

To Check The Feasibility Of Waste Plastic Used In Bituminous Road

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ABSTRACT

The use of plastic and related materials is increasing exponentially due to tremendous growth in population, urbanization and changed life style leads to widespread littering of plastic on the landscape. Disposal of waste plastic is a serious problem globally due to their non-biodegradability and hazardous to human health, since these are not disposed scientifically and thus, create ground and water pollution. If this curse to mankind in the form of waste plastic is used as a boon for mankind by using it as additives in road construction, it will proved to be a best solution over worst road condition. In the present paper techniques has been developed to use plastic waste for construction of bituminous roads and flexible pavements. In general bitumen is used as binder in road construction. Binding properties of this bitumen can be modified by blending it with waste plastic pieces. It can be used for construction purpose. Waste plastic coated road aggregates can improve road strength. This modified bitumen mix and aggregates show better binding property, stability, density and more resistant to water thus increasing durability of roads with increased resistance to wear and tear of road.

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I. INTRODUCTION

Several studies have proven the health hazard caused by improper disposal of plastic waste. The health hazard includes reproductive problems in human and animal, genital abnormalities etc., Looking forward the scenario of present life style a complete ban on the use of plastic cannot be put, although the waste plastic taking the face of devil for the present and future generation. We cannot ban use of plastic but we can reuse the plastic waste. There visibility has been perceived as a serious Problem and made plastic a target in the management of solid waste. They also have a very long lifetime and burning of plastics waste under uncontrolled conditions could also lead to generation of many hazardous air pollutant(HAP) depending upon the type of polymers and additives used. The mix polymer coated aggregate and tyre modified bitumen have shown higher strength. Use of this non-biodegradable (according to recent studies, plastics can stay unchanged for as long as 4500 years on earth) product is growing rapidly and the problem is what to do with plastic-waste. Studies have linked the improper disposal of plastic to problems as distant as breast cancer, reproductive problems in humans and animals, genital abnormalities and even a decline in

human sperm count and quality. If a ban is put on the use of plastics on emotional grounds, the real cost would be much higher, the inconvenience much more, the chances of damage or contamination much greater. The risks to the family health and safety would increase and, above all the environmental burden would be manifold. Hence the question is not 'plastics vs no plastics' but it is more concerned with the judicious use and re-use of plastic-waste. Use of this mix for road construction helps to use plastic waste effectively. Now a day's waste plastic is used in bituminous road construction. This technology is not a new concept rather not practiced widely. The experimentation at several institutes indicated that the waste plastic, when added to hot aggregate will form a fine coat of plastic over the aggregate and such aggregate, when mixed with the binder is found to give higher strength, higher resistance to water and better performance over a period of time.

OBJECTIVE

To utilize this waste plastic re-cycling and reuse as useful binding material.

To study the basic physical and mechanical properties of waste plastic in order to contribute a better knowledge of its properties.

To identify the optimum of plastic waste to be added in the bitumen mix for getting the required strength.

To identify different properties of bitumen with increasing percentage of plastic waste.

II. LITERATURE REVIEW

Prof.C.E.G.(2001), Justo States that addition of 8.0 % by weight of processed plastic for the preparation of modified bitumen results in a saving of 0.4 % bitumen by weight of the mix or about 9.6 kg bitumen per cubic meter (m³) of BC mix. Modified Bitumen improves the stability or strength, life and other desirable properties of bituminous concrete mix.

V.S. Punith, (2002), some encouraging results were reported in this study that there is possibility to improve the performance of bituminous mixes of 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 130-180°C. Softened plastics have a binding property. Hence, it can be used as a binder for road construction.

Dr. R.Vasudevan and S. Rajasekaran, (2007) stated that the polymer bitumen blend is a better binder compared to plain bitumen. Blend has increased Softening point and decreased Penetration value with a suitable ductility.

Verma S.S. (2008). Concluded that Plastics will increase the melting point of the bitumen. This technology not only strengthened the road construction but also increased the road life. Sundaram&Rojasay (2008) studied the Effective blending technique for the use of plastic waste into bitumen for road laying and Polymer-bitumen mixtures of different compositions were prepared and used for carrying out various tests.

Swami et al. (2012) investigated the Use of waste plastic in the construction of bituminous Road. They concluded that plastic waste consisting of carry bags, cups and other utilized plastic could be used as a coating over aggregates and this coated stone could be used for Road construction.

III. METHODOLOGY DRY PROCESS

- 1) Covert the waste plastic in 2.5 mm with the help of shredding machine.
- 2) heat the aggregate at 150 -180°C in hot mix asphalt on the other hand heat the bitumen above is softening point above 60°C
- 3) Mix the bitumen aggregate and shredded + plastic together for formation of combine mix by adding 10 to 12% of shredded plastic.
- 4) Apply the final product of mix on road.
 - The process use in project is the
 - Convert the plastic waste in the size upto 2.5mm.
 - Blend the shredded plastic and mix with the bitumen by heating the bitumen at 180°C above 8-12% shredded plastic.
 - Now heat the aggregate at 150 -180°C in hot mix asphalt and mix the bitumen which is 180°C.
 - Apply the final product on the road pavement.

3.2 WET PROCESS:

Waste plastic by direct mixing with hot bitumen at 180°C.

- 1) Waste plastic collect first.
- 2) Collected plastic waste sorted as required thickness.
- 3) Normally polyethylene 60 micron or below is used for the further process.
- 4) Generally less micron plastic is easily mixable in the bitumen at higher temperature(160-180°C).
- 5) Collected plastic was cut into fine pieces as for as possible.
- 6) Then sieves in through 4.75mm sieves and retain on 2.36mm sieves was collected.
- 7) First bitumen heated at about (160-170°C) temp.
- 8) Then pieces were added into this.
- 9) At constant temp mixture was stirred manually for about 20-30 min. Polymer bitumen mixture of different composition were prepared & used for carrying out different test i.e penetration test, ductility test, flash point test & fire point test, Marshall Stability test.

IV. FIGURE AND TABLE

Comparison between ordinary bituminous roads and waste plastic bituminous roads:

SR. NO.	PROPERTIES PLASTIC ROAD	PROPERTIES ORDINARY ROAD
1.MARSHALL STABILITY VALUE	MORE	LESS
2.BINDING PROPERTY	BETTER	GOOD
3.SOFTENING POINT	LESS	MORE

4.PENETRTRION VALUE	MORE	LESS
5.TENSILE STRENGTH	HIGH	LESS
6.RUTTING	LESS	MORE
7.STRIPPING (POT HOLES)	NO	MORE
8.SEEPAGE OF WATER	NO	YES
9.DURABILITY OF THE ROADS	BETTER	GOOD
10. COST OF PAVEMENT	LESS	NORMAL
11.MAINTANC E COST	ALMOST NIL	MORE
12.ENVIRNME NT FRIENDLY	YES	NO

V. CONCLUSION

It shows that with the increase of waste plastic in bitumen increases the properties of aggregate and bitumen. Use of plastic in flexible pavement shows good result when compared with conventional flexible pavement. The optimum use of pavement can be done up to 10% based on Marshall Stability test. This has added more value in minimizing the disposal of plastic waste as an eco-friendly technique. Costing of polymer on the surface of the aggregate has resulted in many advantages which ultimately help to improve the quality of flexible pavement. Use higher percentage of plastic waste. Reduce the need of bitumen around by 10%.

- Increase the strength and performance of the road.
- Reduce the cost of project.
- To higher stability value as compare to ordinary road.
- Binding property is better.
- Softening point is very less.
- Penetration value is very more as compare to ordinary road.
- Tensile strength is higher. Rutting is less.
- No Striping. Durability of the is the better.

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