

Pothole Filling Vehicle Using Waste Plastic: A Review

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Abstract: Aim is to challenge major world issue: Repurposing millions of tons of waste plastic, saving millions in the cost of road repairs and strengthening our existing roads. Potential hazardous are pothole and plastic- uneven road surfaces increase the likelihood of road accidents, whereas plastic lying dormant in landfill sites is harmful to our environment. Both the issues when taken together lead to a single solution that we can use this waste plastic to work towards improving the safety of our roads whilst creating harder and tough roads that will stand the long time.

Keywords: pothole, waste plastic, sensor, Bitumen

• Introduction

India is one of the fastest developing countries as of today. India's road network is gigantic. Giving it a thought about the condition of the road. India is a home for the several bad roads. Be it the metropolitanism, the cities or villages. potholed roads are the common sight across the rural & urban India. Especially during monsoons. Every year crores of rupees are spent by the road agencies in extensive pothole patch repair. Also, it takes lots of times, labors and human efforts to repairs potholes. [12]

Potholes are mainly cause due to heavy vehicle, oil spills, heavy rain, poor quality of road construction etc. Water is the primary cause of potholes. it can be cause by diesel spillage mechanical damage vehicle rims, animal hooves on road surface in hot weather, poor road design over certain subgrades such as expensive, collapsible & dispersive soils. Environmental cracking can occur due to ultraviolet light from sun, heat oxidation or some other causes that leads to shrinkage of asphalt. [11]

Potholes not only causes damage vehicle but also causes serious vehicle accidents, affects quality of driving, suspension of vehicle. The traffic congestion causes due to pothole may leads to wastage of fuel, and increasing air pollution, releasing CO (Carbon monoxide) and other pollutants by congested car account for environmental and health problem. [11]

2nd major problem we all are facing is waste plastic. The generation of waste plastic is increases in large amount. The single use of items like shopping bags, wrappers of betel nuts, cold drink bottles & all the forms of plastic create significant environmental & economic problem. Plastic is scattered in everywhere of today's lifestyles & its disposal is a great problem. it is a non-biodegradable product due to which these materials pose environment pollution & problems like breast cancer, reproductive problems in human & animal & genital abnormalities.

So for overcoming both of these problem we are making a machine which will helps to reduce the pot holes on the road as well as waste plastic scatter in our surrounding. Detecting pot holes by depth sensor & adding the waste plastic to the potholes on the road, times for the repairing potholes is decrease same the cost of producing material is reduce. Waste plastic is recycled effectively & the roads themselves will last longer - a win situation for all.

• Literature review

Pothole detection:

AjitDanti, et al. [1] have proposed a model based on image processing approach. In this paper, Haugh transformation is given for the lane detection and clustering based algorithm is used for detection of potholes.

GanjanChaugh, et al. [2] have develop a system in which a various road conditions are detected using smartphone sensor. In this system a set of sensors is installed in vehicles. These sensors detect the condition of roads and GPS system receiver is used to collect the data. This provides the methods for detecting the road anomalies such as potholes.

Lin and Liu [3] have proposed a method for pothole detection based on the SVM, where SVM stands for Support Vector Machine. Texture measure based on the Histogram is extracted as the features of the image region and the non-linear support vector machine is built up to identify whether a target region is a pothole. Based on this, an algorithm for recognition of potholes of the pavement is proposed. The experimental result shows that the algorithm can achieve a high recognition rate.

Pothole repaire techniques:

Shivani singhDhriyanet al.[4] conducted the study on Bitumen is replaced by bitumen emulsion for making of flexible pavement. Conventional method of road construction involves the burning of bitumen that produces toxic gasses which degrade the environment. In winter region it is difficult to maintain the poring temperature of hot mix. To overcome these problems and conserve the energy the bitumen emulsion is considered as a good option. It conclude that Heating is not required when bitumen emulsion is used as binder for construction of road.

Cesare Oliviero Rossi et.al. (2017) [5] conducted study on the performances of modified bitumen as a function of the concentration of an added organosilane modifier was examined in terms of its consistency, adhesion properties. A quantitative evaluation of the modified bitumen's performance was carried out by a contact angle test and boiling test. The modification of the bitumen with the organosilane surfactant is visibly increases the adhesion properties of the bitumen. Moreover, contact angle tests were carried out and the results were compared with those obtained with the Boiling Test method. Concluded that the modifier guarantees excellent performance at 0.01 wt% loading, and almost complete resistance to water at 0.03 wt% loading.

Bhrugu Kotak et.al. (2014) [6] conducted study on Failure in pavements takes place due to shearing, loading and deflection of materials. Generally, the pavement failure is done because the water get entry, the presence of water in pavement will ultimately result in pavement deterioration. If the pavement has cracked, the water can easily enter which will lead to failure of pavement. The application of geo sheet in pothole repairing work gives durability to the work. After applying it, the seepage through base will reduce which will improve the durability of repaired pothole.

Use of plastic waste:

Amit Gawande (2012)[8]- The quantum of the waste plastic in municipal solid waste (MSW) is increases because of increase in population, urbanization, development activities and changes in life style which leading widespread littering on the landscape. Thus, disposal of plastic waste is a menace and become a serious problem globally due to their non-biodegradability and unaesthetic view. Since these are not disposed scientifically & possibility to create ground and water pollution also make it hazardous to environment. This waste plastic partially replaced the conventional material for improving desired mechanical characteristics for particular road mix. In conventional road making process a bitumen is used as a binder. Such a bitumen can be modified with waste plastic pieces and bitumen mix is made which can be used as a top layer coat of flexible pavement. This waste plastic modified bitumen mix shows better binding property, stability, density as well as more resistant to water.

Sunil J. Kulkarni (2015) - Minimization of waste plastic is important aspect of the modern growth and development initiatives. Plastic is used in various domestic as well as industrial applications. Use of plastic bags and bottles is very common nowadays. The disposal of plastic waste is major problem because of non-biodegradable nature of plastic. The plastic can be used as a feedstock for ethanol like products. It can be used for road construction and other construction activities.

Rishi Singh Chhabra (2014)[7]- In highway infrastructure, a large number of originates materials and technologies have been invented to determine their suitability for the design, construction and maintenance of the potholes. Plastics and rubbers are one of them. Also considering the environmental approach, due to excessive use of polythene in day to day business, the pollution to the environment is enormous. The use of plastics such as carry bags, cups, etc. is constantly increases day by day. Since the polythene is not biodegradable, the need of the current hour is to use the waste polythene in some beneficial purposes. The use of these materials as a road construction proves eco-friendly, economical and use of plastic gives strength in the sub-base course of the pavement.

• **Methodology**

The waste plastic which is collected from various sources like apartments, schools and by civic workers, is put in a shredder. The shredded bits are then stored in bags for about a week to drain out the moisture from them. A sensor can be used to detect the pothole. Then the shredded bits are melted in a melting pot and are made to pour in the potholes to fill the potholes. Now once the potholes are filled with this melted plastic, an air blower is used to cool the melted plastic and harden it. Once it is hardened then the bitumen, asphalt like traditional road material mixture can be poured in small amount to form a layer on it. This would eventually reduce the cost of filling potholes and reducing the waste plastic from scattering in the nearby surrounding which is hazardous for ecosystem. This type of filled potholes does not only withstand monsoon but also withstand the everyday wear and tear. Normally the life of road is about three years but using plastic to fill potholes increases the life of roads. This is because the melting point of bitumen is 60-70 degrees whereas the melting point of plastic is about 130-140 degrees depending upon the type of plastic used. Shredded plastics would be melted over low heat to avoid the emissions of gases which are harmful to the environment. These harmful gases are released only when the plastic is burned or heated to a very high temperature. Polystyrene is toxic when burned but when it softened, it turns into excellent pothole filler. so by this project we want to makes environment clean and also it helps to decrease dangerous accidents.

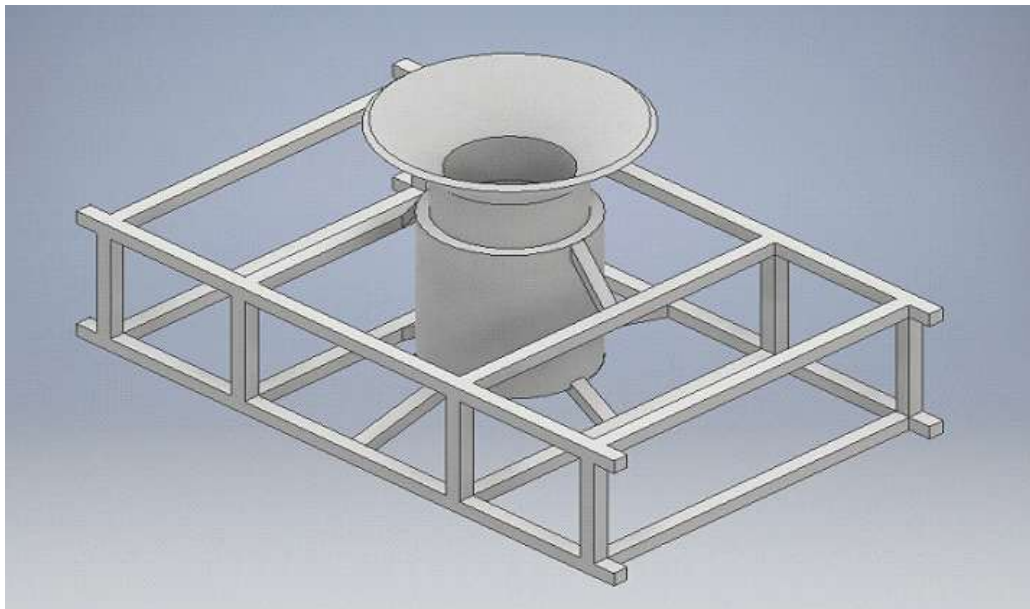


Fig.1 CAD Model

• Conclusion

In this paper we have proposed model which will detect the pot hole on the road. And fill up this pot hole by using waste plastic as a filler material. Due to heavy vehicles running on roads and other environmental condition pot holes are generated which will cause hazardous problem. Also, the waste plastic cause environmental pollution and health problem to human and animals. pot hole filling vehicle detect pot hole on the road and fill up with waste plastic. This will helps to reduce both the major problems of pot hole as well as waste plastic. and makes the environment clean and healthy

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