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UTILISATION OF WASTE PLASTIC IN ROAD CONSTRUCTION

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ABSTRACT

Disposal of plastic waste is very serious problem and hence it is very important to proper utilize the plastic waste. In India, nearly about greater than 12 million tons plastic wastes are available. For the utilization of plastic waste from the different forms such as plastic carry bags, bottles, container, cup, packing strip, etc. Plastic waste leads to various environment problems like, if the plastic waste is burn for the disposal purpose there is the formation of poisonous gases that is increase in air pollution and open dumping of plastic waste also destroy the valuable agricultural land and hence it increases the soil pollution. Littered plastics spoils beauty of the city and choke drain & make important public places filthy. Therefore it is very necessary to utilize the plastic waste effectively, efficiently, conveniently, safely and economically with technical development in each field. Sometime plastic is used as binding agent. With the use of plastic waste it increases the strength of flexible pavement of road. As compare to plain bitumen the life of flexible road pavement in which plastic & polythene is use has greater strength and durability. The melting point of plastic waste is low as compare to other waste used in road construction. In this topic, we studied how to utilize the waste plastic in flexible road pavement construction also in improving the characteristics of bitumen. Use of innovative technology will not only strengthen the road construction but also increase the life of road. This technology is not a new concept but rather not practiced widely.

Keywords: *Utilize the plastic waste, Bitumen, Road construction, Flexible pavement.*

1. INTRODUCTION

In today's life style plastic is available everywhere and it is major problem to dispose it off. Plastic is non-biodegradable material that contains one or more polymers. It is durable, the chemical bond that makes the plastic so durable, make it equally resistant to naturally processes of the degradation. In all percentage of solid waste about 60% of waste contains plastic. It is hazardous to the human health and environment. Thus, the utilization of plastic waste in road construction purpose of road pavement will be one of the best alternatives for disposing them in a user friendly manner. The waste plastic bags were collected from the roads, garbage truck, dumpsite & compost plant, rag pickers buy at suitable rate and transfer to the project site & after that various processes are done such as segregation, cleaning process, shredding process, then dry or wet process are done as per convenient. Therefore it is necessary to utilize the plastic waste efficiently with technical development in each field. The possible use of these materials should be developed for the construction of the low volume roads. The polymer improve to show good properties for flexible road construction and plastic waste can be find its uses, in this process it can be help to solving the problems of solution. The use of the waste in hot bituminous mix too enhances the performance of the flexible pavement. Plastic mix has decreased the penetration value test with suitable ductility, also increase the softening point of bitumen. Softened plastic have the binding property, so it can be used good binder for flexible road pavement.

2. OBJECTIVES

a. The addition of waste the plastic improves the properties of the bitumen in road construction.
b. It reduces the total cost of the project up to 7 to 10%.
c. Plastic has the property of absorbing sound, so it also helps to prevent the sound pollution.
d. Plastic waste also use as a binding agent & hence it modified the properties of flexible road pavement.
e. In hot temperature region, the problems like bleeding are reduces.

3. METHODOLOGY

a. Flow chart of plastic waste of road laying process.

b. Collection process: The plastic waste is collected from different areas.
c. Segregation: It gets separated.
d. Cleaning process: It gets cleaned & dried.
e. Shredding process: It cut into the small pieces & different types of plastics waste are mixed together.

4. FIELD TRIALS

1. Wet Process
2. Dry Process

Wet Process

In this process, waste plastic bags are collected first. After that collecting of plastic waste are sorted that means separated into the different sizes of plastic. The thickness of plastic waste varies as per mixing purpose. Generally, 50 to 60 micron polythene (plastic) is used for further process. Nearly 50 to 60 micron of polythene is easily mixable in bitumen at higher temperature (160 to 170 degree c) then the plastics is shredded into the small pieces as per convenient .all pieces of plastic sieve it through 4.75 mm and retained 2.36 mm sieve. In this process after shredding the plastic waste is directly added in the hot bitumen having melting temperature 160 to 170 degree c. Nearly about 20 to 30 min mixture stirred manually. At the last polymer bitumen mixture is properly set then for using the different way same test such as :

1. Penetration test.
2. Softening test.
3. Ductility test.
4. Flash point and fire point test.

Addition of the stabilizers and proper cooling are required since, the wet process required lot of investment and bigger plant therefore this process is not commonly used.

Dry Process:

a. The plastic wastes are like, plastic bags, bottles, etc. cut into the sizes in between 2.36 to 4.74 mm use in shredding machine.
b. The aggregate mixed is heated up to 170 degree C. And then it is transfer to the mixing chamber.
c. Similarly, the bitumen is to be heated up to the maximum of 160 degree C. At the mixing chamber, the shredded particles of plastic waste are added over the hot aggregate. The plastic waste coated aggregate is mixed with hot bitumen, at the site of hot mixed bitumen plant.
d. In this process, after shredding the plastic waste is heated in 170 degree C in mini hot-mix plant.
e. This process is commonly used for the construction of flexible road pavement.

5. ADVANTAGES & DISADVANTAGES OF PLASTIC WASTE

Advantages:

a. The strength of the road is increase & better soundness property.
b. It increases the life of flexible pavement.
c. Maintenance cost of the road is less.
d. No effect of radiation like UV rays.

Disadvantages

a. During the road laying process there is formation of gases like HCL gas which is harmful for environment.
b. It is not useful for rigid pavement.

6. CONCLUSION:

In this topic we concluded that, the use of the innovative technology not only strengthen the road construction but also increases the road life as well as creating a sources of income. Plastic road would be a boon for India's hot and extremely humid climatic where temperature frequently cross 50 degree c. the addition of the plastic waste modifies the property of bitumen in road .the modified bitumen shows a good result when it compared too standard result. We research a lot about plastic waste being thrown here & there in the country side and also in harm. The optimum content of the plastic waste to be used in between ranges of 5% to 10% .in this way we know the idea about how to use the plastic waste as an alternative of bitumen in road construction.

In future as Civil Engineer we use this topic's knowledge in the enhancement of flexible road pavement and also improving the property of pavement .we chose this idea because it deals with the excessive amount of plastics being used these days. Thus we wanted a way out of it. Then we got to know that plastic can be used for road laying by processing it in a certain way. The use of

Waste plastic for flexible pavement is one of the best methods for easy disposal of plastic.

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