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Experimental Investigation of Effect of Use of Plastic in Bituminous Mix

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Abstract: *In this paper the study of some of plastic waste materials which we can reuse by certain processing and use in the stability of soil and in road construction. The new technique of soil stabilization can be effectively used to meet the challenges of society to reduce the problem of disposing the plastic as well as increases the density of soil in an economical way and help in the construction of Embankment, Road and Building on low bearing capacity soil.*

Keywords: Plastic

I. INTRODUCTION

Disposal of waste plastic is a major problem. It is non-biodegradable material. Burning of these waste plastic causes pollution. Waste plastic in India are categorized as solid or hazardous waste. The abundance and increase of waste plastic disposal is a serious problem That leads to environmental pollution

The creation and disposal of non decaying waste material such as materials waste,plastics etc. have been posing difficult problems. To find its utility in bituminous mixes for road construction, laboratory performance studies wear conducted on bituminous mixes. Laboratory studies proved that waste plastic improves the properties of bituminous mix. Its better solution for disposal in an useful way. Use of plastic Waste increases strength and high resistance to water and and better performance over a period of time.

The use of the innovative technology will not only strength the road construction but also make it economical as well as increase the life span of roads. Plastic roads will be most feasible for a country like India, where temperature is around 50oC and the heavy monsoons too create havoc, leaving the roads with potholes and ruts. It is hoped that in near future we will have strong, durable and eco-friendly roads that will relieve the earth from all type of plastic waste.

II. OBJECTIVE

- To study basic properties of raw material used.
- To test the effect of use of plastic in bituminous mix.
- To compare result of plastic modified mix with standard specimen.
- To study effect of waste plastic for base course.

III. METHDOLOGY

1. Specific Gravity Test

Specific gravity test of aggregates is done to measure the strength or quality of the material while water absorption test determines the water holding capacity of the coarse and fine aggregates. The main objective of this test is to measure the strength or quality of the material.

2. Impact Value Test

The test sample is filled in 3 layers and each layer is tamped for 25 numbers of blows. Metal hammer (weighing approx. 14 kg) is pre-arranged to drop with a free fall of 380mm. The test specimen is subjected to 15 numbers of blows each at not less than 1 second. The aggregate impact value is a measure of resistance to sudden impact or shock, which may differ from its resistance to gradually applied compressive load.

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3. Water Absorption Test

Water absorption gives an idea on the internal structures of aggregate. Aggregates having more absorption are more porous in nature and are generally considered unsuitable, unless found to be acceptable based on strength, impact and hardness test.

4. Penetration Test

Penetration test of Bitumen determines the hardness or softness of bitumen by measuring the depth in millimeter to which a standard loaded needle will penetrate vertically in five seconds while the temperature of the bitumen sample is maintained at 25 0C. Penetration test measures the consistency and stability of pure bitumen and oxidized bitumen (Blown bitumen). For very soft materials with low viscosity such as tars, penetration tests cannot be carried out.

5. Ductility Test

The ductility test of the bitumen sample is one of the important tests of bitumen to be conducted before road construction. Ductility measures the adhesive property of the bitumen too along with its elasticity. The bituminous binder used in the pavement should be ductile enough to take up the deformations acting upon it without exceeding the deflection limit. Ductile bitumen can form a thin ductile film around the aggregate particles.

6. Specific Gravity Test

The specific gravity of semi-solid bituminous material, asphalt cements, and soft tar pitches shall be expressed as the ratio of the mass of a given volume of the material at 25 °C to that of an equal volume of water at the same temperature. This test is done to determine the specific gravity of semi-solid bitumen road tars, creosote and anthracene oil as per IS: 1202 – 1978.

7. Marshall Stability Test

This test is done to determine the Marshall stability of bituminous mixture. The sample needed is From Marshall stability graph, select proportions of coarse aggregates, fine aggregates and filler in such a way, so as to fullfill the required specification. The total weight of the mix should be 1100 gm for one specimen

IV. RESULT AND DISCUSSION

Bitumen test results analysis, it was noted as better values are obtained for plastic added bituminous mix design. The main test results are specific gravity and marshal stability test, flow value are analysed. The graph results shown that the 6-8% plastic blended bituminous mix gives better results, as the plastic percentage increases, the above test values are decreased slowly. By observing all the above value we strongly conclude that the plastic blended bituminous concrete mix give better values. The marshal stability value is increased from 906 to 1048 kg/mm2 that means the marshal stability value increased by 17 % than the conventional bitumen strength value. It is great achieving in strength point of view. It noted that 8% plastic gives better values.

Fig.1: Prepared Mould Specimen

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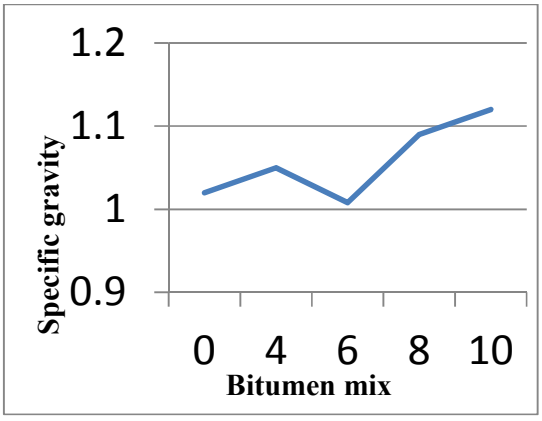
Fig. 2: Weight of Sample

Test name	Test Result
Specific gravity	2.64
Water absorption test (%)	0.81
Impact value test (%)	26.67

Table 1: Test Result.

Bitumen with shredded plastic (%)	Specific gravity test	Ductility test (cm)	Penetration test (mm)
P0B100	1.02	82	68
P4B96	1.05	79	66
P6B94	1.008	72.16	65
P8B92	1.09	71	59.5
P10B90	1.12	69	56.5

Table. 2



Flow Chart .No-1 Gravity Test

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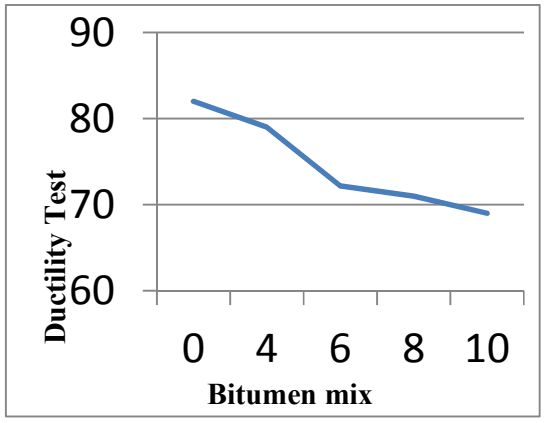
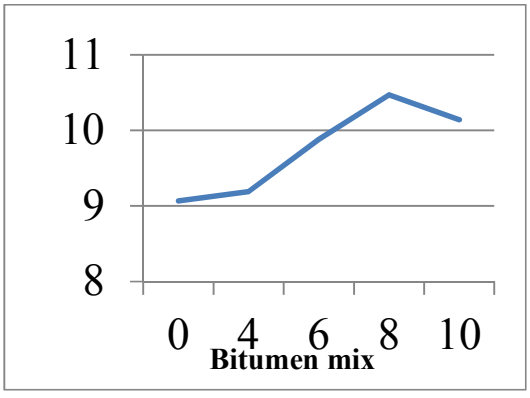


Flow Chart -2 Ductility Test.

Test Result

Bitumen (%)	Marshall stability Value (KN)	Flow value (mm)
P0B100 I	9.06	3.8
P0B100 II	9.03	3.82
P0B100 III	9.04	3.79
P4B96 I	9.21	2.56
P4B96 II	9.19	2.46
P4B96 III	9.20	2.49
P6B94 I	9.91	2.89
P6B94 II	9.87	2.76
P6B94 III	9.86	2.82
P8B92 I	10.54	3.29
P8B92 II	10.32	3.40
P8B92 III	10.56	3.35
P10B90 I	10.10	3.62
P10B90 II	10.12	3.72
P10B90 III	10.20	3.79

Table .No -3 Marshall Staibility Test.



Flow Chart. No-3

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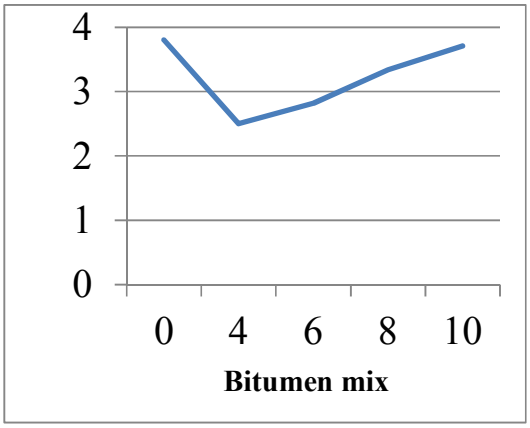

Flow Chart .No- 4

V. CONCLUSION

Waste Plastic can be used as coating material in bituminous concrete mixture for road construction. Properties of BC can be further improved by use of waste plastic. Use of waste plastic **8%** waste plastic improves strength. The only problem faced during this project is the shredding of plastics. To overcome this problem the shredding machines used should be easily available Plastic will increase the melting point of the bitumen. Use of the innovative technology not only strengthened the road construction but also increased the road life. Help to improve the environment. Plastic road would be a boon for India's hot and extremely humid climate where durable and eco-friendly roads which will relive the earth from all type of plastic waste.

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