Use of Polythene In Flexible Pavement As An Ingredient

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Abstract- *Plastic waste are increasing day by day, which is significant danger for the climate. Plastic waste is non-biodegradable and responsible for global warming. This needs to be removed from environment or utilized effectively.*

It has been seen that the plastic waste material can be improve the desired properties of bituminous mix for repair and construction of bituminous pavement. This will not only strengthen the pavement and increases its stability and durability. It is also economical and eco- friendly.

The use of the innovation technology not only for their strength of road construction, but also increases the road life as well as will help to improve the environment and creating a source of income.

Keywords- Plastic Waste, Non-biodegradable, Environment, Bituminous pavement, Stability, Durability.

I. INTRODUCTION

Plastic is non-biodegradable material, and it has been searched that plastic takes around 4000 years to decay in nature. Plastic Waste is great danger for environment. In 2005, monsoon rains flooded Mumbai, plastic bags were responsible for clogging the underground drainage system.

In 2000, 3000 cows died in Lucknow, the city investigated and find plastic bags in their stomach, which became the causes of death.

In research found that, 300-million-ton plastic waste are occurred in year globally. 3.5-million-ton plastics produce in India every year and 9200 ton produces in every day. Plastic wastes are durable, improper disposal of plastic may cause breast cancer, reproductive problems in humans and animals, genital abnormalities and much more.

Nowadays, we can use plastic in road construction purposes because, durability of plastic is high, and it degrades very slow. The technique for using plastic waste for ecological beneficiation by and for the future age must be derived. To decrease the high rate of waste collection, there are approaches to reuse them in road construction.

The use of plastic-coated aggregates has been proposed for disposing plastic wastes. Utilizing reused plastic can enhance the mechanical qualities of flexible pavement and some of the advantages are binding property, stability, density, and high resistance to water in cracks.

Use of higher percentage of plastic waste reduces the need of bitumen 10%. Plastic can also increase strength and performance of the pavement. Plastic increases the melting point of bitumen and hence, missing can be done is better and easier way.

Plastic waste replaces 10 % to 15% of bitumen, and thereby save approximately Rs. 30000 to Rs.50000 per kilometer of a road stretch. Shredded plastic waste act as a strong binder agent for making the asphalt.

II. LITERATURE REVIEW

The use of plastic waste in flexible pavements would open a solution for the disposal issues regarding plastic wastes. Many research works have been done in the area of the use of plastic waste in bituminous road construction.

Prof. C.E.G. Justo said that addition of 8% by weight of processed plastic for the preparation of modified bitumen results in a saving of 0.4% bitumen by weight of mix of about 9.6 kg bitumen per cubic meter of bituminous concrete mix.

V.S. Punith (2001) said that there is possibility to improve the performance of bituminous mixture in road pavement. Waste plastics are softened on heating at 130 ^{0}C.

Dr. R. Vasudevan and S. Rajasekaran (2007), said that the polymer bitumen blend is a better binder compared to plain bitumen. Blend has increase softening point and decreased Penetration value with a suitable ductility.

Sabina (2001) studied that the comparative performance of
[Type here]
bituminous mixes containing plastic / polymer (PP) with conventional bituminous concrete mixture. Improvement in properties like Marshall Stability, indirect tensile strength.

Sultana (2012), investigation and utilization of waste plastic as a strength modifier in surface course of flexible and rigid pavement. The use of waste plastic modifier for asphalt concrete and cement concrete pavement.

III.OBJECTIVES

The main objective of this project is to produce flexible pavement from plastic wastes-

1. To prepare Marshell stability samples with plastic waste and without plastic waste.
2. To coat the aggregates with the waste plastic material.
3. To check the properties of bituminous mix specimen.
4. To prepare statistical model for optimum utilization of plastic waste.
5. To reduce the disposal problem of plastics.

IV. METHOLOGY

There are two processes for making plastic waste bituminous road-

A. WET PROCESS
B. DRY PROCESS

WET PROCESS-

1. Waste plastics are collected first.
2. Collected plastic waste sorted as required thickness.
3. Normally polyethylene 60 micron or below is used for further process.
4. Generally, less micron plastic is easily mixable in the bitumen in higher temperature
5. Collected plastic was cut into fine pieces as for as possible.
6. Then sieve it through 4.75 mm sieve & retain 2.36mm sieve was collected.
7. First bitumen heated at about 160 – 170 ^{0}c temperature which is melting temperature.
8. At constant temperature mixture was stirred manually for about 20 -30 min.
9. Plastic waste is ground and made into 6 – 8 %**.** Plastic is added to the bitumen at 160 ^{0}c.

This process did not yield a homogenous mixture with prominent separated solid deposit of mixture there for wet process was not adopted and therefor we have not conducted any experiments on wet process.

DRY PROCESS

The simplest process to utilize plastic in road construction is by using the "dry-processed" In the dry process, the processed waste plastic is shredded and added to the hot aggregate. The Indian Road Congress (2013) and National Rural Roads Development Agency (2019) indicates that the shredded waste plastic size should preferably be 2-3 mm for better spread and coating on the aggregate. Dust and other impurities should not exceed 1%. The shredded waste plastic is then added to the aggregates that are heated to 170ºC. The shredded waste plastic softens and melts to form a coating around the aggregates. The bitumen is also heated to 160ºC, and the plastic-coated aggregates are then mixed with bitumen and used for road construction

V. LABROTARY TESTS

Test on aggregates

1. Aggregate crushing test
2. Los Angeles abrasion test
3. Impact test

Test on bitumen

1. Penetration test
2. Softening point test
3. Viscosity test 4.Marshall Stability test.

VI. ADVANTAGES

Durability:

Plastic waste can enhance the durability of pavements, making them last longer.

Reduced Maintenance:

Pavements with plastic additives require less maintenance over time.

Environmentally Friendly:

It helps recycle plastic waste, reducing its impact on the environment

Cost Savings:

Using plastic waste can lower construction costs, as it's often cheaper than traditional materials.

Reduced Maintenance:

Pavement with the plastic tend to require less maintenance due to their enhanced durability.

VII. DISADVANTAGES

Environmental concerns:

While it can plastically waste, there may still be environmental concern related to the long - term effects of plastic in the pavement.

Quality control:

Ensuring consistent quality and performance of plastic – based pavement can be challenging.

Limited applications:

Not suitable for all types of pavements or road conditions.

Research needed:

More research is required to fully understand the long-term effects [Type here] and benefits.

VIII. FUTURE SCOPE

1. Road accidents due to potholes will be reduced to a Greater extent.
2. Cost of construction will be reduced.
3. Strength of the road increased (increased Marshall Stability value).
4. Better resistance to water and water stagnation.
5. No stripping and have no potholes in the pavement.
6. Increased binding and better bonding of the bitumen mix.
7. Increased load withstanding property of road.
8. Overall consumption of bitumen decreases.
9. Maintenance cost of the road is almost nil.
10. The road life period is substantially increased.
11. No effect of radiation like UV.

IX. CONCLUSION

Using waste plastic in flexible pavements can be promising way to recycle plastic and make roads more durable. It helps reduce plastic pollution and can save money.

We need to keep studying and improving this technique to make sure it is safe for environment and maintenance quality over time. So, while its positive step, we should continue researching and refining the use of waste plastic in pavement for a sustainable future.

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