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EXPERIMENATAL STUDY OF THE POLYMER MODIFICATION OF BITUMEN USED IN FLEXIBLE PAVEMENT

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Abstract - *Bituminous mixes are most commonly used all over the world in flexible pavement construction. It consists of asphalt or bitumen (used as a binder) and mineral aggregate which are mixed together, laid down in layers and then compacted. Under normal circumstances, conventional bituminous pavements if designed and executed properly perform quite satisfactorily but the performance of bituminous mixes is very poor under various situations. Today's asphaltic concrete pavements are expected to perform better as they are experiencing increased volume of traffic, increased loads and increased variations in daily or seasonal temperature over what has been experienced in the past. In addition, the performance of bituminous pavements is found to be very poor in moisture induced situations.*

Key Words: **Flexile pavement, Bituminous pavements, Asphaltic concrete, Volume of Traffic**

1. INTRODUCTION

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.

Pavement design and the mix design are two major considerations in case of pavement engineering. The present study is only related to the mix design of flexible pavement considerations. The design of asphalt paving mixtures is a multi-step process of selecting binders and aggregate materials and proportioning them to provide anappropriate compromise among several variables that affect mixture behavior, considering external factors such as traffic loading and climate conditions.

1.2 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 economical. There are two types of the mix design ,i.e. dry mix design and wet mix design.

1.3 Polymer modification

Bituminous binders are widely used in road paving and their viscous elastic properties are dependent on their chemical composition. Now-a-days, the steady increment in high traffic intensity in terms of commercial vehicles, and the significant variation in daily and seasonal temperature put us in a situation to think about some alternative ways for the improvement of the pavement characteristics and quality by applying some necessary modifications which shall satisfy both the strength as well as economical aspects. Bitumen can also be modified by adding different types of additives to achieve the present requirement. One of these activities the polymers.

2. 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. Polyethylenesget 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.

3. CONCLUSIONS

In this study, three types of mixes i.e. SMA, DBM and BC are prepared with VG30 grade bitumen used as a binder. The effect of addition of waste polyethylene in form of locally available artificial milk with brand AMUL MOTI packets in the bituminous mixes has been studied by varying concentrations of polyethylene from 0% to 2.5% at an increment of 0.5%.

Using Marshall Method of mix design the optimum bitumen content (OBC) and optimum polyethylene content (OPC) have been determined for different types of mixes. It has been observed that addition of 2% polyethylene for SMA and DBM mixes and 1.5% polyethylene for BC mixes results in optimum Marshall Properties where stone dust is used as filler. But when small fraction of fine aggregates are replaced by granulated blast furnace slag and filler is replaced by fly ash, optimum Marshall Properties for all types of mixes result with only 1.5% polyethylene addition.

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