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Enhancement of Stabilization in Bituminous Roads using Propylene Glycol

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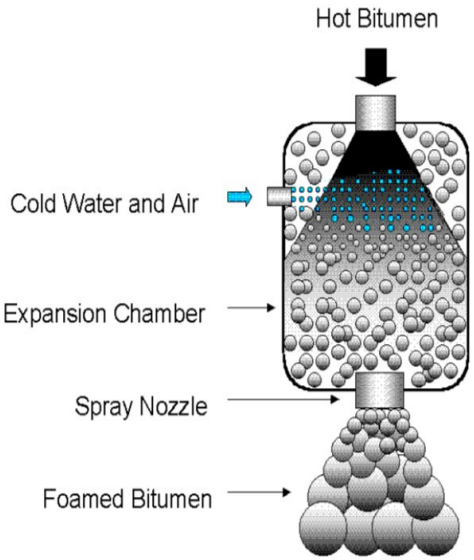
Abstract: This project presents a part of research on the physical properties of bitumen modified by foaming agent and water. The hot bitumen, water and foaming agent of various percentages are added. The obtained bitumen content with foaming agent is used to assess the volumetric properties of Marshall mix design to evaluate the stability of flexible pavement. The results are related to the changes in the physical properties of foamed bitumen.

Keywords: Bitumen, Water, Propylene Glycol, Aggregate.

I. INTRODUCTION

Foamed asphalt is a mixture of aggregates and foamed bitumen. The bitumen is foamed by an innovative process, harnessing the usually undesirable reaction which occurs when hot bitumen is contaminated with water. Foamed asphalt mix refers to mixture of pavement construction aggregates and foamed bitumen. Foamed bitumen is produced by a process in which water is injected in to hot bitumen resulting in spontaneous foaming. Water on contact with hot bitumen is turned into vapor, which is trapped in thousands of tiny bitumen bubbles. Incorporating foamed bitumen into the aggregates produces foamed asphalt mix.
in order to mix bitumen with road-building aggregates, first it is needed to considerably reduce the viscosity of the cold harder binder bitumen. Traditionally this was done by heating the bitumen and mixing it with heated aggregates to produce hot mix asphalt. Other methods of reducing the bitumen viscosity include dissolving the bitumen in solvents and emulsification. In the foam state the bitumen has a very large surface area and extremely low viscosity making it ideal for mixing with aggregates.



METHODOLOGY

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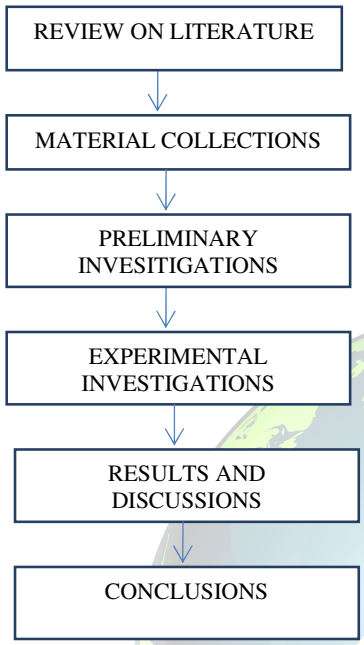

III. MATERIALS USED

Bitumen: It is a black viscous mixture of hydrocarbons obtained naturally or as a residue from petroleum distillation. It is used for road surfacing and roofing.

Aggregate: It is commonly considered inert filler, which accounts for 60 to 80% of the weight of concrete. It is usually greater than 4.75mm (retained on a no.4 sieve).

Foaming agent (propylene glycol): It is a synthetic organic compound with the chemical formula C3H8O2.It is a viscous colourless liquid which is nearly odourless but possesses a faintly sweet taste. Its density 1.036g/cm3, Melting point -59˚C(-74˚F;214K),Boiling point 188.2˚C (370.8˚F;461.3K).

Water: It is a polar inorganic compound that is at room temperature a tasteless and odourless liquid, which is nearly colourless apart from a hint of blue.

III. PRILIMINARY TEST

A. Aggregate test:

1. Specific gravity test.
2. Water absorption test.
3. Impact test.
4. Crushing test.

Table No.4.1 Test results on Aggregate

B. Bitumen test:

1. Penetration test.

S.No	DESCRIPTION	OBTAINED VALUES
1.	Water absorption test	1.19%
2.	Specific gravity test	2.70
3.	Crushing strength test	5%
4.	Impact test	3.76%

2. Softening point test.
3. Viscosity test.
4. Ductility test.

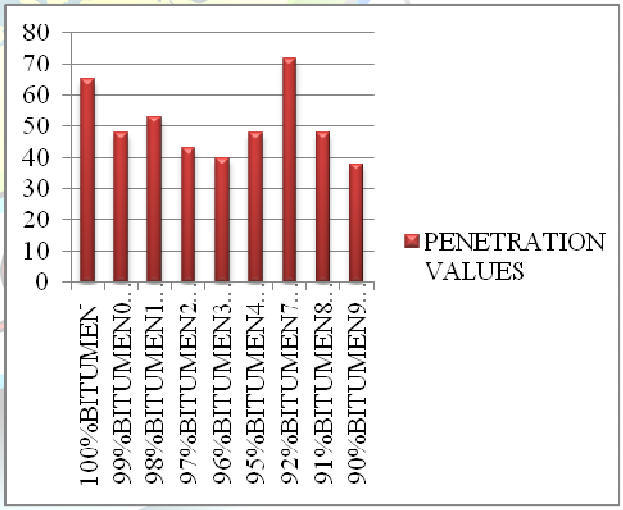

Fig.No.5.1 Penetration results

Table No.4.2 Tests results on Bitumen

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SI.NO	TESTS	100% (100% of bitumen)	99% (99% 0f bitumen 0.5% water 0.5% F.A)	98% (98% 0f bitumen 1.5% water 0.5% F.A)	97% (97% 0f bitumen 2.5% water 0.5% F.A)	96% (96% 0f bitumen 3.5% water 0.5% F.A)	95% (95% 0f bitumen 4.5% water 0.5% F.A)	92% (92% 0f bitumen 7.5% water 0.5% F.A)	91% (91% 0f bitumen 8.5% water 0.5% F.A)	90% (90% 0f bitumen 9.5% water 0.5% F.A)
1.	Penetration test	65.66	47.66	53.66	43	40	48	72.33	48	37.66
2.	Softening test	47.5˚C	47.5˚C	48˚C	48.5˚C	49.5˚C	48˚C	49˚C	49.5˚C	51˚C
3.	Ductility test	77cm	71cm	100cm	81cm	92.66cm	80cm	68cm	72cm	87cm
4.	Viscosity test	64Sec	75Sec	115Sec	67Sec	76.66Sec	85Sec	147.6sec	175Sec	167Sec

IV. Results and Discussions

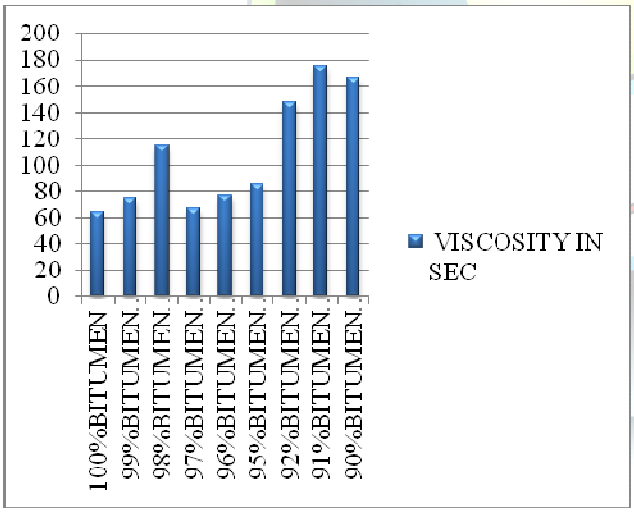

Fig.No.5.2 Viscosity results

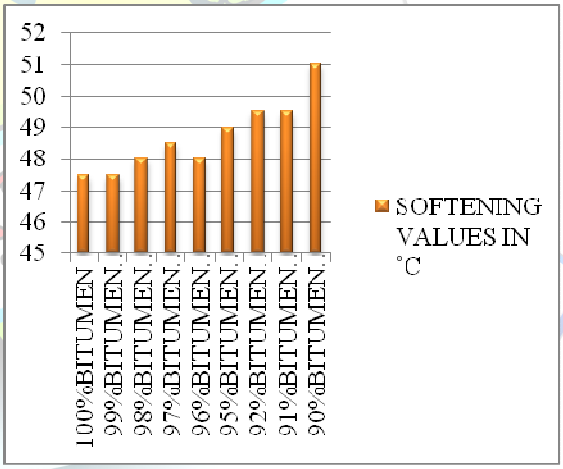

Fig.No.5.3.Softening Values

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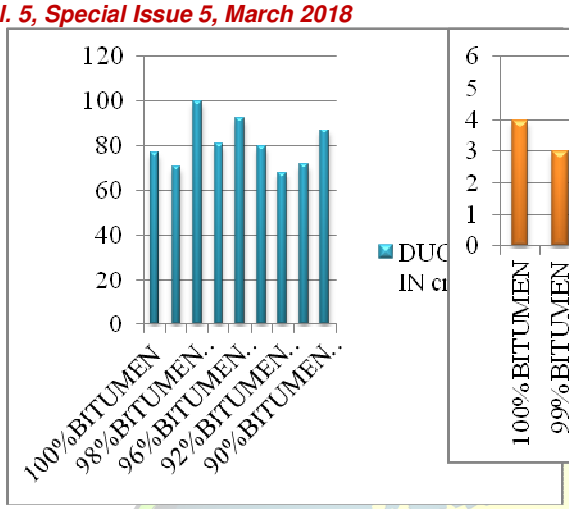

Fig.No.5.4.Ductility Values

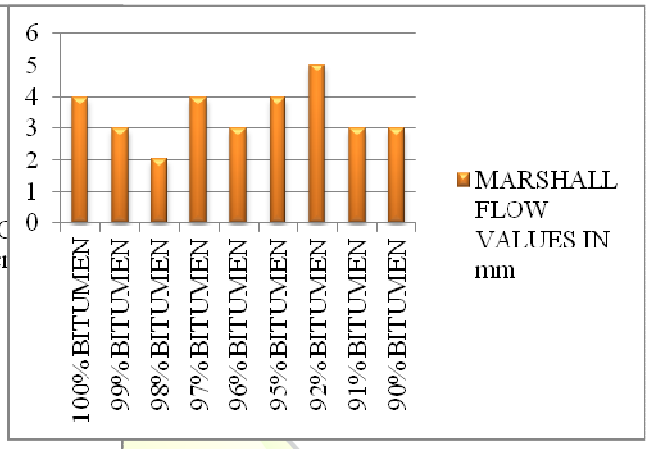

Fig.No.5.6 Marshall Flow Values

Marshall Stability test

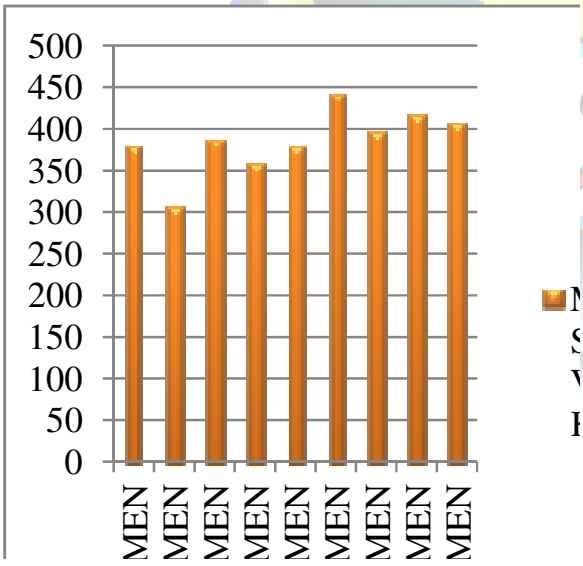

Fig.No.5.5 Marshall Stability Values

S.No	SAMPLE	STABILITY VALUES(Kg)	FLOW VALUE(mm)
1.	100% (100% of bitumen)	377.295	4
2.	Modified Bitumen 99% (99% 0f bitumen 0.5% water 0.5% F.A)	305.915	3
3.	98% (98% 0f bitumen 1.5% water 0.5% F.A)	387.492	2
4.	97% (97% 0f bitumen 2.5% water 0.5% F.A)	356.901	4
5.	96% (96% 0f bitumen 3.5% water 0.5% F.A)	377.295	3
6.	95% (95% 0f bitumen 4.5% water 0.5% F.A)	438.478	4
7.	92% (92% 0f bitumen 7.5% water 0.5% F.A)	397.689	4
8.	91% (91% 0f bitumen 8.5% water 0.5% F.A)	418.084	3
9.	90% (90% 0f bitumen 9.5% water 0.5% F.A)	407.886	3

V. CONCLUSION

From the results obtained the foamed bitumen have increase in stabilization and physical properties in the bitumen mix of 90% bitumen, 9.5% water, 0.5% foaming agent than other mix. The technique of foamed bitumen can be successfully used in heavy traffic loads with economically.

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REFERENCES

[1] K.M.Muthen 'Foamed Asphalt Mixes', (1999), CSIR TRANSPORTEK contract report CR-98/077.
[2] Martin Kendall, Bruce Baker, Peter Evans, JothiRamanujan 'Foamed Bitumen Stabilisation'
[3] Ramanujham, Jashon , Michel Janosevic 'DESIGN, CONSTRUCTION AND PERFOMANCE OF INSITU FOAMED BITUMEN STABILISED PAVEMENTS' (2009).
[4] Syed Usman Husainy, H. Syed Saleem, M.R. Faizan Ahmed, N. Syed Kahmruddin Fazeel, C. Neeladharan, K. Mohan, "Enhancement of Stabilization in Bituminous roads using Polyethylene and Epoxy resin," International Research Journal of Engineering and Technology, vol. 4, no. 4, pp 2401-2404, 2017.
[5] IS 1202-1978 Methods for testing Tar and Bituminous material for determination of specific gravity
[6] IS 1206-1978 Methods for testing Tar and Bituminous material for viscosity
[7] IS 1205-1978 Methods for testing Tar and Bituminous material for determination of softening point.
[8] IS 1203-1978 Methods for testing Tar and Bituminous material for determination fof penetration.
[9] IS 2386(part-1)-1963 Methods Of Testing Aggregates for concrete Specific gravity.
[10] IS 2386(part-1)-1963 Methods Of Testing Aggregates for concrete Impact value.