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Experimental Investigation on Reuse of Plastic In Bituminous Mix

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Abstract—*In order to address ecological impacts related with Plastic waste development and weakening of ordinary bituminous road surface, there is need of answer for such issue. To diminish the weight of discarding plastic it is a perfect idea to utilize plastic into bituminous asphalt to improve its properties. Impressive endeavors had been taken worldwide to use plastic waste as beneficial restricting materials to improve the properties of bitumen just as of totals in the road surface to accomplish conservative and compelling structure. This task reports the aftereffects of a test examination did to think about the correlation of traditional technique bituminous mix and the bituminous mix after the addition of shredded plastic in it for the quality advancement and the ideal utilize plastic waste in the bituminous mix. Bitumen is in part supplanted with three rates (4%, 6% and 8%) with shredded plastic of thickness up to 30 microns for all incomplete substitution. Experimental test results correlation between ordinary sort of bituminous mix and plastic bituminous mix will demonstrate the impact of expansion of plastic to bitumen.*

Keywords: shredded plastic waste, bitumen, bituminous mix, road surface, partial replacement.

I. INTRODUCTION

In the developing nations like India and urban cities like Mumbai have lost valuable foundations worth billions of rupees through weakening of their roads. In the event that the experts don't do a lot to keep these disappointments of street blends, they will lose billions more. Substantial road systems, worked at incredible cost have been under kept up and more great utilized and manhandled than anticipated. In the event that this proceeds with, the decay of streets will increment quickly as the old asphalts disintegrate and the new ones outlast the underlying time frame amid which the impacts of disregard are scarcely observable. The expense of reestablishing these crumbled streets will be a lot higher than anticipated for the convenient powerful upkeep. Asphalt weakening then again is normal in creating nations. Keeping roads in great condition is the most difficult approach to spare the asphalts. We can see the need of upgrade of bituminous road mix material properties.

The rate of creation of plastic has expanded hugely in practically everywhere throughout the nation. The amounts of waste produced from different utilizations that are collecting, are causing genuine pollution issues. The moderate techniques for plastic waste management are observed to be insufficient. Because of populace development, industrialization, commercialization and mechanical improvement there has been a gigantic increment in the rate of generation of waste. Metropolitan organizations of numerous urban communities in India spend about crore rupees for treatment and disposal of these plastic wastes. In this circumstance, the traditional waste disposal techniques are observed to be derisory. Through this experimental project work, a little effort has been made at concluding another system of waste transfer. This venture work goes for proposing another strategy for disposal of plastic utilizing it for development of bituminous mix properties. This paper imagines the utilization of plastic waste for the improvement of the attractive properties of bituminous mix like penetration, water absorption etc. For this research facility test are led on the plain bitumen and bitumen blended with various rates of shredded plastic.

The plastic have many important properties which can be utilized for betterment of bituminous concrete mixes are summarized below-

- Durable and corrosion resistant
- Economical and longer life
- Maintenance free
- Good thermal insulation
- Reduction in pollution

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II. OBJECTIVES

- To use plastic waste material in bituminous mix to observe the effects of plastic waste on bituminous mix material.
- To find optimum content of waste plastic usage in bituminous mix.
- To increase the engineering properties of bituminous road surface such as durability and resistance to wear, tear, weathering action, by adding waste plastic material.
- To reduce the burden of disposal of plastic waste material.
- To compare the waste plastic mixed bituminous mix with the conventional bituminous mix.

III. METHODOLOGY AND EXPERIMENTAL WORK

3.1 Methodology:

To achieve study goals, implementation would include the following:

- Literature review of previous studies which include revision of books, scientific papers and reports inthe field of recycled polymer modifiers of bituminous mix.

3.2 Collection of Material:

- Low density Bitumen- Purchased from local shop
- 10mm & 20mm Aggregate- Purchased from nearby stone quarry.
- Plastic Bags up to 30 microns- Plastic waste bags includes polyethylene carry bags, chocklate wrappers collected from dry waste collection bins of Society.
- There are two processes for preparing bituminous plastic mix:
- Wet Process- In whichwaste plastics by direct mixing with hot bitumen at 160°C .
- Dry Process- In which aggregate is heated to 170°C in the mini hot mix plant.The shredded plastic will be added in equal proportions.Immediately the hot Bitumen (160°C) is added.

For present work Wet Process adopted for preparing bituminous plastic mix. Plastic of 4% by weight of bitumen was added to bituminous mix for initial tests.

- Aggregates, bitumen and plastic mixed bitumen were tested for their properties.
- Test results discussion and drawing conclusions.

IV. EXPERIMENTAL RESULTS

4.1 Aggregate Test Results:

Test	Result
Impact Test (IS: 2386 PART IV -1963)	12.98%
Los Angeles Abrasion Test (IS 2386 Part -IV- 1963)	21.2

4.2 Test Results of bitumen without Plastic:

Test	Results
Penetration Value Test	25 mm
Ductility Test	48mm

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4.3 Test Results of Plastic Bituminous Mix (4% plastic by weight of bitumen):

Test	Results
Penetration Value Test	18mm
Ductility Test	24 mm

V. CONCLUSION

- The addition of waste plastic modifies the properties of bitumen.
- The addition of plastic decreases the penetration number.
- The problems like bleeding can be reduce in hot temperature region.
- The addition of plastic waste also decreases ductility of bitumen making it rigid.
- Plastic has property of absorbing sound, which also help in reducing the sound pollution of heavy traffic.
- The waste plastics thus can be put to use and it ultimately improves the quality and performance of road.

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