To Study The Effect of Different Type of Additives Laboratory Performance on Semi-Dense Bitum Inous Concrete

RAZA ALI[1], VIKAS GARG[2]
[1]Dept of Structural Engineering
[2]Assistant professor, Dept of Civil Engineering
[1, 2] Grimt, Radaur ,Yamunanagar, Haryana, India

Abstract- *India has the third largest in the world over 4,236,000 kilometers road network. The road transport carries up to 85% of passenger traffic and 70% through freight transport. Any pavement with the incorporation of certain additive can improves the properties of bitumen and bituminous mixes to meet requirements. Using different types of additives such as Polymers, Crumb Rubber and waste material silk discarded tube tyres,plastic bottles and rice husk ash can be prepared bituminous mixes and used in a pavement section for a bituminous binder course. Modified bituminous mixes are expected to give higher life of surfacing depending upon degree of modification and type of additives used. The plastics consumption is increasing day by day. For packing 50 to 60% of the total plastics are consumed. They do not undergo bio-decomposition once used of plastic materials are generally thrown out. Hence, land filled or incinerated method, but both are not eco-friendly processes are causing land and the air pollution. Similarly, in India are categorized solid hazardous waste tyres. That about 60% of waste estimated tyres is disposed via unknown routes in the urban as well as rural areas. Impacts such as alterations in hydrological regimes when gullies and watercourses become waste sites and other the hazards of waste tyres include- air pollution associated with open burning of tyres, aesthetic pollution caused by waste tyre stockpiles and illegal waste tyres collecting. Incorporating the plastic wastes developing the bituminous mixes for the Dense Bituminous Macadam (DBM) Grade 1. Waste of tyre tubes and rice husk ash as partial replacement of the bitumen content. The DBM Grade 1 mixes with different blends by using Polymer Modified Bitumen(PSMB) and Crumb Rubber Modified Bitumen (CRMB). The analysis Stability-Flow for the various DBM Grade 1 mixtures with modified binders and with different percentage replacement of bitumen with plastic wastes, waste tyre tubes and rice husk ash are reported. That found of the three materials used, replacement of OBC by 10% of discarded tyre tube has the highest stability value. The PMB for use in DBM Grade 1 mix is 5% and optimum content of CRMB. Also the bituminous mixes of DBM Grade 1 with 5% PMB having 40% stone dust shows the maximum stability value and the bituminous mixes of DBM Grade 1 with 5% CRMB having 44% stone dust shows the maximum stability value.*

I. INTRODUCTION

GENERAL

A country economy and hence the quality of our life's dictates the quality of roads. For transport of the goods and passengers are vital roads. In India, the road transport carries up to 85% of passenger traffic and 70% through freight transport. But involves huge amount of the investment the construction of highways and mainly 60% percent of the highway project cost is associated with the pavement construction. Surfacing of a pavement is a durable road, airstrip, or similar area and underlying soil subgrade and the primary function is to transmit loads to the sub-base. The Indian Highways have a covered surface with bituminous layers around 90% percent which are constructed and maintained by using naturally available road aggregates and bitumen, a petroleum product, which being mixed at high temperatures to produce hot mix asphalt. The mix design for the different layers of the pavement has a major impact on the performance, cost and sustainability of the bituminous surfaces.

OBJECTIVES

- Aggregates and fillers for Concrete and Board Production
- Economical Substitute for Micro Silica / Silica Fumes
- Absorbents for Oils and Chemicals
- Soil Ameliorants (An Ameliorant Is Something That Helps Improve Soil Drainage, Slows Drainage, Breaks Up Soil Or Binds Soil, Feeds And Improves Structure Etc.)
- As a Source of Silicon

- As Insulation Powder in Steel Mills
- As Repellents in the Form Of "Vinegar-Tar"
- As a Release Agent in the Ceramics Industry
- As an Insulation Material for Homes and Refrigerants

II. LITERATURE REVIEW

Kumar et al (2010) Investigates to improve the mechanical properties of asphalt mixes, additives are added to the base asphalt binder. These binders are called modified asphalt binders. The objectives of the present study are to compare the performance of asphalt mixes with different binders by two different mix design methods and to optimize the asphalt binder type to achieve the desired performance. Two methods of mix design namely, Marshall and Super pave mix design methods are considered. The performances of asphalt mixes viz., tensile strength, moisture damage, densification and rutting resistance were compared. The results indicated a statistically significant difference in the optimum asphalt binder content from the two mix design methods.

III. RESULT AND DISCUSSION

3.11.1 Effect of Plastic waste on the Stability Flow analysis of DBM Grade 1 Mix:

The variation of stability and flow of DBM mix with percentage replacement of OBC with plastic content. It is observed from the data obtained that on replacing OBC with 8%, 12% and 16% waste plastic, the stability value decreased. The stability value decreased by 24.76% with 8% plastic waste, 12.26% with 12% plastic waste and 36.10% with 16% plastic waste. However, all the three mixes have higher stability value than the minimum specified stability value as per MS2 and MORTH specifications. But the flow criteria of 3 to 6 mm for DBM grade 1 [MS2 and MORTH] was satisfied only for the mix with 8% plastic waste.

3.11.2 Effect of Discarded Tyre Tubes on the Stability Flow analysis of DBM Grade 1 Mix:

The Optimum binder content calculated for the DBM grade 1 was replaced with the 6%, 10% and 14% discarded tyre tube. The variation of stability and flow of DBM mix with percentage replacement of OBC by discarded tyre tubes. With this replacement, the stability value increased by 3.1% with 6% discarded tyre tube, 15.4% with 10% discarded tyre tube and 23.02 % with 14% discarded tyre tube. Also, all the three mixes have higher stability value than the minimum specified stability value as per MS2 and MORTH specifications. But the flow criteria of 3 to 6 mm for DBM grade 1 [MS2 and MORTH] was satisfied only for the mix with 10% Discarded tyre tube.

3.11.3 Effect of Rice Husk ash on the Stability Flow analysis of DBM Grade 1 mix:

The Optimum binder content calculated for the DBM grade 1 was replaced with the 6%, 10% and 14% Rice Husk ash the variation of stability and flow of DBM mix with percentage replacement of OBC by varying percentages of rice husk ash as stated above. With this replacement, the stability value increased by 13.38% with 6% Rice Husk ash, however, the stability value decreased by 10.58% with 10% rice husk ash and by 20.72% with 14% rice husk ash replacement. However, all the three mixes have higher stability value than the minimum specified stability value as per MS2 and MORTH specifications. But the flow criteria of 3 to 6 mm for DBM grade 1 [MS2 and MORTH] was satisfied for the mix with 10% Rice Husk ash and 14% Rice Husk ash . the comparison of the stability values for the selected replacement levels of the different materials used. It is observed that replacement of OBC by 10% discarded tyre tube has the highest stability value.

IV. CONCLUSION

The major conclusions drawn from the study carried out on stability flow analysis of DBM (GRADE 1) by using different additives are as under:

1. The flow criteria for DBM grade 1 is satisfied only if the Bitumen is replaced by 8% plastic waste, although the stability values lie within the specific range for all replacement levels.
2. The stability values for the DBM grade 1 mix increase with replacement of OBC by all the considered percentages of discarded tyre tube waste.
3. The flow criteria for DBM grade 1 as per MS2 and MORTH specifications is satisfied on replacing the optimum binder content of 4.5% with 10% discarded tyre tube waste only indicating that this percentage is the only suited level of replacement.
4. Although the stability value increased for 6% replacement of OBC by rice husk ash and reduced for 10% and 14% replacement levels, but the 6% replacement level only does not satisfy the flow criteria. It indicates that 10 to 15% replacement level of rice husk ash is suited for creating a stable and flow able DBM mix of grade 1. Higher limit of rice husk ash replacement needs further investigations.

REFERENCES

[1] Nuha S. Mashaan, Asim Hassan Ali, Mohamed RehanKarim and MahrezAbdelaziz (2012) “An Overview of Crumb Rubber Modified Asphalt” International Journal of the Physical Sciences. Vol. No.2, pp. 166 – 170.

[2] AhmetTortum, CaferCelik and AbdulkadirCuneytAydin (2005) “Determination of the Optimum Conditions for Tire Rubber in Asphalt Concrete” Building and Environment.Vol.40 pp. 1492–1504.

[3] Prithvi S Kandhal, Parker and Speller Berg ”Precision of Marshall Stability and Flow Test Using 6-inch(152.4mm) Diameter Specimen” Journal of Testing and Evaluation, Vol. 24, No.1, January 1996.

[4] Bradley J. Putman and Serji N. Amirkhanian (2004), “Utilization of Waste Fibre in Stone Matrix Asphalt Mixtures”, Resources, Conservation and Recycling, Volume 42, Issue 3, Pp .265-274

[5] A.I. Al-Hadidy,” Effect of Polyethylene on Life of Flexible Pavements (2009)” Construction and Building Materials 23 (2009) 1456–1464

[6] S Shankar, Prasad C.S.R.K (2009).,” Evaluation of Rutting Potential for Crumb Rubber Modified Bitumen in Asphaltic Mixes” Emirates Journal for Engineering Research, 14 (2), pp- 91-95.