STUDY THE BEHAVIOUR OF BITUMINOUS BY MIXING DIFFERENT TYPES OF WASTE MATERIAL

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Abstract - The objective of this study is thus to evaluate the behavior of bituminous mix when added with different types of waste materials and evaluate the performance of this mixture. In this study, a laboratory investigation was conducted on the properties of CRM and LDPE binders as a function of percentages. Evaluation of the binder included the following testing rocedures: penetration and softening point test while for the bituminous mixture: Marshall Test, creep test as well as indirect tensile stiffness modulus test. Based from previous literature, it is expected that the results from this study will indicate that the higher CRM and LDPE percentages up to a certain optimum point for binders will lead to a higher viscosity, a better rutting resistance and a less chance for low temperature cracking.

1 INTRODUCTION

Economic growth might be teetering across the world, but the amount of garbage generated by global cities is only going up. Together, urban centres generate 1.3 billion tonnes of solid waste a year and it is set to grow to 2.2 billion tonnes by 2025, according to projections by the World Bank. Most of the waste is sent to landfills, or worse, to open dumps, raising concerns about air pollution, social unrest, and impact on poverty and so on. Managing solid waste has costs—$205.4 billion at present—and it's growing. It is set to touch $375.5 billion by 2025 (Ramnath, 2012). Malaysia, like most of the developing countries, is facing an increase of the generation of waste and of accompanying problems with the disposal of this waste. Overall, the local communities generate 16,000 tons of domestic waste per day and the amounts per capita vary from 0.45 to 1.44 kg per day depending on the economic status of the areas concerned (Lau, 2004). With the rapid economic growth and urbanization that is taking p lace in currently, solid waste generation and management is becoming a major social and environmental issue. One of the approaches towards solving the issue would be recycling of waste materials. The number of motorcar waste tires produced annually in Malaysia was estimated to be 8.2 million (Thiruvangodan, 2006). Besides that, waste tire is neither categorized as solid waste or hazardous waste. It is generally considered as industrial or trade waste and hence there is no specific law or regulation which governs waste tire management (Thiruvangodan, 2006). Another major contributor to solid waste production is plastic waste which is ranked the second highest with 24% out of the total waste disposed, compared to only 10% in Indonesia, 16% in Vietnam, 19% in Netherlands and 14% in Germany (Lai, 2012).

Figure 1 Discarded Vehicle Tires

Figure 2 Plastic Wastes

2 SIGNIFICANCE OF PROJECT

The aim of the project is to study the performance of crumb rubber (CRM) and

low density polyethylene (LDPE) in modified bitumen. By doing this, we will be able to reduce the cost and also improve the performance of flexible pavement for future highways construction due to the involvement of a more environmental friendly materials. Not to forget, the contribution it does to the reduction solid waste generation.

3 RESULTS

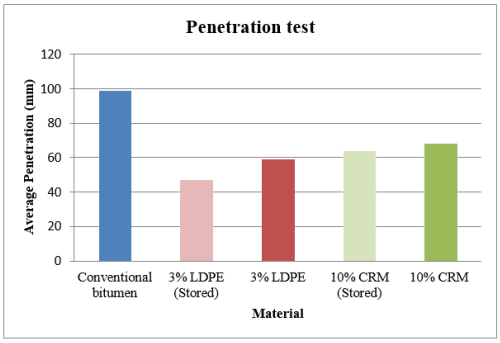

Figure 3 : Penetration Test Result

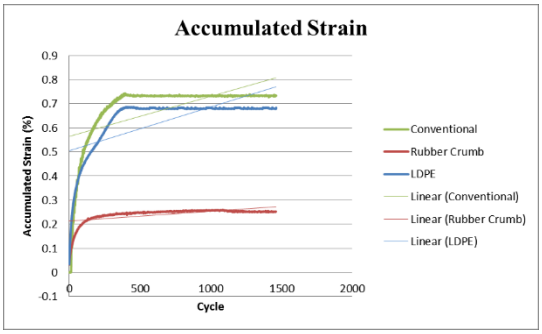

Figure 4 Accumulated Strain

Material	Stiffness Modulus (Mpa)
Conventional	828.17
Rubber Crumb	780.12
LDPE	802.58

Figure 5 Stiffness Modulus of Bituminous Mixture

4 CONCLUSION

From the study, the following can be concluded:

1. The incorporation of crumb rubber and low-density polyethylene (LDPE) affects the properties of the conventional bitumen. This can be seen through the penetration and ring and ball test whereby the binder properties are observed to undergo changes due to the addition of the rubber crumb and LDPE.
2. Besides that, in terms of storage, it can be concluded that both modified bitumen are not suitable for long-term storage. After mixing with additives, modified bitumen should not be stored temporarily because separation process will occur between the bitumen and the additives.
3. For this study the mixture components selection were done in accordance with JKR recommendations.

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