

PLASTIC ROADS-USAGE OF WASTE PLASTIC IN CONSTRUCTION OF ROADS BY EMPLOYING PVC PIPES

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Abstract : The global plastic production is increasing rapidly with rise in population and changes in life style. This makes the disposal of plastic is becoming complicated because of the non-biodegradable property. So it is better to recycle than disposal. One of the trend in recycling of plastic is use in construction of roads. This type of recycling can also help in protecting the environment from the greenhouse gases that are exposed to atmosphere while disposal. The waste plastic in form of bottles, cups, caps, etc are made in form of powder or blended with crusher and coated over the aggregate and bitumen mixture by heating process for roads construction. This polymer coated aggregate and bitumen mixture shows high strength, better binding property, stability, and increase in wear resistance, better durability and tear of roads.

IndexTerms - Aggregate, Bitumen Mixture, Plastic, Composition, Economy, Recycling

I. INTRODUCTION

Today every sector around the world from agriculture to electrical, packing, automobile, building construction, communication sector are widely using plastic. The usage was started after the industrial revolution and its large scale production seemed to be cheap. Generally plastic is a non- biodegradable and many research found that plastic take around 4500 years to degrade. Several studies proven that the disposal of plastic causes many health problems and also reduces the fertility of soil. The plastic production over the world has crossed 400 million tons and the recycling of plastic is only 10%. Various experiments are being conducted in order to improve the properties of bituminous road. The recent advancement in that study is use of waste plastic in road construction. The use of plastic in road construction is gaining importance now a days due to its performance, life span and low construction cost.

II. IDENTIFY, RESEARCH AND COLLECT DATA

We done some research using previous data of journals, by that we concluded that 'in previous journals they didn't used PVC pipes so here we are using pvc to construct plastic roads .it gives better strength than the normal roads /ordinary roads.

III .CONSTRUCTION METHODS

The process of construction of plastic roads are :

- 1.Dry Process
- 2.Wet Process

1.DRY PROCESS

1. The plastic waste is dried and cleaned to remove the impurities. Then cut into 1.18mm - 4.36mm in shredding machine. The PVC should be eliminated from the plastic waste incleaning process.
2. As per HRS specifications the aggregate is heated to 165oC and the bitumen is heated to a extent of 160oC to have good binding property. In mixing chamber the cut plastic is added to hot aggregate to apply coating uniformly over aggregate for 30 to 45 seconds.
3. The plastic coated aggregate is added to bitumen at a temperature between 150oC - 165oC.

2.WET PROCESS

1. The plastic is collected 60 micron or below sizes preferred for next step. The reason behind this is that less size of plastic can easily mixable with hot bitumen at temperature between 160oC- 170oC.
 2. The bitumen is heated to 160oC-170oC which is the melting temperature of plastic.
 3. The fine pieces of plastic is added to the hot bitumen
- At constant temperature mixture was stirred manually for about 20-30min.

IV.COMPOSITION

The analysis of plastic roads mainly depends on the percentage of plastic used, grade of bitumen and size of aggregate. It is suggested to use an aggregate of size 10mm - 20mm. 60/70, 80/100 grade of bitumen and maintaining the laying temperature between 110oC to 120oC. As the percentage of plastic increases softening point, flash point and fire point increases whereas penetration value and ductility decreases. From the experimental results the percentage of plastic is given as 10%. The porosity should be less than 2%. Due to this porosity the air is accumulated in bitumen and it causes oxidizing of bitumen. This makes bitumen hard. The coating of plastic reduces the porosity. Also stone dust and lime are used as filler materials. The Impact value and Los Angeles abrasion value decreases with increase in percentage of plastic.

VI.COMPARISION OF PROPERTIES IN ORDINARY ROADAND PLASTIC ROAD**ECONOMY**

One of the main factors to be considered in any technology and global market is economy. In order to compare the cost of construction between ordinary road and plastic coated bituminous road, consider a road of dimensions 3.75m width and 1Km distance.

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|-----------------------|---|
| Cost of Waste plastic | = Rs. 5/- per Kg |
| Cost of bitumen | = Rs. 50/- per Kg Generally, for 1 Km of road 10 tons of bitumen is required. |
| bitumen per Km | = 50×100000 |
| | = 50,0,000/- |

For plastic coated bituminous road,

It is already discussed above that 10% of plastic is required.Amount of bitumen required for

Plastic coated bituminous road= 9000Kg;Amount of plastic required= 1000Kg

Cost of bitumen in plastic coated bituminous road+Cost of plastic required= $9000 \times 50 + 5,000 = 4,55,000/-$

Savings in construction per Km=(cost of bitumen per ordinary road - cost of plastic coated bituminous road per Km)

$$= 5,00,000 - 4,55,000$$

$$= 45,000/- \text{ per Km.}$$

VII.CONCLUSION

The generation of waste plastics is increasing rapidly. Also the disposal of plastic is becoming complicated. So, using of the waste plastic in construction is a eco-friendly manner. The plastic coated bitumen increases the melting point. Polymer Modified Bitumen is used due to its better performance. The plastic coated bitumen helps in binding strength and increases the area of contact between the aggregate and bitumen. It also helps in eliminating of the voids. Due to the elimination of voids, road show the resistance towards the oxidation of bitumen by entrapped air. This property makes the plastic coated bitumen road to withstand heavy traffic and show better durability.

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