

THE PERFORMANCE OF BITUMINOUS MIX USING POLYTHENE ADMIXTURE WITH FILLER AND REPLACING WITH FILLER AND REPLACING VARIOUS PERCENTAGE OF BITUMEN

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Abstract

Plastics are everywhere in today's lifestyle and are growing rapidly throughout particularly in a developing country like India. As these are non-biodegradable there is a major problem posed to the society with regard to the management of these solid wastes. Low density polyethylene (LDPE) has been found to be a good modifier of bitumen. Even, the reclaimed polyethylene originally made of LDPE has been observed to modify bitumen. In the present study, an attempt has been made to use reclaimed polyethylene which has been obtained from plastic packets used in packaging of domestic goods.

Key words- asphalts mix, LDPE, flexible pavements, filler,

INTRODUCTION

Bituminous binders are widely used by paving industry. In general pavements are categorized into 2 groups, i.e. flexible and rigid pavement. Flexible pavements are those, which on the whole have low flexural strength and are rather flexible in their structural action under loads. These types of pavement layers reflect the deformation of lower layers on-to the surface of the layer. If the surface course of a pavement is of Plain Cement Concrete then it is called as rigid pavement since the total pavement structure can't bend or deflect due to traffic loads.

Bituminous mix design:-

The bituminous mix design aims to determine the proportion of bitumen, filler, fine aggregates, and coarse aggregates to produce a mix which is workable, strong, durable and economical. There are two types of the mix design, i.e. dry mix design and wet mix design.

ROLE OF POLYETHYLENE IN BITUMINOUS PAVEMENTS:-

Use of polyethylene in road construction is not new. Some aggregates are highly hydrophilic (water loving). Like bitumen polyethylene is hydrophobic (water hating) in nature. So the addition of hydrophobic polymers by dry or wet mixing process to asphalt mix lead to improvement of strength, water repellent property of the mix. Polyethylene's get added to hot bitumen mixture and the mixture is laid on the road surface like a normal tar road. Plastic roads mainly use plastic carry-bags, disposable cups, polyethylene packets and PET bottles that are collected from garbage as important ingredients of the construction material. Polymer modification can be considered as one of the solution to improvise the fatigue life, reduce the rutting & thermal cracking in the pavement. Creating a modified bituminous mixture by using recycled polymers (e.g., polyethylene) which enhances properties of HMA mixtures would not only produce a more durable pavement, but also provide a beneficial way of disposal of a large amount of recycled plastics.

Objectives of present study: - A comparative study has been made in this investigation between SMA, and BC, mixes with varying binder contents (4% - 5.5%) and polyethylene contents (0.5%-2.5%). The objectives of this investigation are to observe the followings; Study of Marshall Properties of mixes using Stone dust as filler, The effect of polyethylene as admixture on the strength of bituminous mix with stone dust filler. The performance of bituminous mix under water with and without polyethylene admixture with different filler and replacing some percentage of fine aggregate, To study resistance to permanent deformation of mixes with and without polyethylene.

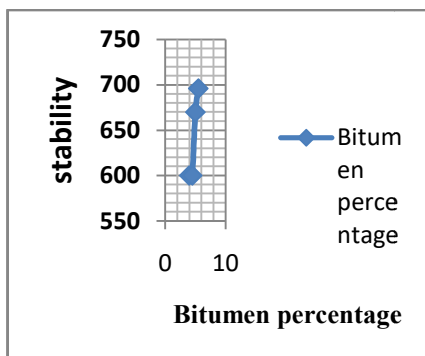
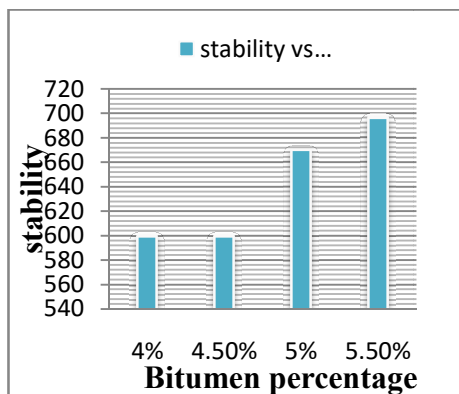
EXPERIMENTS

In this method, the resistance to plastic deformation of a compacted cylindrical specimen of bituminous mixture is measured when the specimen is loaded at a deformation rate of 50 mm/min. in this study during experiment two values are found for the Marshall method of mix design.

- (i) Stability, flow tests and
- (ii) Voids analysis.

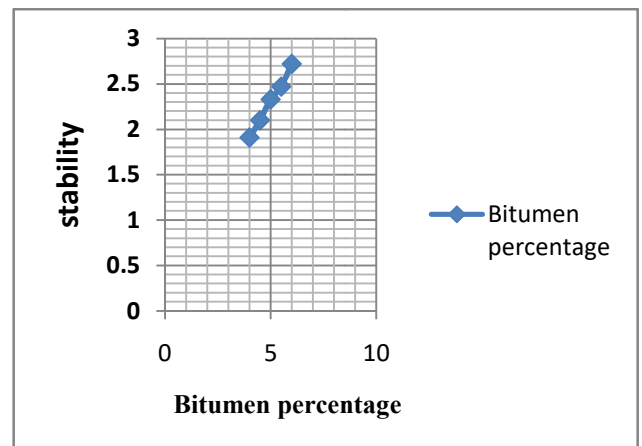
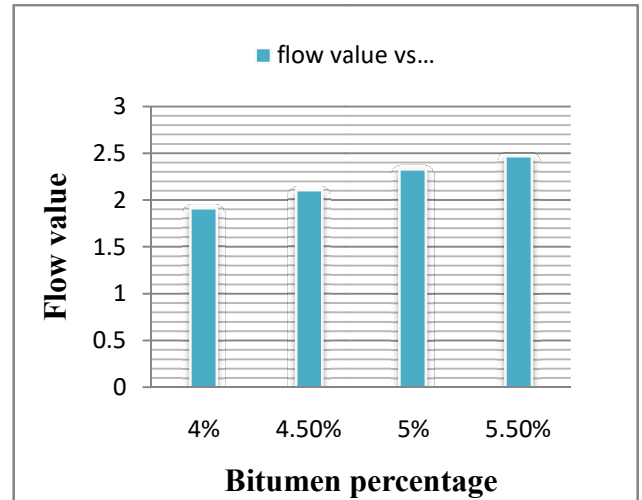
RESULTS

STABILITY – BITUMEN CONTENT RELATIONSHIP:-Stability is the maximum load required to produce failure of the specimen when load is applied at constant rate 50 mm / min. In Figure it is shown, stability results for different bitumen contents are represented.



FLOW – BITUMEN CONTENT RELATIONSHIP:-Flow is the total amount of deformation which occurs at maximum load (Jendia, 2000). In Figure, Flow results for

different bitumen contents are represented. Flow of asphalt mix increases as the bitumen content increase till it reaches the peak at the max bitumen content 5.5 %.



Bulk Density – Bitumen Content Relationship:-Bulk density is the actual density of the compacted mix. In Figure Bulk density results for different bitumen contents are represented. Bulk density of asphalt mix increases as the bitumen content increase till it reaches the peak (2.35 g/cm³) at bitumen content 5 % then it started to decline gradually at higher bitumen content.

RESULTS AND DISCUSSION

1. **V. CONCLUSIONS:** - The optimum amount of WPB to be added as a modifier of asphalt mix was found to be (5.0 %) by weight of optimum bitumen content of the asphalt mix.

- Asphalt mix modified with (5.0 % WPB by OBC weight) has approximately 18% higher stability value compared to the conventional asphalt mix.
- Asphalt mix modified with WPB exhibit lower bulk density as the WPB percentage increased. This decrease in bulk density can explained to be as a result of the low density of added plastic material.

SCOPE FOR FURTHER STUDY

- Study recommends local authorities to confirm using WPB in asphalt mix with the proposed percentage (5.0% by OBC weight) for improved performance of asphalt mix.
- Further studies are needed in various topics related to effective utilization and best incorporation techniques of waste materials in asphalt pavements.
- Constructing test road sections using WPB modified asphalt mix for further field studies of its performance.
- It is recommended to conduct similar studies on the wearing course layer of asphalt pavement.

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