

Plastic Roads - A New Innovation

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Abstract

"Plastic polymeric material that has the capability of being molded or shaped usually by the application of heat and pressure" is defined by Britannica Plastic has a wide range of applications. We utilize plastic in our daily lives, and it has been discovered that while plastic products are robust and long-lasting, they do not have any negative aspects. One of its main drawbacks is that it recycles label material but not biodegradable material. As a result, bitumen and the best plastic can be used together to create a powerful combination for building roads.

Keyword: Plastic roads, durable, bitumen, manage plastic waste, environment friendly.

INTRODUCTION

Nowadays, plastic is a term that is used in practically every industry because of its many qualities, such as being lightweight, flexible, affordable, and resistant to moisture. However, when a product made of plastic becomes toxic, it can be recycled but never decomposes like paper. As a result, we see plastic waste all over the roads and even large pieces of plastic debris on the outskirts of cities. Most of this waste is made up of polythene cups, bags, and other materials.

The surrounding vegetation and fauna are at risk from the trash. When plastic burns, hazardous and dangerous chemicals including mercury, dioxins, furans, etc. are released into the air, affecting both human and animal health. Animals occasionally inadvertently ingest plastic, which leads to their premature demise. Since Marie Lu stated that there is always a solution to a problem, one major solution for the waste plastic is the construction of plastic roads. If supported and encouraged by the road authorities, this solution will have many benefits, including cost effectiveness, durability, and environmental friendliness.

The management of plastic garbage will be substantially aided by the plastic road. Countries like the US, UK, Australia, India, and others are at the forefront of building plastic highways to manage your plastic garbage more effectively and efficiently.

REVIEW OF LITERATURE

Dr. R. Vasudevan, an Indian scientist, came up with the concept of the "plastic road." He believed that bitumen could be mixed with plastic garbage and used to build roads. His primary goal was to dispose of plastic garbage more sustainably. He also conducted research on bitumen's characteristics and the construction of

plastic roadways. He devised and built the plastic bitumen model, demonstrating the model's resilience.

METHODOLOGY

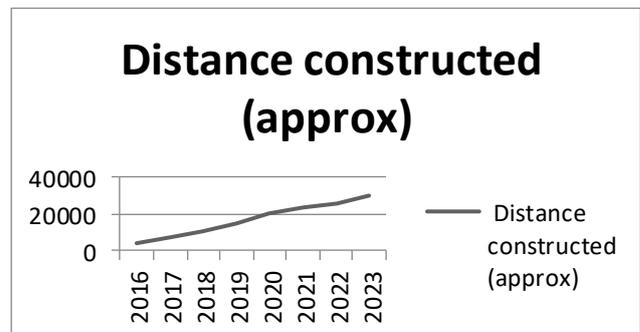
Both primary and secondary data serve as the foundation for the study. By creating a questionnaire with ten questions that precisely correspond to the issue, the primary data is extracted. The secondary data was taken from a number of websites and articles. The study began on September 4, 2024, and it carefully examined the subject. The research is both qualitative and quantitative in character.

FINDINGS

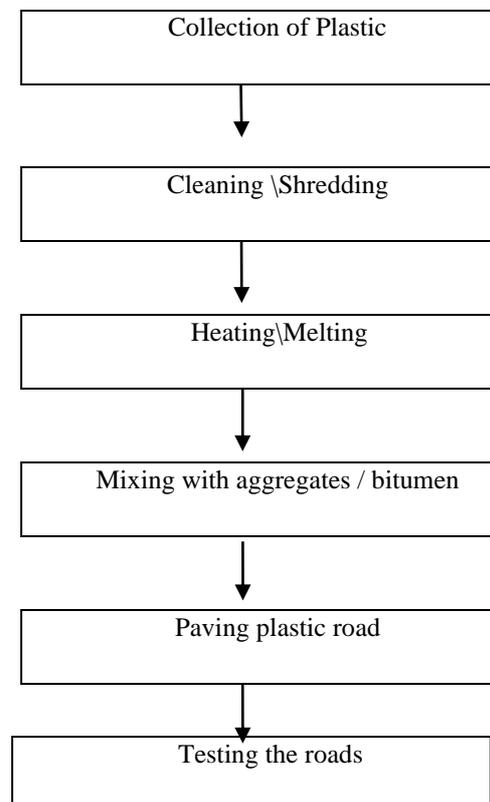
TIMELINE OF PLASTIC ROADS

- In 2004, Kambainallur, in the Dharampuri district of Chennai, saw the construction of the first 1000-kilometer plastic road. Thaigarajar College of Engineering patented the technology of building plastic roads in 2006.
- In 2009, a 703-kilometer national highway was built in Bangalore utilizing plastic garbage.
- Himachal Pradesh Chief Minister PK Dhumal declared in 2010 that plastic garbage would be mixed with bitumen when building roads.
- The IRC updated its plastic regulation in 2013, adding the use of plastic trash in road construction.
- In 17 districts containing plastic garbage, the Madhya Pradesh Rural Road Development Authority built about 35 km of roads in 2014.
- More than 1 lakh kilometers of roads were built utilizing plastic garbage after Union Minister for Road Transport and Highways Nitin Gadkari announced in 2016 that it was permitted to be utilized in road construction.
- In 2018, Meghalaya used 470 kg of plastic garbage to construct its first plastic road in Nongstoin, West Khai Hills.
- Three thousand kg of recycled plastic were used to construct a road in Bangalore in 2022.
- On 26 June 2024, Jaipur military station becomes the second military station in the country to have a plastic road. Even a road of 813 km constructed in Lucknow using plastic waste.

Years	Distance of roads constructed till (approx)
2016	3000-5000 km
2017	5000-10000 km
2018	10000 km
2019	15000 km
2020	20000 km
2021	20000-25000 km
2022	25000 km
2023	30000 km



PROCESS OF BUILDING A PLASTIC ROAD



It's really creative to build highways out of plastic since it will make managing plastic waste easier. Following every stage of the procedure is essential, even if the creation of plastic roadways was patented in 2006. Therefore, the following processes are involved:

1. Plastic collection and sorting

Waste is gathered from a variety of locations, including communities, recycling facilities, and landfills. This garbage include plastic items such as straws, fishing nets, plastic bags, plastic pipes, food and drink containers, toys, and more. To make sure the garbage is compatible with the road mixture, it is then sorted according to its type and quality. After confirming if it is polythylene or polypropylene, the next procedure is initiated.

2. Clean up and shredding

Plastic garbage is collected, sorted, and then cleaned to get rid of contaminants like sand, grime, and other materials. To make it easier to combine with other road components, the trash is then shred into uniformly small pieces.

3. Melting and heating

After that, the plastic shreds are heated to a certain temperature in order to soften them. After that, it begins to melt and turn into a liquid, which is ready to be mixed with other components of the road mixture.

4. Combining Bitumen with Aggregates

Following the addition of bitumen to bind the plastic and aggregate together, the plastic liquid is combined with aggregate, such as crushed stone or gravel, to provide structural support. Bitumen is a black material that functions similarly to glue.

5. Paving the way

Various paving tools are then used to lay the finished slurry on the road surface. To guarantee a smooth and long-lasting finish, it is compacted or pressed with heavy rollers after paving.

6. Road testing

Following the compacting process, the road is allowed to cool and solidify. The road is evaluated on a number of parameters, including strength, resistance, and durability, once it has cooled.

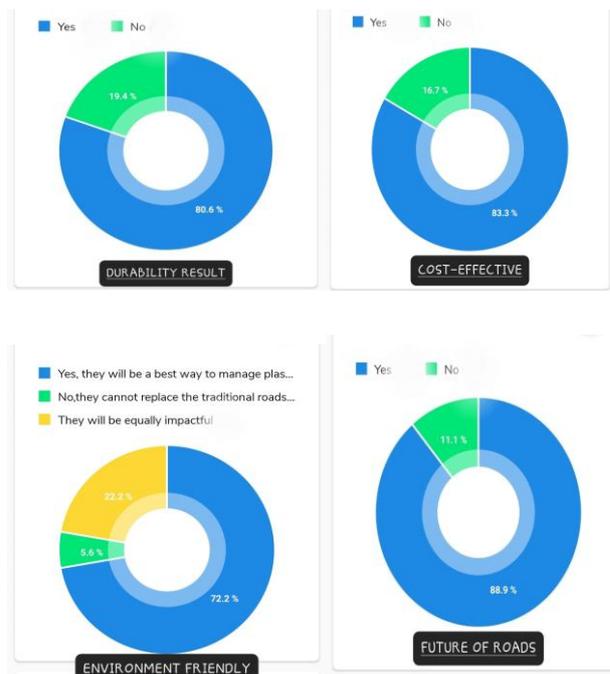


Plastic aggregate bitumen interaction model for the Plastics waste coated aggregate bitumen mix.

The survey's findings

The survey's foundation is a pilot research with thirty participants. A questionnaire consisting of ten items is used to conduct this survey. The responders came from areas where plastic has been found during the previous few years, such as Delhi, Bangalore, Mumbai, Lucknow, Noida, etc.

Data about the benefits of plastic roads and how people find them beneficial is gathered through the questionnaire. Pie charts are used to display the data below.



CONCLUSION

Plastic roads are the most practical way to reduce the amount of plastic waste in the environment because they can easily replace traditional asphalt roads and have many advantages, such as durability, cost effectiveness, and environmental friendliness. They also play a significant role in managing plastic waste and improving infrastructure.

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