# Study of Changes in Behaviour of Bitumen after Adding Waste Plastic

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*Abstract*— As we all know now-a-days plastic is being widely used all over the world on a large scale in each and every household and commercial work which is easy to use but affects our environment and surrounding aggressively. It affects animals human plants wildlife marine etc. it might be very suitable to consume waste plastic into construction of road as a modifier in properties of bitumen because only 24% of plastic only gets recycled and rest is scraped in lands and other places.it will reduce plastic wastage and help the environment to be clean.

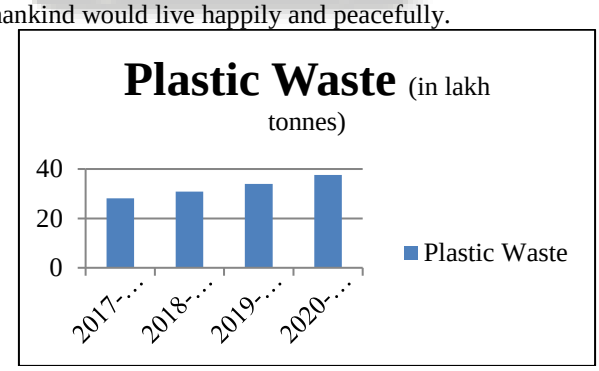
***Keywords:*** Bitumen, Plastic, Pavement, Road, Polymer, Recycled, Ecofriendly, Waste plastic, Disposal

## I. INTRODUCTION

Issue of discarding plastic waste will not get rid of up to when actions will not be started to execute on every level. Plastic is very cheap and easy accessible crude substance. It is used electrical appliances, daily use materials, packing, infrastructure build up, tele-communication etc.

It is achievable to enhance the property of bitumen mixed in upper two layers of road. Previous studies have shown that mixing of plastic is quiet good in bitumen. plastic being good in strength assumed to be enhancing the properties of bitumen because these both show same properties as on high temperature both melt and at low temperature both become hard. Both are high molecular compounds of carbon.

Keeping the current situation in knowledge plastic can't be fully restricted to use so we have to reduce its consumption and try to lower the amount of waste plastic and find more alternative to make it more non disposable. So that mankind would live happily and peacefully.




## II. LITERATURE REVIEW

Dr.R.Vasudevan, 2007) - stated that the plastic bitumen blend is a superior binder compared to normal bitumen. Blend has higher softening point and reduced Penetration value with an appropriate ductility.

Zahra Niloofar Kalantar (2012) - Addition of plastic to asphalt for the aim of excelling the characteristics of asphalt over a broad temperature span in paving, recycled plastic added to asphalt have also shown almost the same result in upgrading the road pavement performance as compared to polymers. In this study, a critical review on the past and benefits of using waste plastic in asphalt is presented.

Rishi Singh Chhabra (2014) - Due to uncontrolled use of polythene in day to day life, the pollution to the environment is boundless. Since the polythene are not decomposable, the need of the current scenario is to use the waste polythene in some useful purposes. The use of these materials as a road construction material proves eco-friendly, economical and utilization of plastic gives strength in the sub-base course of the pavement.

Sunil J. Kulkarni (2015) - Plastic is used in various domestic and industrial applications. Utility of plastic bags and bottles is very usual. The disposal of plastic waste is huge problem due to non-decomposable nature of plastic. The plastic can be used as raw material for ethanol like products. It can be adopted for road construction and other civil infrastructure related activities. The current review summarizes the research on use of waste plastic

Ms. Amruta Mundhe - conclude that the addition of plastic can increase the properties of bitumen and thus can be put to use and improve the quality and performance of road.

Ahmed Trimbakwala - conclude that we can save approx. Rs.45000/Km and give some benefits of modified binder (plastic in bitumen).

## III. BASIC STUDY

Previous researches have shown that plastic is very good at binding with bitumen and aggregate and can easily be operated as it was first started by Mr.R.Vasudevan of Thiagarajar College of Engineering, Madurai in 2002.He made a road in his campus mixing plastic with bitumen. He took approximate of 8 to 10% of plastic with bitumen. According to previous studies and experiments Normal bitumen roads don't need any repair approximately up to 5 to 10 years and after mixing plastic with bitumen roads in as their properties and up to 25 to 30 years they don't need any maintenance or anything. Mixing plastic with bitumen lowers the water absorption during rain which enhances the life of roads. Plastic waste reports 8.3 billion tones all over the world.

## IV. METHODOLOGY

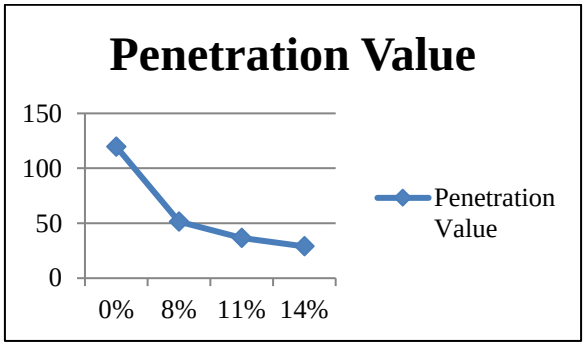
### A. *Material*

1) Bitumen: - Bitumen is used as a binding material in road construction. We take the bitumen of grade 100/120 from laboratory for our study.
2) Waste Plastic: - we collect the plastic waste from road, college canteen and dustbin and mix it in the bitumen in shredded form and use as a modifier.

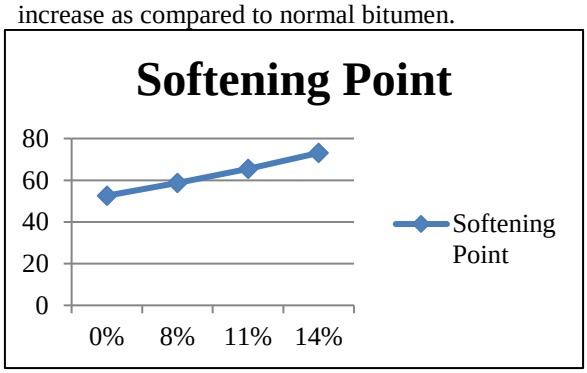
### B. *Testing*

1) Penetration test:-We observed that after mixing the plastic waste in the bitumen the penetration value will decreases and if we mix the plastic 10% or more the penetration value will be very small.

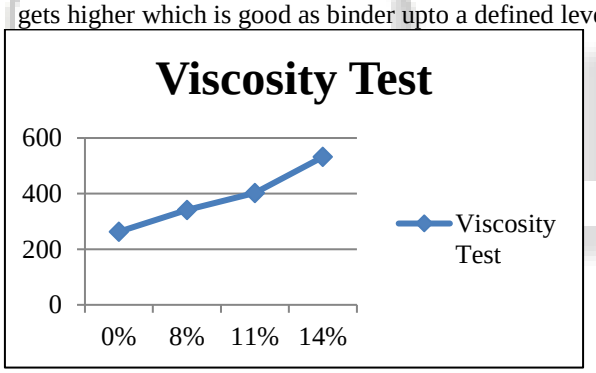
 



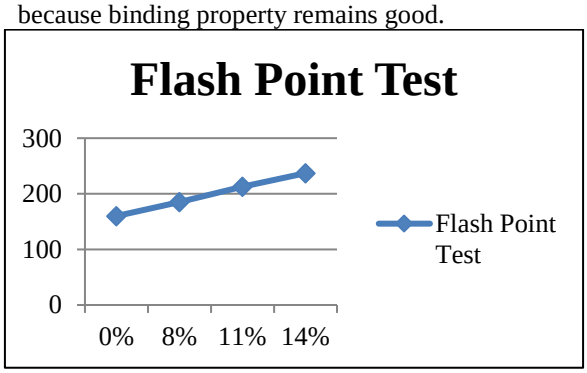

2) Softening point test:- After mixing the waste plastic in the bitumen the softening value of modified bitumen will increase as compared to normal bitumen.




3) Viscosity test:- After mixing plastic, viscosity of bitumen gets higher which is good as binder upto a defined level.




4) Flash point test:-On mixing plastic with bitumen, flash point increases which is good for road in hot temperature because binding property remains good.




### *C. Comparison*

After performing tests on normal bitumen and plastic mixed bitumen, we observed that on mixing a certain amount of plastic i.e.,8%-10%, bitumen shows it's adhesive properties. After mixing more plastic, it loses its effectivity i.e., it does not remain workable.

Here we are giving data to compare properties of normal bitumen and plastic mixed bitumen:-

| Test | Normal Bitumen | Bitumen with % of plastic waste | | |
|---|---|---|---|---|
| | | 8% | 11% | 14% |
| Penetration test (mm.) | 119.73 | 51.48 | 36.63 | 28.92 |
| Softening Point test (°C) | 52.6 | 58.7 | 65.4 | 73.1 |
| Viscosity test @100°C (sec) | 263 | 341 | 403 | 532 |
| Flash Point test (°C) | 160 | 185 | 213 | 237 |

## V. CONCLUSION

As far as we have studied and observed in our observations, mixing a sort of 8% to 10% of plastic with bitumen, it enhances it's Stability Characteristics and using plastic as a modifier is good for the strength and durability of roads. It lowers the Stability Flow Value i.e., the opposition to distortion under massive burden of wheels. Mixing plastic with bitumen will get us to the end of waste plastic which will be good for nature and living creatures. We have to minimize the use of plastic and if possible end it's use so that it doesn't get produced and be a problem for us.

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