



## A REVIEW: USE OF PLASTIC WASTE IN ROADCONSTRUCTION

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**Abstract :** The Waste plastic and its disposal is a major thread to the environment which results in pollution in global warming. The utilization of plastic waste in bituminous mines in to enhance its properties and also its strength. Disposal of waste plastic is a major problem its non-biodegradable and causes environmental pollution. The waste plastic is shredded and coated over aggregate and mixed with hot bitumen and result mixed is used for pavement construction. After mixing the mixture is laid as one would with regular asphalt concrete. According to toxic link report 3.6 million tonnes plastic is produced in 2019. It means 9206 tonnes plastic per day.

**IndexTerms** - Plastic waste, Strength, Bitumen, Asphalt, Flexible Pavement

### I. INTRODUCTION

Plastic wastes are made 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; specially, they show better wear resistance. Implementation of plastics in roads also opens a new option for recycling consumer plastics. Indonesia, India, United States, and many other countries have used technology which can incorporate plastic waste into an asphalt mix. Plastic roads can be made into interlocking pieces that can be quickly assembled or disassembled. This makes on-site construction much faster and convenient. Simplicity and speed of road work also correlates to lower cost. Improvement in properties of bituminous mix provides the solution for disposal in a useful way.

Plastic roads can be built from waste plastic, the majority of which is usually put into landfill, incinerated, or polluted into the environment. Landfilling and incinerating plastic are both problematic methods of managing plastic waste. Plastic in landfills can leak pollutants into the surrounding soil; incinerating creates gaseous pollutants, such as carbon dioxide.

### II. RESEARCH METHODOLOGY

#### ➤ Segregation

- Plastic waste collected from various sources must be separated from other waste.
- Maximum thickness of 60 microns

#### ➤ Cleaning Process

- Plastic waste get cleaned and dried

#### ➤ Shredding Process

- Plastic will be shredded or cut into small piece
- The different types of plastic waste are mixed together

#### ➤ Basic Process

- Plastic roads are made from recycled plastics, and the first step in constructing them is to collect and manage the plastic material
- Some of the most common plastics used in packaging are polyethylene terephthalate (PET or PETE), polyvinyl chloride (PVC), polypropylene (PP), and high and low density polyethylene (HDPE and LDPE).
- After sorting, cleaned, the shredded plastic is mixed and melted at around 170°C.
- Hot bitumen is then added and mixed with the melted plastic.
- After mixing the mixture is laid as one would with regular asphalt concrete.

- **TEST ON CONCRETE**

- **Aggregate Concrete Test**

The strength of the coarse aggregate may be assessed by aggregate crushing test. The aggregate crushing value provides a relative measure of resistance to crushing under gradually applied compressive load. To achieve a high quality of pavement, aggregates possessing high resistance to crushing or low aggregate crushing value are preferred.

- **Abrasion Test**

Due to the movements of traffic, the road stones used in the surface course are subjected to wearing action at the top. Hence road stones should be hard enough to resist the abrasion due to traffic. Abrasion tests are carried out to test the hardness property of stones and to decide whether they are suitable for the different road construction works.

- **Impact Test**

The test is designed to evaluate the toughness of stone or the resistance of the aggregates to fracture under repeated impacts is called impact test. The aggregate impact test is commonly carried out to evaluate the resistance to impact of aggregates and has been standardised by ISI.

The aggregate impact value indicates a relative measure of aggregate to impact, which has a different effect than the resistance to gradually increasing compressive stress. The aggregate impact value should not normally exceed 30% for aggregate to be used in wearing course of pavements. The maximum permissible value is 35% for bituminous macadam and 40% for water bound macadam base course.

- **Softening Point Test**

The principle behind this test is that softening point is the temperature at which the substance attains a particular degree of softening under specified condition of the test. Softening point denotes the temperature at which the bitumen attains a particular degree of softening under the specifications of this test.

The test is conducted by ring and ball apparatus. A brass ring containing test sample of bitumen is suspended in liquid like water or glycerine at a given temperature. A steel ball is bitumen touches the metal plate which is at a specified distance below. Generally, higher softening point indicates lower temperature susceptibility and is preferred in hot climates.

### III. LITERATURE REVIEW

- Dr.R.Vasudevan(2007) -stated that the polymer bitumen blend is a better binder compared to plain bitumen. Blend has increased softening point and decreased Penetration value with a suitable ductility.
- Amit Gawande (2012)- The quantum of plastic waste in municipal solid waste (MSW) is increasing due to increase in population, urbanization, development activities and changes in life style which leading widespread littering on the landscape. Thus disposal of waste plastic is a menace and become a serious problem globally due to their non-biodegradability and un aesthetic view. Since these are not disposed scientifically & possibility to create ground and water pollution. This waste plastic partially replaced the conventional material to improve desired mechanical characteristics for particular road mix. In conventional road making process bitumen is used as binder. Such bitumen can be modified with waste plastic pieces and bitumen mix is made which can be used as a top layer coat of flexible pavement. This waste plastic modified bitumen mix show better binding property, stability, density and more resistant to water.
- Sunil J. Kulkarni (2015) - Minimization of waste material is important aspect of the modern growth and development initiatives. Plastic is used in various domestic and industrial applications. Use of plastic bags and bottles is very common. The disposal of plastic waste is major problem due to non-biodegradable nature of plastic. The plastic can be used as feedstock for ethanol like products. It can be used for road construction and other construction related activities. The current review summarizes the research on use of waste plastic.
- Rishi Singh Chhabra (2014) - In the highway infrastructure, a large number of originates materials and technologies have been invented to determine their suitability for the design, construction and maintenance of these pavements. Plastics and rubbers are one of them. Also considering the environmental approach, due to excessive use of polythene in day to day business, the pollution to the environment is enormous. The use of plastic materials such as carry bags, cups, etc. is constantly increasing day by day. Since the polythene are not biodegradable, the need of the current hour is to use the waste polythene in some beneficial purposes. The use of these materials as a road construction proves eco-friendly, economical and use of plastic gives strength in the sub-base course of the pavement.

#### IV. CONCLUSION

Plastic coating on aggregates is used for the better performance of roads. This helps to have a better binding of bitumen with plastic wasted coated aggregate due to increased bonding and area of contact between polymers and bitumen. The polymer coating also reduces the voids. This prevents the moisture absorption and oxidation of bitumen by entrapped air. This has resulted in reducing rutting, ravelling and there is no pot hole formation. The roads can withstand heavy traffic and show better durability.

#### V. REFERENCES

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