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A Review on Plastic Roads

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ABSTRACT—

Disposal of plastic waste is major problem in India. Plastic consists o both commercial and industrial can be problem of disposal of waste plastic. Therefor it is necessary to utilize waste effectively with technical development day by in each filed. Many of products are produced by using plastic waste.

Plastic roads would be backbone for our country and near future we will have strong, durable, and eco-friendly roads which will receive the earth from all type of plastic waste. This process is ecofriendly and economical too.

Keywords: Plastic waste, plastic roads and eco-friend nature.

I. INTRODUCTION:

Today, plastic is used extensively across many industries, including those in agricultural, electrical, packaging, transportation, building construction, and communication. After the industrial revolution, usage began, and it appeared to be affordable to produce on a big scale. Plastic is often not biodegradable, and numerous studies have shown that it takes plastic 4500 years to break down. Numerous studies have demonstrated that improper plastic disposal results in numerous health issues and lowers soil fertility. There are 400 million tons of plastic produced each year worldwide, but only 10% of that plastic is recycled. The qualities of bituminous roads are being improved through a variety of experiments.

The utilization of discarded plastic in road construction represents a recent development in that study. Utilizing plastic in road construction is gaining importance.

Fig-1: Plastic waste

Table-1: Types of plastic & usage:

TYPE OF PLASTIC	ORIGIN
Low density polyethylene (LDPE)	Bags, sacks, and bin lining
High density polyethylene (HDPE)	Bottle of pharmaceuticals, disinfectants, milk, fruit juices and bottle caps.
Polypropylene (PP)	Film wrapping for biscuits, microwave trays for readymade meals.
Polystyrene (PS)	Yoghurt pots clear egg packs, bottle caps.
Polyvinyl chloride (PVC)	Mineral water, folders, toys, pipes, furniture, and pens.

Fig-2: types of plastic images

I. MATERIALS USED

1. Aggregate:

Size of aggregate is 20mm and 10mm

Examples: Stone dust and lime as fillers.

Fig-3: Aggregate

2. **Bitumen:**

It refers to a substance produced through the distillation of crude oil. Commonly bitumen grades are 60/70 and 80/100.

Fig-4: Bitumen

3. **Plastic waste:**

The roads constructed using waste plastic, popularly known as plastic roads when compared to conventional bituminous road. PVC is not used for construction of roads.

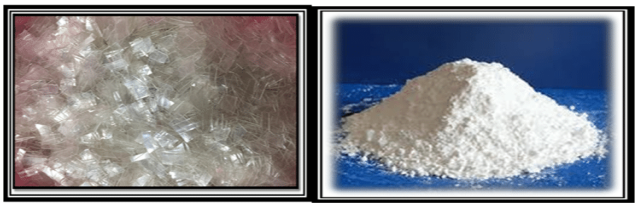

Fig-5: Plastic waste

II. CONSTRUCTION OF ROADS:

The roads are constructed by using following steps below:

Step-1:

Plastic waste (bags, cups and bottles) made out of PE; PP & PS cut into a size of 2.36mm & 4.75mm by using shredding machine.

Fig-6: plastic waste by using shredding machine

Step-2:

The aggregate mix is heated to 165^0C (as per the HRS specification) and transferred to mixing chamber. An amount of plastic to be added is 8% of bitumen.

Fig-7: Aggregates

Step-3:

Similarly, the bitumen is to be heated up to a maximum of 160^0C should have strong binding and avoid weak bonding as per the HRS Specification (Monitoring the temperature is very important).

Fig-8: Heating of bitumen

Step-4:
At the mixing chamber, the shredded plastics waste is to be added. Within 30 to 60 seconds, it evenly coats the aggregate, giving it an oily appearance.

Fig-9: shredded plastic waste over the aggregate

Step-5:
The plastic waste coated aggregate is mixed with got bitumen and the resulted mix is used for road construction. The 8-ton roller is being used.

Fig-10: laying of road by using bitumen and aggregates mixing

Step-6: The road laying temperature is between 110^0C to 120^0C and the rollers are used have capacity 8-ton generally.

III. FIELD TRAILS:

There are two types of filed trails are:
1. Dry process
2. Wet process

1. Dry process:

Aggregates→ hot aggregates (mixing of plastic waste) → Adding of bitumen with coated plastic waste→ Road laying

2. Wet process:

- Plastic waste is directly mixing with hot bitumen at 160^0C.
- We require a Mechanical stirrer.
- Stabilizer addition and appropriate cooling
- Since the wet process require a lot of investment and bigger plants.

IV. COMAPRISION BETWEEEN ORDINARY BITUEMN ROAD AND PLASTIC WASTE ROADS:

S.NO	PROPERTIES	ORDINARY ROADS	PLASTIC ROADS
1	Marshall stability value	Less	More
2	Binding property	Good	Better
3	Softening point	More	Less
4	Penetration value	Less	More
5	Rutting	More	Less
6	Stripping (pot holes)	More	No
7	Durability of roads	Good	Better
8	Seepage of water	Yes	No

V. ADVANTAGES OF PLASTIC ROADS:

- Stronger road with increased Marshall Stability Value.
- Better resistance towards rain water and water stagnation.
- No potholes.
- Increased binding and improved mix bonding.
- No UV-like radiation effects.
- It contributes to meeting the current need for more road transport by increasing the road's strength by 100% and its capacity to resist additional loads.
- It helps to satisfy today's need of increased road transport.
- The cost of road construction is also decreased when compared to standard road constructions.
- In future, Disposal of plastic waste will no

longer be a problem.

- The use of plastic waste on the road has helped to provide better place for buying the plastic waste without causing disposal problem.

VI. USAGE OF PLASTIC MATERIALS:

- Plastic waste collected from various sources must be separated from other waste. Maximum thickness of plastic is 60 microns.
- After the collection of plastic materials, plastic waste gets cleaned and dried.
- Different types of plastic wastes are mixed and plastics get shredded or cut into small pieces.
- Then sieve analysis is conducted to collect the plastic waste retaining in 2.36mm.

VII. CONCLUSION:

By using this innovative technology, not only strengthened the road construction but also increased the road span and helps to improvement the environment. Most of the places have been implemented this process for road construction to decrease the climatic conditions of producing huge waste. This is very easy and does not require any machinery for construction of road. For every kilometer, approximately 40-50 grams of bitumen is used and $1/10^{th}$ of plastic waste. It increases the aggregate impact value and quality of flexible pavements also improves.

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