



Use of Plastic Waste in Road Construction

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Abstract: We face Challenges and for developing countries like India, china, etc. The major problem they are suffering is the disposal of plastic waste and establishing a road network which is economical and durable with the help of this presentation we are trying to introduce various ways in which plastic can be utilized and since our project is mainly focusing on plastic roads we have also explained various steps to be followed for using plastic in roads. With the help of this technology a major problem of disposal of plastics waste can be solved at the same time, using plastic in roads increases the strength and durability of roads, On the other hand it is economic pollution free and safe. Plastic technology has a wide range of scope. Since this can be used in cloth making, Rail Sleepers and also plastic can be used as construction material and if plastic roads are brought into regular practice this will increase the demand of transportation engineer who are aware of this technology. Increasing demand of plastics will also enhance the work of plastics pickers, hence solving the problem of employment. The Question frequently arising in my mind is when this technology has proved to be economical, durable and safe then why it is not brought into regular practice???? So In my opinion this technology must be adopted for the fast growth of our road networks.

Keywords: Plastic Waste, Bitumen, Aggregate, Plastic Roads.

1.0 INTRODUCTION

A Plastic Material is any of a wide range of synthetic or semi-synthetic organic solids that are mouldable. Plastic are typical organic polymers of high molecular mass, but they can often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, but many are partially natural. Basically it is the non degradable material. Plastics have numerous properties that make them superior to other materials in many applications. Plastics generally have: Resistance Corrosion and Chemicals , High strength to Wet Ratio, Low electrical and Thermal conductivity, Colours available in a wide variety and transparent //*, Resistance to shock, Good Durability, Low cost, Are easy to Manufacture, Resistant to Water and Have Low Toxicity.

2.0 LITERATURE REVIEW

1) **Dr. R. Vasudevan** states that the polymer bitumen blend is better binder compared to plain bitumen. Blend has increased softening point and decreased penetration value with a suitable ductility. When it is used for road construction it can withstand higher temperature and load. The coating of plastics reduces the porosity, Absorption of moisture and improves soundness. The polymer coated aggregate bitumen mix forms better material for flexible pavement construction as the mix shows higher Marshall Stability value and suitable Marshall Coefficient. Hence the use of waste plastics for flexible pavement is one of the best methods for easy and prevention of pollution and so on. According to **V.S. Punith** (2001), some encouraging results were reported in this study that there is possibility to improve the performance of bituminous

mixes of road pavements. Waste plastics (polythene carry bags, etc.) on heating soften at around 130°C. Thermo gravimetric analysis has shown that there is no gas evolution in the temperature range of 130°C-180°C. Soften plastics have a binding property. Hence, It can be used as a binder for road construction.

3.0 TYPES OF PLASTICS

1. Thermosets.
2. Elastomers.
3. Thermoplastics.

4.0 METHODOLOGY:

- 1) Basic process:
 - a) segregation
 - b) Cleaning process
 - c) Shredding process
 - d) Collection process
- 2) Field Trials:
 - a) Dry process
 - b) Wet process

1) Basic process:

a) Segregation

Plastic waste collected from various sources must be separated from other waste. Maximum thickness is 60 microns.



b) Cleaning Process

Plastic Waste get cleaned and dried.



c) Shredding Process

Will be shredded or cut into small piece. The different types of plastic wastes are mixed together.



d) Collection Process

The plastic waste retaining in 2.36mm is collected.

2) Field trials:

a) Dry Process

The Aggregate is Heated to 170°C in the mini hot mix plant. Add the fibre in equal and required proportion.



Immediately the hot bitumen 60/70 or 80/100 grade (160°C) is added

The mixture is transferred to road and the road is laid



**b) Wet Process**

1. Waste plastics by direct mixing with hot bitumen at 160°C.
2. Mechanical stirrer is needed.
3. Addition of stabilizers and proper cooling.
4. Since the wet process require a lot of investment and bigger plants.
5. Not commonly used.

5.0 ADVANTAGES AND DIS-ADVANTAGES**ADVANTAGES:**

- Increases the plasticity of road.
- Water Repellent.
- By which crack does not occurs.
- Segregation does not occur.
- Reuse of plastic.
- Cheap.
- Good utilization factors.
- Good compaction and bonding factors.
- Use of higher % of waste plastic.
- Reduce 10% of bitumen requirement.
- Increases the strength and performance of roads.
- Reduces the cost to around 5000/km of single lane roads.
- Generate the job for rag picker.
- It is eco-friendly.
- By which environment will be clean.
- Save ecosystem and stop erosion of soil.

DIS-ADVANTAGES:

- Cleaning process.

Toxic present in the co-mingled plastic waste would start leaching.

- During the road laying process.
Due to presence of Noxious HCL Gases.

6.0 COMPARISON

1. The durability of roads laid out with shredded plastic waste is much more compared with roads with asphalt with the ordinary mix.
2. While a normal 'highway quality' road last four to five years it is claimed that plastic-bitumen roads can last up to 10 years.
3. Rainwater will not seep through because of plastic in tar.
4. The cost of plastic road construction may be slightly higher compared to the conventional method.
5. The maintenance cost is low as compared to conventional method.
6. Its initial cost is slightly more as compared to conventional method.

7.0 CONCLUSION

- 1) Plastic will increase the melting point of the bitumen.

- 2) This innovative technology not only strengthened the road construction but also increased the road life. Plastic road would be boon for India's hot and extremely humid climate, where temperature frequently crosses 50°C.

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