a walk in the park. It involves rigorous procedures and attention to detail. The processes may take months. Irrespective of the type of plastic and its usage, it usually undergoes some general steps during recycling. Here are six essential steps to recycle plastic materials.

Step 1: Collection of Waste Plastic

The first step to plastic recycling is gathering waste plastic products. While this process may seem like an easy task, it is not entirely so.At this stage, employees or volunteers go around collecting waste plastic from homes, offices, and public places. Certain areas have collection sites where people can dispose of their plastics.

Step 2: Sorting of Plastics into Categories

After collection, recyclers send the plastic they have gathered to facilities where they separate the plastics according to types. As you must already know, plastics differ in size, color thickness, and use. In this process, recycling machines sort plastics based on the properties of the material.

Step 3: Washing to Remove Impurities

After sorting plastics, recyclers wash the materials to remove impurities. These impurities in plastic include paper labels, dirt, and particles. Washing plastic also removes glue and additional chemicals that plastic materials may contain. Washing is essential because failure to remove impurities may damage the new product. Moreover, the contaminants contained in plastic products are not plastic materials and may not be recyclable.

Step 4: Shredding and Resizing

This process comes immediately after washing plastics. It is impossible to recycle plastic in its already developed state. There is a need to resize the plastic material to a form that can be recycled. In this fourth process, materials will be put into shredders to reduce the plastic into fragments.

Step 5: Identification and Separation of Plastics

After resizing has been completed, the next process is to identify and separate plastic materials. In this process, plastic particles undergo testing procedures. The reason for testing plastics is to identify the class and quality of the plastic. The plastic materials are then separated based on their features for further processing.

Step 6: Compounding

Compounding is the final process in plastic recycling. This step is where recyclers transform plastic particles into materials that manufacturers can reproduce. Compounding involves smashing and melting plastic particles to create pellets. This process is also called extrusion.

3. RESULTS AND DISCUSSION

Benefits of Plastic Recycling:

After all, the process looks cumbersome, and you must justify it based on its benefits. Well, the fact is that it comes with various benefits. And these benefits are why you should encourage recycling.

- Plastic recycling reduces the amount of trash that ends up in the oceans.
- Plastic recycling creates new jobs.
- Plastic recycling creates additional revenue for the government and private organizations.
- Recycling plastic reduces the release of carbon dioxide and harmful gases into the environment.
- Plastic recycling conserves the space used as landfills. It makes it possible to use those landfills for other purposes.
- Recycling saves petroleum that producers may use to make new plastics.
- Plastic recycling lessens the energy that manufacturers consume in creating new products.
- Plastic recycling prevents global warming.
- Plastic recycling reduces the emergence of all forms of pollution.
- Plastic recycling provides income for volunteers who collect plastic waste.
- Plastic recycling helps reduce activities like deforestation that happen when making new plastic.
- Encourages a Sustainable Lifestyle among People

4. CONCLUSIONS:

1. Overall consumption of bitumen decreases.
2. While asphalt roads last for three years, roads with plastic have longevity of seven years. (Increased Marshall Stability Value)
3. Water does not seep through – hence less stripping and potholes
4. Road does not crack or melt, so maintenance cost of the road decreases.
5. No leaching of plastics and no effect of radiation like UV.

Plastics serve lots of purposes in our daily life. This article has explained plastic recycling and the benefits the world stands to gain if we recycle plastic. So, when next you empty a plastic bottle, don't just throw it away. Be sure to dispose of plastic in a way that makes it possible for it to get recycled.

5 REFERENCES:

[1]. Dr. V. Vasudevan, TEC, Madurai, and CRRI, New Delhi
[2]. Appea A. K., Al-Qadi, I. L., Bhutta, S. A., and Coree, B. J., "Quantitative Assessment of
[3]. Transmission Layer in Flexible Pavements," 77Th Transportation Research Board, Paper No. 980994, Washington, DC, 1998.
[4]. http://www.pardos-marketing.com/paper_h04.htm (26 August, 2014)
[5]. D. Ashutosh, Tewari A., M. K. Chaturvedi, "Plastic waste and its recycling", VSRD Technical and Non Technical Journal, Vol-I(1), 2000, 30-34
[6]. IRC, "Guidelines for the Design of flexible pavements," IRC: 37-1970, Indian Roads Congress.
[7]. Battiato, G., and Verga, C., "The AGIP Visco elastic Method For Asphalt Pavement Design," Proceedings of The Fifth International Conference On The Structural Design Of Asphalt Pavements, Netherlands, August 23-26 1982 pp.59-66.
[8]. Barksdale, R. D., Brown, S. F., and Francis, C., "Potential Benefits of Geosynthetics in Flexible Pavement Systems," National Cooperative Highway Research Program, Report No.315, Transportation Research Board, Washington, D. C. 1989.
[9]. ISI, "Indian Standards Specifications for Roads Tar", IS: 215, Indian Standard Institution M. Mani. Et al. characterization and effect of using waste plastic oil and diesel fuel Blend compression ignition engine. Energy36 (2011), 212-219