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Studies on Use of Waste Plastic: A Review

Ashok Pundir[1]*, Mohindra Singh Thakur[1], Vikas Mehta[1], Bhupender Kumar[1] and Radha[2]
[1]School of Mechanical and Civil Engineering,
Shoolini University of Biotechnology and Management Sciences, Solan (Himachal Pradesh) India
[2]School of Biological and Environmental Sciences,
Shoolini University of Biotechnology and Management Sciences, Solan (Himachal Pradesh) India

(Corresponding author: Ashok Pundir)
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ABSTRACT: Minimization of waste material is significant aspect of the modern growth initiatives. Plastic is used in several industrial and domestic applications. The use of plastic bags and bottles is very common in day to day life. The removal of plastic waste is chief problem due to its non-biodegradable nature. Plastic waste can be used for road construction and other construction related activities. The use of plastics waste in road construction can reduce the cost of road construction and pollution index of environment. Plastic acts as a good binder with bitumen. It gives better stability, binding property, resistance to water and durability. Use of plastic waste in construction material is suitable acceptable due to the better-quality of materials. This knowledge is not a new idea but rather not experienced far and wide. The present review precise the research on use of waste plastic.

Keywords: Recycle, disposal, composite materials, strength, fuel, pavements.

I. INTRODUCTION

Sustainable growth is important characteristic of modern improvement. The minimization of waste is key to several environmental difficulties. Many investigations are these days focused on use of waste material for a number of applications. Such wastes material is being used for acetic acid, starch, ethanol and manufacturing of additional chemical [1]. Waste things are being used as adsorbents for elimination of organic matter [2]. Elimination of phenol and heavy metals was also carried out successfully by several detectives [3]. A number of waste and raw materials have been tried for biodiesel and bioethanol production. The study on application of recycled plastics and its compounds in the built Environment. According to him, recycled plastic materials and compounds should replace new materials in the built environment. The use of waste plastic and waste rubber tyres in flexible highway pavements. Several study carried out on use of plastic waste in road construction [4].

These research was aimed at recommending a new method of disposal of plastic. For this determination, tests conducted including specific gravity, CBR test and grain size analysis. It was observed that, as the percentage of waste plastic rises, the maximum dry density decreases, thereby declining the CBR value. Also, increase in 5 of quarry dust give rise to CBR value and increase of maximum dry density. The study carried out on change of waste plastic into valuable chemical products [5]. The study points out that due to poor facilities, maximum of these plastics, are at present disposed of in illegal dumping places or burned uncontrollably in the fields [6]. It was observed that a number of concrete mixes in which sand was partially substituted by waste plastic flakes in variable % by volume. At room temperature tested plastic mix concrete with and without super plasticizer. It was reported that the reduction in compressive strength and workability due to partially replacement of sand by waste plastic, was minimal and can be improved by adding of super plasticizer [7].

According to many researchers the quantum of plastic in solid waste is growing and it is significant to reprocess it. They also reported that the failing quality of roads was another part of fear. They investigated the performance of the bituminous mix modified with bio-medical plastic waste. They tested autoclaved medical plastic waste in the form of shredded syringes in road construction. They also investigated the properties of Plastic Coated Aggregate. It was found that Plastic Coated Aggregate had improved properties associated to normal mix. Many review carried out on production of alternative diesel fuel from waste oils [8]. The chief focus of researchers was discovery substitute fuel resources and using them to remove their negative effects. Researchers examined the properties of the oils derived from waste plastic pyrolysis oil, waste tire oil and used engine oil.

They decided that the produced diesel from plastic pyrolysis oil, waste tyre oil, and waste engine oil are technically appropriate, economically sustainable and less responsible to contaminate environment. Many research carried out on use of plastic waste in flexible pavements [9].

The plastic waste cut into a size so that it permits through 2-3mm sieve using shredding machine. The combined mixture was heated and the plastic was efficiently coated over the collective. The plastic coated mixture was used with bitumen for road construction. It was observed that use of the innovative technology will not only make stronger the road construction but also increase the road life expectancy as well as will aid to improve the surroundings. It was determined that using waste plastic in mix will benefit for decrease in need of bitumen by around 10%. According to many researchers on use of plastic waste and waste rubber in joint and bitumen for road constituents [10]. In many investigation polymer and crumbed rubber used as a binder with respect to bitumen and aggregate. They tested the material for impact value, crushing value, specific gravity, abrasion value, bitumen penetration value, softening point and ductility. It was found that use of rubber tyres and waste plastics in the form of powder for flexible pavement material is one of the finest methods for easy discarding of wastes. It was also explored application of plastic waste as an in effect construction material in flexible pavement [11].

The use of plastic as an advanced technology strengthened the road construction but it also increases the road lifespan. It was observed that the increase of plastic waste in bitumen rises the characteristics of and bitumen and aggregate. The usage of waste plastics on the road has help out to provide better place for burying the plastic waste without producing disposal difficult. It also provided superior roads [12].

Plastic waste acts as a strong binding agent. Plastic are user friendly but not environmental as they are non-biodegradable [13]. Plastic rises the melting point of the bitumen and makes the road retain its flexibility throughout the winters season and this resulting in its long life [14]. Waste plastic can be transformed into other products such as ethanol. Plastic waste treatment problem is solved by reusing and recycling the plastic waste. Non-biodegradable material causes serious trouble due to their non-decomposable properties [15]. The throwing of biodegradable waste can be carried in open dumping or composting techniques. Burning can also be utilized for solid waste management. The serious problem of solid waste minimization lies with non-biodegradable waste.

Declining road quality is increasingly becoming reason of worry. The increase in poor quality construction material and vehicle can be main purpose for this.

The use of plastic in road construction material, bitumen and with asphalt is widely explored alternative [16]. The disposal of waste plastic is major solid waste problem. Several studies carried out for exploring possibilities of use of waste material for road construction. Failing road excellence is gradually becoming cause of concern. The increase in poor quality construction can be reason for this [17]. The property of concrete can be better than bitumen roads. It showed that 7.5% E-plastic content in mix yielded stability and observed reduction in compressive strength of concrete by 52.98% when fine combined is substituted by 21.5% of E-waste. In some study it was reported that different amounts of plastic waste with the soil sample and their influences on geotechnical properties. Waste plastic can be efficiently used as binder material with excellent results. Several studies on environmental effects of plastic use in road construction has been done [18, 19].

As the % of plastic waste in mix rises, the dry density declines whereas highest favorable water content rises. Higher plastic material, used which reduced the bitumen requirement by 10%. It was found that plastic alone is not appropriate for pavement subgrade. They fixed optimum percentage of plastic 10% based on the results of the tests. . The usage of plastic waste also shows a lesser crushed fraction underweight. The use of polymer covering can rise quality of collective [20]. It was found that waste plastic in asphalt mix formed well asphalt mixture compared with conventional mix [21]. The disposal is becoming high difficult due to limited space on landfills. The use of waste plastics has become more attractive. These plastic bottles if used in roads construction, can rise characteristics of road materials. Huge quantity of plastic bottles is disposed every single day. Plastic bottles are used for water and cold drinks. In different parts of India several study has been carried on waste plastic utilization in road construction [22].

A maximum rise of 17.63% in the Marshall stability for 10% of waste plastics. The survey to verify use of waste materials in road construction and it indicates that use of swine manure, animal fat, silica fume, roofing shingles, empty palm fruit bunch, cement kiln dust, fly ash, citrus peels, slag, glass, carpet, plastic, tire scraps, foundry sand, concrete aggregate and asphalt pavement in construction is increasing. The design of flexible pavement using waste plastic [23]. According to researchers, waste plastics are durable, strong, long lasting and reliable road network is backbone of development. They used materials like cups, bags, thermocole after shredding and cutting. Bituman gets soft at high temperature. It was found that at higher percentage of polymer bitumen blend the blend is a high polymer dispersal in bitumen [24].

The PVC up to 10 percent can be used for bituminous pavement creation in warmer area. Many researchers determine strength properties of coarse aggregates, optimum content of PVC and Marshall design properties of bituminous mixes [25].

According to many researchers, polymers, plastic bottles, cups, etc. can be re-used by blending powdering. They explained various aspects of utilization of plastic waste in construction of roads and they emphasized need for re-examining and formulating new guidelines with regard to manufacture and design of concrete roads. Information from a number of construction groups and from research can lead to additional effective solution of plastic waste and road superiority. The technical, economic and ecological criteria govern extent of use of plastic in road resources. The thermoset plastics possess 20% of whole postconsumer plastic waste generate. There are other various elements like better durability, indirect tensile strength and increased compressive strength [26].

Now these days' removal of different wastes produced from different Industries is a excessive problematic. These resources pose environmental pollution in the close locality because few of them are non-biodegradable. Traditionally stone aggregates, soil, bitumen, sand and cement etc. are used for road construction. In nature natural materials being exhaustible, its quantity is gradually declining. The cost of extracting good quality of natural material is growing. The scientists are watching for alternative materials for main road construction, and industrial wastes product is one such kind. If these materials can be used in road construction, the disposal and pollution problems may be partially reduced. Throughout the country these solid wastes have occupied more than a few acres of land around plants. In India keeping in mind the urgent need for bulk use of these solid wastes material, it was believed expedient to test these materials and to grow specifications to rise the use of these industrial wastes in road making, in which higher financial profits may be promising. The use of these profits should be developed for construction of short volume roads in different portions of our country. The essential specifications should be formulated and attempts to make the most of the use of solid wastes in different layers of the road pavement. Generally, plastics are user friendly but not eco-friendly because they are non-biodegradable. Plastic is versatile material and a friend to common man. The Road surface with neat bitumen can cause bleeding in hot weather, may develop cracks in cold climate, and can cause serious damages because of greater axle load in existing conditions due to fast infrastructure expansion. India has to increase transportation system to a higher level both in terms of quality and length. The polymer bitumen blend is a superior binder related to plain bitumen. The blend has better softening point and rise penetration value with a proper ductility. When used for road manufacture it can hold out greater temperature. Hence it is suitable for tropical areas. It has reduced penetration value. Hence its load carrying ability is improved. The blend with collective has no stripping value. So it can resist the effect of liquid [27].

II. CONCLUSION

The addition of plastic waste modifies the characteristics of bitumen. The improved bitumen displays good result when compared to standard results. Plastic waste used between the range of 5 percent to 10 percent. Plastic has property of absorbing sound, which benefit in reducing the sound pollution of heavy traffic. The plastics waste can be put to use and it advances the performance and quality of road. A novel information of plastics management, based on the production of multiple materials with improved properties for flood protection systems. The waste polymer reuse, gives a new light for recycling and many new applications. The waste plastic can be used for diesel production. Waste plastic is chief issue faced by increasing nation state because of chemical nature of plastic. This plastic waste can be used with road construction material to strengthen the road. This can solve the difficult of the plastic disposal and road improvement. The present review summarizing the research on use of plastic waste for different uses.

The issue of waste plastic can be minimized by reuse. Plastic waste can be used for production of products like ethanol. Serious problem of solid waste minimization lies with non-biodegradable remaining. The use of plastic in construction material is suitable more acceptable due to the better properties of materials. The usage of plastic waste for road construction is generally examined region. The power of the roads constructed with plastic mixed bitumen was found to be additional than that created with normal material. The manufacture of plastics waste is increasing every now and then. The use of waste plastics for pavement is one of the best method for easy disposal. This has resulted in reduced rutting, raveling, and there is not pothole formation. The few investigators carried out conversion of plastic waste into fuel oil successfully. It can be determined that use of plastic waste can decrease the disposal difficulty and increase economic aspects of fuel production and several construction activities. The use of plastic in construction material is becoming more acceptable.

The road can bear up heavy traffic and shows better strength. The use of waste plastic in flexible pavements shows good result.

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