

Evaluation of Design Mix Bituminous Concrete using Plastic Waste in Road Pavement

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ABSTRACT

Today's high traffic intensity in terms of commercial vehicles and the significant daily and seasonal temperature variation place us in a challenging situation where we must consider some alternatives for improving the characteristics and quality of the pavement by implementing some necessary modifications that will satisfy both the strength and the economic aspects. Taking into account the environmental perspective as well, there is significant environmental damage as a result of the excessive usage of polythene in daily operations. The requirement of the hour is to use the leftover polythene for some advantageous purposes because polythene is not biodegradable.

KEYWORDS: Pavement, Waste Polythene, Bitumen, Marshall Stability Test, Bitumen

INTRODUCTION

The most important and expensive component of a highway is the pavement structure. The pavement should be stable and non-yielding, to allow the heavy wheel loads of road traffic to move with least possible rolling resistance. The road surface should be even along the longitudinal profile to enable fast moving vehicles to travel safely and comfortably at the design speed.

Such pavements are much stiffer than the flexible pavements rigid pavements are those which possess noteworthy flexural strength or flexural rigidity. The cement concrete pavement slab can very well serve as a wearing surface as well as effective base course. Therefore usually the rigid pavement structure consists of a cement concrete slab, below which a granular base or sub-base course may be provided. Though the cement concrete slab can also be laid directly over the soil sub-grade, this is not preferred particularly when the sub-grade, consists of fine grained soil. Providing a good base or sub-base course layer under the cement concrete slab, increases

the pavement life considerably and therefore works out more economical in the long run. The rigid pavements are usually designed and the stresses are analyzed using the elastic theory, assuming the pavement as an elastic plate resting over elastic or a viscous foundation.

LITERATURE SURVEY

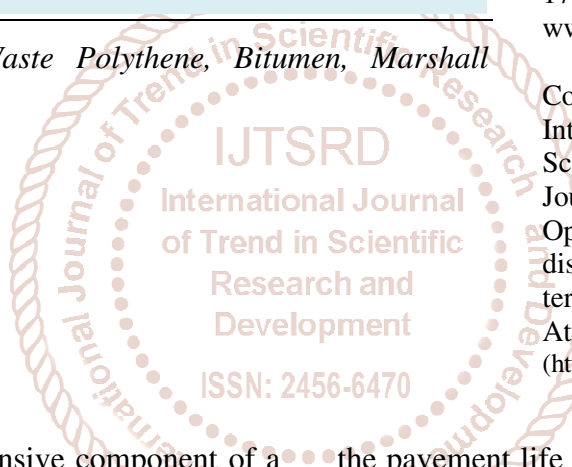
Tiwari et al. (2018) were concluded that waste plastic is accumulated everywhere the world causing serious environmental issues. This paper aims to check the plastic waste bituminous concrete using dry method of blending for construction. The study evaluates the addition of sliced waste plastic within the hydrocarbon concrete which ends up in important increase within the stability worth and Marshall Properties of combine. The study reveals that the utilization of waste plastic in hydrocarbon concrete is safe and property for construction.

Singh and Swamy (2019) were over that due to inherent benefits, waste polythene (generated from domestic sources) has been used as asphalt modifier.

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This text discusses elastic properties of the polythene modified asphalt binder. Many asphalt concrete mixtures were designed by varied polythene and asphalt content. Chopped polythene incorporated into asphalt concrete by dry mix process. using optimized asphalt content (at many polythene percentages), mixtures were ready and compacted. These compacted specimens were aged for various length in convection kitchen appliance. Asphalt binder (from aged specimens) was extracted and tested for its elastic properties using dynamic shear rheometer. Comparison of master curves indicated increase in complicated modulus and reduce in point values with addition of polythene the least bit reduced frequencies. However, the extent of amendment was extremely passionate about frequency, aging length and polythene content. this indicates that the addition of polythene provides a lot of resilience to asphalt binder particularly with less aging time. Storage modulus master curves (at lower frequencies) and relaxation modulus values (at longer time) indicate polythene provides further stiffening to binder. Further, changes in viscous modulus with addition of polythene were marginal. Overall results indicate that waste polythene improves the properties of asphalt binder over extended loading amount once heated for fewer time throughout intermixture.

Biswas et al. (2019) The amount of plastic waste in India is reaching a gigantic scale. Wastes from household, industries and medical facilities contribute towards this. As the plastic waste is a cause of various environmental and health hazards, its proper management that leads to an effective reuse or disposal is a concern for the Government and civic

bodies. Waste plastic, when added to hot aggregates, forms a fine coat of plastic over the aggregates and such aggregates, when mixed with the binder is found to give a mix that has higher strength and resistance towards the deteriorative actions of water. Thus, (the bituminous Roads using waste plastic in the wearing course) also called as plastic roads are now gaining popularity in India. With the Indian Road Congress bringing out a code of specifications on plastic roads (IRC SP: 98 -2013), many agencies are coming forward to implement plastic roads in India as it is a sustainable method and also need of the hour. However, for a large scale implementation, the performance and longevity of these roads need to be evaluated comprehensively. This paper presents the various properties of bituminous mix with 8% waste plastic when compared with normal bituminous mix with the help of a comparative case study. In Pune, Maharashtra, India ten city roads which were overlaid with normal bituminous mix and ten

METHODOLOGY

Present or crude bitumen may be a sticky, tar-like sort of crude that is therefore thick and serious that it should be heated or diluted before it'll flow. At temperature, it's very like cold syrup. Refined bitumen is that the residual (bottom) fraction obtained by fractionation of fossil fuel. It's the heaviest fraction and therefore the one with the highest boiling purpose, boiling at 525 °C (977 °F).

In British English, the word 'Asphalt' refers to a mix of mineral mixture and bitumen (or tarmac in common parlance). The word 'Tar' refers to the black viscous material obtained from the fractionation of coal and is with chemicals distinct from hydrocarbon.



Figure 1 Impact Test Perform

Table 1 Gradation of Aggregates

SIEVE SIZE	% RETAINED
26.5 mm	--
19 mm	5
9.5 mm	25
4.75 mm	20
2.36 mm	15
300 μ	23
75 μ	7

CONCLUSION

For a country like India, where hot temperature prevails in summer in several parts, permanent deformation of bituminous layer is a major concern. This problem can be addressed by adopting courser gradation for wearing course. In the Marshall stability value increases with polyethylene content up to 5% and thereafter decreases.

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