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Waste Plastic Road Making Machine

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Abstract: ***Plastic waste is one of the top most menace the world is facing today. Blanket ban on use of plastic too is quite difficult to implement considering the current life style of mankind. One of the novel use of plastic waste could be to use it to construct good quality roads. In this project, a large amount of existing plastic wastes are utilized for road construction. The road mixture is prepared by using molten bitumen, chips stones, molten plastics, fly ash, sand and steel slag. In this, a simple machine is fabricated with the help of fewer components in order to make the final road mixture. The machine is also applicable to make pavement bricks in which the final mixture is poured into mould cavity.***
Keywords: ***Blanket ban, Fly ash, Steel slag, Pavement bricks, Mould cavity***

I. INTRODUCTION

Plastic is the most widely used material in the present times. It is light in weight, moisture resistant, flexible and very inexpensive. Today plastic is used in every vital sector of the economy, ranging from agriculture to automobile, electronics, construction, etc. It has revolutionized all spheres of life. But this plastic ultimately becomes a waste. Tons of plastic wastes which include polyethenes, cups, bags, etc. are discarded every year, polluting land, rivers, seas, oceans, etc. plastic is a non-biodegradable material and it has been found that it can remain on earth for about 4500 years without showing any signs of degradation. Its improper disposal can cause serious health hazards in humans. It is estimated that approximately 10 thousand tons per day (TPD) of plastic waste is generated i.e. 9% of 1.20 lacs TPD of MSW in India. The plastic waste constitutes two major categories of plastics; (i) Thermoplastics and (ii) Thermoset plastics. Thermoplastics, constitutes 80% and thermoset constitutes approximately 20% of total postconsumer plastic waste generated in India. The experimentation at several institutes and private organizations indicate that the waste plastic could also be capable of making road when mixed with hot bitumen that is found to give higher strength to the road, higher resistance to the water and better performance of the road over a period of time. Plastic waste can be used in hot mix to improve physical properties of bituminous aggregate mix by 'Dry Process' or 'Wet Process'. Both the processes lead to the formation of plastic modified bituminous aggregate mix with enhanced properties imparting strength, stability and durability to the roads. The Dry process incorporates the use of 'Plastone', a mixture of stone chips and waste plastic bags (thickness 40□70 µm) which is heated at 150□170C then added with hot bitumen. Then add a very small amount of fly ash and steel slag, if required in laying roads, pavements and flooring purposes. The 'Wet Process' involves mixing of plastic to hot bitumen followed by mixing with hot aggregate.

II. PROBLEM STATEMENT

The present study highlights the developments in using plastics waste to make plastic pavements. The rapid rate of urbanization and development has led to increasing plastic waste production. As plastic is non-biodegradable, it remains in environment for numerous years and disposing plastic wastes at landfill are unsafe since toxic chemicals percolate out into the earth, and under-ground water and pollute the water bodies. Due to littering routines, insufficient waste management scheme, plastic waste disposal is a big problem for the civic authorities, especially in the urban areas. As mentioned above, plastic disposal is one of the major problems for developing countries. Scarcity of bitumen needs a deep thinking to ensure fast pavement construction.At present the disposal of waste plastic has become a major waste management problem in the world. In present study the aim is to investigate the optimal use of waste plastic in bitumen and aggregate for road pavement construction.

III. OBJECTIVES AND SCOPE OF THE STUDY

A. The main objective of this project is to provide tools to evaluate and to improve the properties of pavement using waste plastic, bitumen, steel slag, chips stones and fly ash such that it may be more confidently employed in roadways and driveways etc.

B. To study the basic properties of aggregates, plastics and plain bitumen.

C. To study the effect of waste plastic on strength and stability characteristics of bitumen mix and to study Strength characteristics of waste plastics.

D. The scope of the study is to evaluate the performance of plastic bitumen flexible pavement road constructed using plastic coated aggregate bitumen mix with steel slag and fly ash.

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IV. LITERATURE REVIEW

Ahmed Trimbakwala (2017) concluded that the use of shredded plastic waste acts as a strong "binding agent" for tar making the asphalt last long.

By mixing plastic with bitumen the ability of the bitumen to withstand high temperature increases. The plastic waste is melted and mixed with bitumen in a particular ratio. Normally, blending takes place when temperature reaches 45.5°C but when plastic is mixed, it remains stable even at 55°C. The vigorous tests at the laboratory level proved that the bituminous concrete mixes prepared using the treated bitumen binder fulfilled all the specified Marshall mix design criteria for surface course of road pavement. There was a substantial increase in Marshall Stability value of the BC mix, of the order of two to three times higher value in comparison with the untreated or ordinary bitumen.

Bereket Kiflemariam Basa, Kotresh Km (Dec 2017) studied that the use of waste plastic has made a good progress in bituminous road construction in recent years.

This investigation is on attempt to evaluate the addition of waste plastic bottles to bituminous concrete (BC) wearing course mix of aggregate gradation I along with plain 80/100 bitumen. Optimum bitumen content obtained for bituminous concrete grade I mix for 80/100 grade bitumen was 5.1% as per the specification of MORT&H standards. Waste shredded plastic bottle were added in the increasing percentage of 0% - 10% to bituminous concrete mix. The importance was to add waste plastic bottles to bituminous concrete (BC) mix and to evaluate the various mix properties like Marshall Stability, flow, bulk density, voids in the mix and VFB helps to produce flexible pavement using green method.

Azmat Shaikh, Nabeel Khan, Faisal Shah, Devendra Shukla, Gaurav Kale (2017) concluded that the modified mix possesses improved Marshall Characteristics.

It is observed that Marshall Stability value increases with plastic content and observed that the Marshall Flow value decreases upon addition of polythene i.e. the resistance to deformations under heavy wheel loads increases. From all the experiments performed they can conclude that the addition of plastic waste enhances the various properties of an ordinary bituminous road. They can obtain a more stable and durable mix for the pavements by polymer modifications. This small investigation not only utilizes beneficially, the waste non-degradable plastics but also provides us an improved pavement with better strength and longer life period. This study will have a positive impact on the environment as it will reduce the volume of plastic waste to be disposed of by incineration and land filling. It will not only add value to plastic waste but will develop a technology, which is eco-friendly.

V. EXPERIMENTAL STUDY

A. Elements of the System

1) Melting furnace
2) Mixing chamber
3) Hopper
4) Electric motor
5) Stopper
6) Mould

B. Materials for Pavement

1) Waste plastics: Waste plastic such as carry bags, disposable cups and laminated pouches like chips, aluminium foil and packaging material used for biscuits, chocolates, milk and grocery items can be used for surfacing roads
2) Bitumen
a) Penetration Grade 20/30
b) Penetration Grade 30/45
c) Penetration Grade 50/70
d) Penetration Grade 80/100
e) Penetration Grade 85/100 and so on.
3) Chips stones
4) Fly Ash
5) Steel slag

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C. Methodology

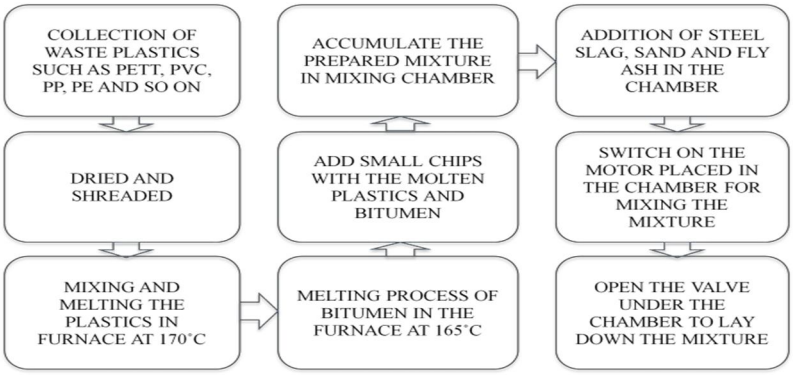


Fig 1 Outline of the system

VI. WORKING PRINCIPLE

A. In this project, A large amount of existing plastic wastes are utilized for road construction.

B. The road aggregate is prepared by using molten bitumen, chips stones, molten plastics, fly ash, sand and steel slag. The bitumen and plastic are melted by providing a furnace connected with a mixing chamber having motor at the bottom.

C. The final mixture is prepared by adding the required amount of fly ash, chips and steel slag with the molten mixture in the chamber.

D. These get mixed perfectly with the help of motor rotation.

E. Then this mixture is applied to surface roads.

F. Finally, A roller is used to compact the mixture.



Fig 2 Waste plastic road making machine

VII. RESULT AND DISCUSSION

In the result it has been found that the by adding plastic waste to the road construction it increases the Marshall Stability value. It normally saves the 10% of bitumen in comparison to ordinary roads. Hence, the properties of plastic pavements are improved and one can able to laying the road simply with the help of the system.

VIII. ADVANTAGES

1) The waste materials such as plastics, fly ash and steel slag are managed and utilized for road making purpose.

2) To simplify the whole road making process by reducing the difficulties in road construction.

3) To reduce manufacturing and maintenance costs.

4) To improve the properties of waste plastic roads than ordinary roads.

5) It is easy to fabricate and operate the machine.

6) Reduces the need of bitumen by around 10%.

7) It is used in laying roads, pavements and flooring purposes.

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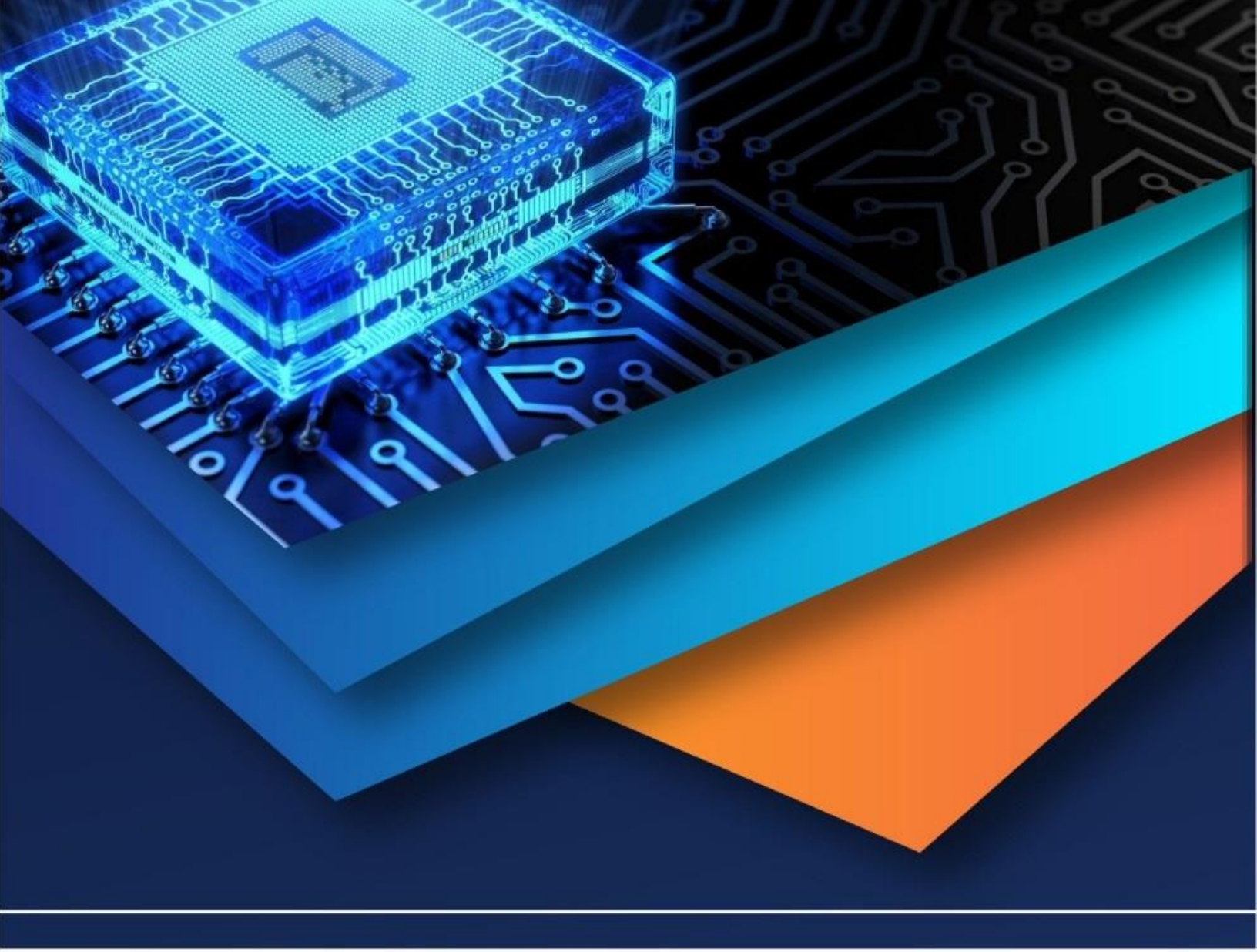
IX. CONCLUSION

It is an efficient method to construct roads. In this project, only the simple waste materials are effectively utilized for preparing the road mixture. Hence, the use of waste plastics for pavement is one of the best methods for easy disposal of waste plastics. It uses most economical processes. The machine is fabricated easily by means of using simple components and processes. In future, most of the ordinary roads will be replaced by waste plastic roads.

REFERENCES

[1] Verma s.s (2008), "Roads from Waste Plastic", The Indian concrete journal, pp 43-47.
[2] P.M.Subramanian, "Plastic recycling and waste Management in the US" Resources Conservation and Recycling vol. (28) pp 253263.
[3] Sherwood, P.T. (1995). "Alternative materials in road construction", "Thomas Telford Publications", London, 1995.
[4] Use of "Waste Plastic in construction of Flexible Pavement", Dr. Aslam, professor & head, Er.Shahan –ur- Rahman, Lecture Engineering, Integral University, Lucknow.
[5] AmitGawande, G.S Zamre, V.C Renge G.R Bharsakalea and SaurabhTayde, utilization of waste plastic in asphalt of roads, scientific reviews and chemical communication.

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