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"USE OF WASTE PLASTIC IN BITUMEN ROAD"

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Abstract: Disposal of waste materials including waste plastic bags has become a serious problem and waste plastics are burnt for apparent disposal which cause environmental pollution. Utilization of waste plastic bags in bituminous mixes has proved that these enhance the properties of mix in addition to solving disposal problems. Plastic waste which is cleaned is cut into a size such that it passes through 2-3mm sieve using shredding machine. The aggregate mix is heated and the plastic is effectively coated over the aggregate. This plastic waste coated aggregate is mixed with hot bitumen and the resulted mix is used for road construction. The use of the innovative technology will not only strengthen the road construction but also increase the road life as well as will help to improve the environment. Plastic roads would be a boon for India's hot and extremely humid climate, where temperatures frequently cross 50°C and torrential rains create havoc, leaving most of the roads with big potholes.

1.1 INTRODUCTION

The threat of disposal of plastic will not solve until the practical steps are not initiated at the ground level. It is possible to improve the performance of bituminous mixed used in the surfacing course of roads
Studies reported in the used of re-cycled plastic, mainly polyethylene, in the manufacture of blended
indicated reduced permanent deformation in the form of rutting and reduced low – temperature cracking of the pavement surfacing. The field tests withstood the stress and proved that plastic wastes used after proper processing as an additive would enhance the life of the roads and also solve environmental
problems. Plastic is a very versatile material. Due to the industrial revolution, and its large-scale production starting from agriculture to packaging, automobile, electronics, electrical, building
construction and communication sectors has been virtually revolutionized by the applications of plastics. Plastic is a non- biodegradable material and researchers found that the material can remain on earth for 4500 years without degradation. Several studies have proven the health hazard caused by improper disposal of plastic waste. The health hazard includes reproductive problems in human and animal, genital abnormalities etc., Looking forward the scenario of present life style a complete ban on the use of plastic cannot be put, although the waste plastic taking the face of devil for the present and future generation. We cannot ban use of plastic but we can reuse the plastic waste.

1.2 SCOPE OF THE WORK

The use of waste plastic in bitumen road construction is an innovative approach to sustainable infrastructure development. This method enhances the durability of roads while addressing plastic waste management issues. The scope of work includes various stages, from material collection to final road construction and quality assessment.

1.3 METHODOLOGY SCOPE

The methodology for incorporating waste plastic into bitumen roads involves several key steps. First, suitable waste plastics such as polyethylene (PE), polypropylene (PP), and polystyrene (PS) are collected from municipal solid waste. These plastics are then cleaned, shredded into small pieces, and preheated to remove moisture. The shredded plastic is then blended with hot aggregates before mixing with bitumen at a controlled temperature. This ensures uniform coating of the plastic over the aggregates, which enhances the bonding between the bitumen and aggregates, improving the road's durability and strength. The prepared mixture is then laid and compacted using conventional road construction equipment. The scope of using waste plastic in bitumen roads is vast, offering environmental and economic benefits. It provides a sustainable solution for plastic waste management by reducing landfill waste and mitigating pollution. Additionally, roads constructed using plastic-modified bitumen exhibit higher resistance to water damage, improved flexibility, and enhanced load-bearing capacity, leading to longer service life with reduced maintenance costs. This method is particularly beneficial in regions facing plastic waste disposal challenges and those with high traffic loads requiring durable roads. Governments and road construction agencies worldwide are increasingly adopting this technology as part of sustainable infrastructure initiatives, promoting a circular economy while addressing environmental concerns.

1.4. Functional Analysis

The functional role of waste plastic in bitumen road projects can be analyzed in terms of its impact on the performance, environmental benefits, and cost-effectiveness of road construction.

1.5 PROBLEM STATEMENT

Plastic waste has become one of the most significant environmental challenges globally, with millions of tons of plastic waste being generated each year, much of which ends up in landfills, oceans, and other natural habitats. At the same time, the construction of road infrastructure requires large quantities of bitumen, which is a non-renewable resource and poses challenges related to its production and environmental impact. Given the growing demand for roads and the increasing plastic waste problem, there is a need for sustainable alternatives that can contribute to both reducing plastic waste and improving the performance of roads.

1.6 OBJECTIVES

The objective of using waste plastic in bitumen road projects is to enhance the quality and durability of the road while promoting environmental sustainability. The plastic waste, when mixed with bitumen, helps improve the road's resistance to wear, water damage, and cracking. It also reduces the environmental impact by recycling plastic waste, thus decreasing landfill waste and contributing to eco-friendly construction practices.

CONCLUSION

The case study above concluded that large firms are good enough and capable of using material management techniques on construction sites. Medium-sized companies have some technical and seasonal problems because they do not use any software. Small firms lag behind in materials management compared to medium and large firms due to lack of knowledge about materials management.

The following recommendations have been made with respect to all sizes of construction companies:

1. The modified bitumen shows good result when compared to standard results.
2. The optimum content of waste plastic to be used is between the ranges of 5% to 10%.
3. The problems like bleeding are reduce in hot temperature region.
4. Plastic has property of absorbing sound, which also help in reducing the sound pollution of heavy traffic.
5. The waste plastics thus can be put to use and it ultimately improves the quality and performance of road.
6. Total material cost of the project is reduced by 7.99%
7. The addition of waste plastic modifies the properties of bitumen

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