ANALYSE THE EFFECT OF USE OF PLASTIC WASTE IN BITUMINOUS MIXTURE ON ITS STRENGTH AND OTHER PROPERTIES

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Abstract The waste materials are always a problem for the environment, some waste may be disposed easily and some cannot. Plastic is also a kind of material whose disposal is always a tedious job. The disposal of waste effected the environment drastically, for minimizing this effect several research in various field is going on to recycle plastic safely. One of its ways is to use the waste plastic in the road construction Plastic Road is a need of an hour as they not only consume waste plastic in an eco-friendly way, but also helpful in increasing the quality of the road. In the review paper we will thoroughly study some of the methods and technique through which plastic is used in the road construction and how these technologies suits in various conditions. Significant environmental and economic problems are created because all forms of plastic like carry bags, wrappers, chocolates, chips, hand bags, cold drinks bottles and lids of all bottles. Utilization of waste plastic bags in bituminous mixes has proved that these enhance the properties of mix in addition to solving disposal problem. The processed 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 founds to give higher strengths, higher resistance to water and better performance over a time period. Therefore, plastic roads, is a simple way to make eco-friendly constructions. The innovative technology not only strengthened the road construction but also increased the road life as well as will help to improve the environment. The main objective of this Paper is to discuss the significant of plastic in terms of innovative methodology for treatment and disposing and to provide solution to reduce, recycle, reuse by applying it for pavement and road construction.

Key Words: Plastic, Road Construction, Environment, Binder, Strength , Disposal

1.INTRODUCTION

Plastic waste when properly processed and incorporated into bituminous mixtures, can enhance the strength and durability of the resulting material. This is particularly important for road construction, where the pavement needs to withstand heavy traffic loads and environmental stresses. The inclusion of plastic waste can also improve the flexibility of bituminous mixtures, making them more resistant to cracking and deformation. This can lead to long-lasting roads that required less frequent maintenance. Utilizing plastic waste in bituminous mixtures contributes to environmental sustainability by reducing the amount of plastic send to landfills or ending of in oceans and water ways. It promotes the concept of circular economy by repurposing waste materials into valuable construction components. In some cases, incorporating plastic waste into bituminous mixture can be cost effective compare to traditional materials. This is especially true in regions where plastic waste management is a significant challenge and disposal cost are high. However, there are challenges to overcome, such as ensuring proper compatibility between plastic waste and bitumen, addressing potential negative impacts on properties like fatigue resistant, and meeting regulatory standards for road construction material.

2.Overview of literature survey

Many research work has been done in the area of use of plastic waste in bituminous road construction. The research papers states, Durability of the road laid out with shredded plastic waste is much more compared with roads with asphalt with the ordinary mix. roads laid with the plastic waste mix are found to be better than conventional once the binding property of plastic makes the road last longer besides giving added strength to withstand more load to the normal highway quality roads lasts 4-5yrs it is claimed that plastic bituminous roads can last up to 10yrs. Rain water will not seep through because of the plastic in the tar. So, this technology will result in lesser road repairs.

3.THEROTICAL BACKGROUND

Plastics have become common man's friend. It finds its use in every field. 12 million tones is the expected consumption for the current year. Plastic is a material created by man but it's also something that can't be destroyed. A majority of the waste created by humans contains plastic waste which ultimately chokes stray animals to death, clogs drain and only leads to mess. The clogged drains lead to flood while the plastic in the fields blocks germination, thereby preventing rainwater absorption.

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Table -1: (Comparing results of marshal value)

Fig -1: Figure

% Of Bitumen	Marshal Value Of0% Plastic	Marshal Value Of 2.5% Plastic	Marshal Value Of5% Plastic	Marshal Value Of 7.5% Plastic	Marshal Value Of 10% Plastic
4.8	-	1067.4	-	-	-
5	-	1140	-	-	-
5.2	992	**1242.6**	**956.8**	432	**270.4**
5.5	**1061.34**		935	475	230
5.8	1017.6	-	916	**525**	218.5

Comparing results of marshal value

4.Objectives of the project work

From the literature review following objectives are drawn,To obtain OBC for the proposed mix design.Partial replacement of bituminous mix by plastic waste.To reduce the % of OBC in plastic added bituminous mix.

5.MATERIAL USE

- AGGREGATE
- BITUMEN
- WASTE PLASTIC
- MATERIAL SELECTION:

6.TESTS CONDUCTED ON AGGREGATE

- Specific Gravity &Water AbsorptionTest
- Aggregate Impact Test
- Aggregate Crushing Value Test
- Aggregate Abrasion Test

7. TESTS CONDUCTED ON BITUMEN

- Penetration Test
- Ductility Test
- Softening Point
- Flash And Fire Point Test

8. TEST ON BITUMINOUS MIX

- Marshall Stability

9. CONCLUSIONS

• Recycled plastic waste exhibits behaviour as binding property like bitumen.

• To reduce the environmental impact of construction practices.

• To increase binding and better bonding of the mix.

• For 2.5% plastic waste better strength occurs at OBC 5.2% so it will use for highway construction

• The result of OBC in the 5% use of plastic waste in 5.2% where it is less content of bitumen as compared to bituminous mix OBC which at 5.5%

• It can be used for low volume roads.

• The result for 7.5% & 10% of plastic of bituminous mix are not proper as compare to the results of bituminous mix.

10. .FUTURESCOP

The main scopes of plastic roads are economic in terms of bitumen. The shredded plastic in form of polymer covers the aggregates and thus, occupies a larger portion of the road reducing the quantity of bitumen needed. Waste plastic is a harmful and non-biodegradable waste responsible mainly for land pollution.

In this project, VG 30 grade of bitumen was used. Therefore, other grades of bitumen can also be used for the same bitumen mix design to obtain better results than VG 30 grade of bitumen.

Above analysis is based on the dense bituminous macadam (DBM), Hence, one can change the pavement type and can see what may be the results.

Various software can also be used for determining the deflection characteristics of road pavement made with plastic aggregates.

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