Use of Plastic Waste in Road Construction

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Abstract— Bottles, containers and packing strips etc. is increasing day by day. As a result amount of waste plastic also increases. This leads to various environmental problems. Many of the wastes produced today will remain in the environment for many years leading to various environmental concerns. Therefore it is necessary to utilize the wastes effectively with technical development in each field. Many by-products are being produced using the plastic wastes. Our present work is helping to take care of these aspects. Plastic waste, consisting of carry bags, cups and other utilized plastic can be used as a coating over aggregate and this coated stone can be used for road construction. The mix polymer coated aggregate and tyre modified bitumen have shown higher strength. Use of this mix for road construction helps to use plastics waste. Once the plastic waste is separated from municipal solid waste, the organic matter can be converted into manure and used. Our paper will discuss in detail the process and its successful applications.

Key words: Low Density Polymer, Flexible Pavements, Bags, Wrapper

INTRODUCTION

Now-a-days disposal of different wastes produced from different Industries is a great problem. These materials pose environmental pollution in the nearby locality because many of them are non-biodegradable. Traditionally soil, stone aggregates, sand, bitumen, cement etc. are used for road construction. Natural materials being exhaustible in nature, its quantity is declining gradually. Also, cost of extracting good quality of natural material is increasing. Concerned about this, the scientists are looking for alternative materials for highway construction, and industrial wastes product is one such category. If these materials can be suitably utilized in highway construction, the pollution and disposal problems may be partly reduced. In the absence of other outlets, these solid wastes have occupied several acres of land around plants throughout the country. Keeping in mind the need for bulk use of these solid wastes in India, it was thought expedient to test these materials and to develop specifications to enhance the use of these industrial wastes in road making, in which higher economic returns may be possible. The possible use of these materials should be developed for construction of low volume roads in different parts of our country. The necessary specifications should be formulated and attempts are to be made to maximize the use of solid wastes in different layers of the road pavement.

LITERATURE REVIEW

Plastics will increase the melting point of the bitumen. The use of the innovative technology not only strengthened the road construction but also it improve the environment and also creating a source of income. 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. It is hoped that in near future we will have strong, durable and eco-friendly roads which will relieve the earth from all type of plastic-waste.

Plastic is everywhere in today's lifestyle. The disposal of plastic wastes is a great problem. These are on-biodegradable product due to which these materials pose environmental pollution and problems like breast cancer, reproductive problems in humans and animals, genital abnormalities and even a decline in human sperm count and quality. In recent years, applications of plastic wastes have been considered in road construction with great interest in many developing countries. The use of these materials in road making is based on technical, economic, and ecological criteria. Several million metric tons plastic wastes are produced in India every year. If these materials can be suitably utilized in highway road construction, the pollution and disposal problems may be partly reduced. Keeping in mind the need for bulk use of these wastes in India, it was thought expedient to test these materials and to develop specifications to enhance the use of plastic wastes in road making, in which higher economic returns may be possible. The possible use of these materials should be developed for construction of low-volume roads in different parts of our country.

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A. Environmental pollution is a major problem in developing countries like Egypt. Reuse of waste polymers is considered an attractive solution for environmental white pollution and reducing

of the costs of road pavement and maintenance. This research aims to prepare environmentally friendly hot mix asphalt (HMA) for paving using some industrial wastes as polypropylene and polyester fibers. The solid materials in the mix include normal and highly porous aggregates. 5% and 10% of waste polymers by weight of the asphalt were used to prepare special binders. The samples were tested for their physical properties, chemical properties, aging, scanning electron microscopy (SEM) and thermo-gravimetric analysis (TGA). The results revealed that the prepared HMA using 5% of waste polymer had high performance as compared to the ordinary one and the waste polymer could be used in road construction.

5 The use of plastic and related materials is increasing exponentially due to tremendous growth in population, urbanization and changed life style leads to widespread littering of plastic on the landscape. Disposal of waste plastic is a serious problem globally due to their non-biodegradability and hazardous to human health, since these are not disposed scientifically and thus, create ground and water pollution. If this curse to mankind in the form of waste plastic is used as a boon for mankind by using it as additives in road construction, it will proved to be a best solution over worst road condition. In the present paper techniques has been developed to use plastic waste for construction of bituminous roads and flexible pavements. In general bitumen is used as binder in road construction. Binding properties of this bitumen can be modified by blending it with waste plastic pieces. It can be used for construction purpose. Waste plastic coated road aggregates can improve road strength. This modified bitumen mix and aggregates show better binding property, stability, density and more resistant to water thus increasing durability of roads with increased resistance to wear and tear of road.

OBJECTIVES

To compare the experimental results with the conventional pavement and perform economic analysis.
To provide solution for no striping and no potholes.
To make stronger road with increased stability value.
To provide better resistance towards rain water and water stagnation.
To prepare better model for optimum utilization of plastic waste.

IV. METHODOLOGY

Following are the plan and cross section of Road.

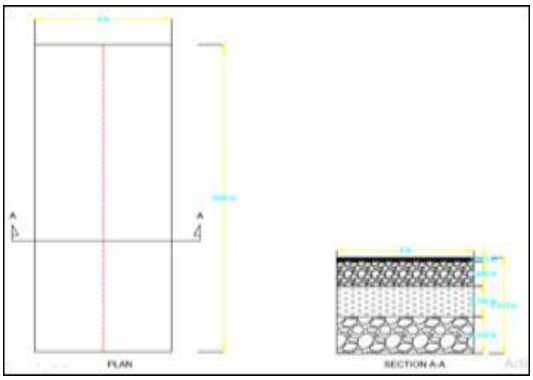

Fig. : Plan and Cross section of road showing diferent layers

A. Raw Materials

Bitumen
Plastic
Aggregates

B. Bitumen

Bitumen is defined as "A viscous liquid, or a solid, consisting essentially of hydrocarbons and their derivatives, which is soluble in trichloro-ethyelene and is substantially nonvolatile and softens gradually when heated. Grades of Bitumen:VG 10, VG 20,VG 30

Plastic:

Plastic in different forms is found to be almost 5% in municipal solid waste, which is toxic in nature. It is a common sight in both urban and rural areas to find empty plastic bags and other type of plastic packing material littering the roads as well as drains. Due to its biodegradability it creates stagnation of water and associated hygiene problems.

C. Construction Process

There are two main processes namely:
Dry process
Wet process
In this project, the construction Process used is Dry Process



Fig. : Dry Procss

D. Dry Process

In Dry process waste plastics are used as coating materials by softening the plastic and not by burning. For a flexible pavement hot stone aggregate (170'C) is mixed with hot bitumen (160'C) and the mix is used for road laying. The aggregate when coated with plastics improved its quality with respect to voids, soundness and moisture absorption and decreases porosity and thus the performance of the pavement is increased.

VI. Conclusion

No stripping and No potholes.
Stronger road with increased Stability Value.
Obtained strength of plastic coated aggregate is more than conventional aggregates.
No effect of rain water and other weather condition mostly of water attacks.
To compare the experimental results with the conventional pavement and perform economic analysis.
This technique is very environment eco-friendly.

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