

USE OF PLASTIC WASTE IN THE CONSTRUCTION OF FLEXIBLE ROADS

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ABSTRACT:- In the present scenario according to UN estimate every year the world uses 500 billion plastic. This projects deals with possibility of using waste of non bio-degradable plastic to reduce the concentration of bitumen in construction of flexible roads. As nowadays the concentration of plastic waste is increasing and we have very less measures to recycle it, we can get rid of plastic waste and prevent them from polluting the environment hence we can use plastic waste in the construction of the roads.

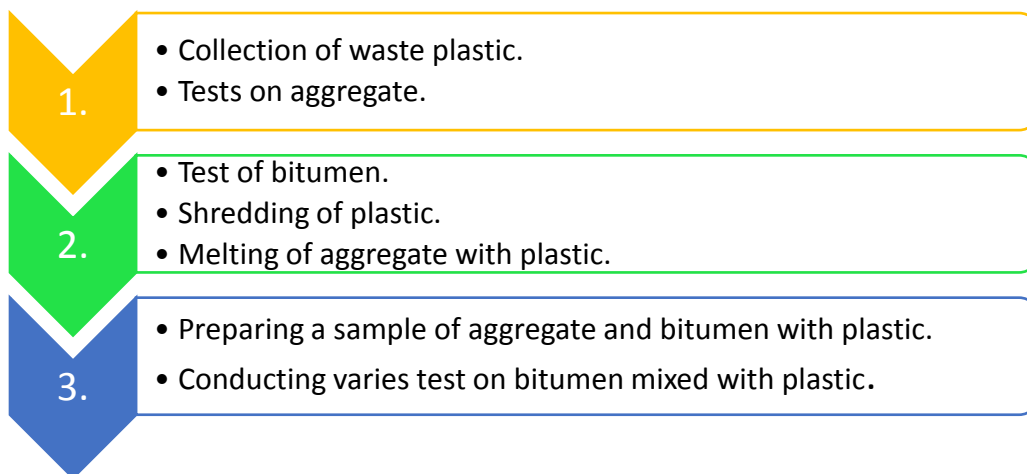
INTRODUCTION

The world toward the finish of the twentieth century that has recently been abandoned was extremely diverse to the world that its kin acquired toward the start of that century. The last 50 per cent of the most recent century saw uncommon mechanical changes and advancements in science and designing in the field of solution, transportation and data innovation, and in the wide range and utilization of materials. Plastic roads are roads made either entirely of plastic or of composites of plastic with other materials. Plastic roads are different from standard roads in the respect that standard roads are made from asphalt concrete, which consists of mineral aggregates and asphalt. Currently, there are no records of regular roads made purely of plastic. Plastic composite roads, however, have existed and demonstrate characteristics superior to regular asphalt concrete roads; specifically, they show better wear resistance. The implementation of plastics in roads also opens a new option for recycling post consumer plastics.

Between 3kg to 10kg of waste plastics are used in every ton of asphalt depending on the road design.

The waste plastic and its disposal is a major threat to the environment, which results in pollution and global warming. The utilization of plastic waste in bituminous mixes enhances its properties and also its strength.

METHODOLOGY



Tests on aggregate

1. Impact test – 21%
2. Los Angeles Abrasion – 21.12%
3. Crushing test – 21.46%

Tests on bitumen without plastic

1. Penetration test – 86.67mm
2. Softening test - 39.35°C

METHODS

MIXING BY MINI HOT MIX PLANT

- Step I: Plastic waste made out of PE, PP and PS cut into a size between 2.36mm and 4.75mm using shredding machine.
- Step II: Similarly the bitumen is to be heated to a maximum of 160°C to have good binding and to prevent weak bonding. (Monitoring the temperature is very important)
- Step III: At the mixing chamber the shredded plastic waste is to be added to the hot aggregate. It gets coated uniformly over the aggregate within 30 Second, giving an oily look Plastic coated aggregate is obtained.
- Step IV: Hot bitumen is then added over the plastic coated aggregate and the resulting mix is used for road construction. The road laying temperature is between 110°C to 120° C. The roller used is 8-ton capacity.

MIXING BY (CMP)

- The dry process can also be carried out using central mixing plant. The shredded plastic is added along with the aggregate in the conveyor belt.
- This is transferred into the hot cylinder. There aggregate is coated with plastic first and then with the bitumen.
- The mixer so prepared is then loaded in the dipper lorry and transported for road laying. CMP helps to have better control of temperature and better mixing of this material thus helping to have a uniform coating.

Type Of Plastic	Chemical Formation
Low Density Poly ethylene Plastic (LDPEP)	(-CH ₂ -CH ₂ -)n
High Density Poly-ethylene Plastic (HDPEP)	(-CH ₂ =CH ₂ -)n

CONCLUSION

The plastic mixed with bitumen and aggregates is used for the better performance of the roads. The polymer coated on aggregates reduces the voids and moisture absorption. This results in the reduction of ruts and there is no pothole formation. The plastic pavement can withstand heavy traffic and are durable than flexible pavement. The use of plastic mix will reduce the bitumen content by 10% and increases the strength and performance of the road. This new technology is eco-friendly.

FUTURE SCOPE

As the population increases, the solid waste also increases proportionally .The best alternative is the usage of waste as construction material assuring a good disposal. As this method is economic the practice would be on satisfactory extent aiding the future generations for a good solid waste management.

REFERENCES

1. Indian Roads Congress IRC: 37-2012 - Guidelines for the design of flexible pavements-August 2012.
2. R Vasudevan (2011)-A technique to dispose waste plastics in an ecofriendly way Application in construction of flexible pavements, construction and building materials, VOL-28 Department of Chemistry, Thiagarajar College of Engineering, Madurai, Tamil Nadu, India, pp 311-320.



3. Miss Apurva J Chavan - Use of plastic waste in flexible Pavements -ISSN 2319 -4847, Volume 2, Issue 4, April 2013
4. S.S.Verma - Roads from plastic waste - The Indian Concrete Journal - November 2008
5. 5. Vinoth.N - Use of plastic wastes in road construction - Central Institutes of Plastic Engineering and technology