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WASTE PVC USED IN BITUMINOUS CONCRETE MIX FOR BITUMINOUS PAVEMENTS - REVIEW

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Abstract - *Nowadays country suffers with huge quantity of polyethylene waste, the waste of polyethylene as per SP-98-2013 have different types i.e. Polyvinyl chloride, Polyprolene, polyethylene terypthalate, Polystyrene, high density polyethylene, low density polyethylene. This study shall be works on utilization of PVC waste material as modifier with respect to bitumen for flexible pavements. Used of waste material in flexible pavements is a better option for us because of huge requirements of flexible pavements. As per literature survey it is notified that with the help of waste bituminous concrete mix improves its strength as well as its durability. Out comes shall be examined as per Indian standard codes.*

Key Words: county, Polyvinyl chloride, Polyprolene, polyethylene terypthalate, Polystyrene, high density polyethylene, low density polyethylene, flexible pavements.

INTRODUCTION

India generates almost 9.5 Million Tons of Plastic Waste every Year and most of this Plastic Waste is one time or Single-Use Plastic. A Recent Study ("Ref. https://www.cseindia.org/managing-plastic-waste-in-india-10352") by Centre for Science and Environment estimated that world has produced about 8.3 billion metric tons of Plastic between 1950 and 2015. Out of this 80 % is Single-use plastic. Only 9% of this total production has been recycled so far. As much as 79% of the one-time use plastic lands up in the landfills or in inland water bodies or our oceans.

India needs to act on the Honourable Prime Minister's call for 'Freedom' from Single Use Plastics. Centre for Science and Environment offers an actionable agenda to counter this challenge which includes understanding the characteristics of the product, segregation at the source and recycling the plastic material. One of the ways to recycle the same which has picked up a lot of traction in the coming years is by using the 'Pulverized Plastic Waste' in construction of roads.

India has one of the Largest Road network extending to approximately 6 Lakh Kilometres. It has been increasing at the rate of 30 km per day in 2018-19. One of the main ingredients used in laying the road surface is Bitumen. Bitumen is a black viscous mixture of hydrocarbons obtained naturally or as a residue from petroleum distillation. 90% of total Bitumen used in India is in road construction with the balance of 10% shared equally for roofing and waterproofing.

In 2015, the Cental government made it compulsory to use Plastic Waste for road construction. Since then Utilization of 'Pulverized Plastic Waste' has found space in Bitumen Modification and has found utility in bitumen mixes for laying highways. Field Studies have found the use of Pulverized Plastic Waste with bitumen to be advantageous as the roads constructed using this mix increases Durability, has high resistance to deformation, has improved fatigue life along with better stability and strength. Also this process becomes a great way of disposal of plastic waste which is one of the biggest polluters and poses a great health hazard to land and marine life.

LITERATURE REVIEW

Many researches carried out as reference this, some of these are discussed below:

1. Recasens, et al., (2005) [3] used different fillers including lime in bitumen to study the effect of fillers on bituminous mixes. First properties of materials were determined then the optimum asphalt content for each mixture was determined according to the Marshall Mix Design Method and at last tests were conducted. The tests included Marshall Stability and Flow tests. Also bulk specific gravity, density and percent air voids were conducted. Lime was added in different percentage 0.5, 1, 1.3 and 1.5 and the mixture develops the maximum energy at the same concentration as the critical concentration (C_v/C_s=1.0) and at this point air voids content was 26.4% and density was 1.834 g/cm3.

2. Tayh, and Jabr, (2011) [7] incorporated the use of lime as a filler in bituminous mix. Various tests were conducted and at various percentage of lime 2, 2.5, 3, 3.5, 4, 4.5,5 and 5.5. The maximum bulk density was reported for asphalt mixture with limestone dust filler at proportion of asphalt content 5.5% by total. The maximum stability (13.55 KN) was reported for asphalt mixture with hydrated lime at bitumen at proportion 5.5% by total weight of mix.The maximum percentage VMA of asphalt mixture 16.2 % was reported for asphalt mixture with hydrated lime filler at 5%.

3. Rahman, et al., (2012) [9] used different types of fillers including stone dust in bitumen to study the effect of fillers on Marshall Properties of the bitumen. Various tests were conducted. The tests include Marshall Stability and Flow tests. Also bulk specific gravity, density and percent air voids were conducted. The result of the tests indicated that the optimum asphalt content of 6.3% (by weight of aggregate) was obtained for the mixtures At this optimum value, the Marshall Stability, flow, unit weight, %VTM and %VMA values were 7.50 KN, 2.75 mm, 2.29 g/cm^3, 4.00% and 18.10%, respectively.

4. **R. Manju, et al., (2017) [10]** did research in which the main focus was to minimize the global warming, pollution, and greenhouse gases, to increase the lifespan of the roads and to minimize the potholes. In the research various tests, conducted on normal aggregates and plastic-coated aggregates which were prepared with the help of dry process, were performed. About 10% of bitumen was replaced for the modification with plastic. It was observed that there is about 40% decrease in aggregate crushing value of modified bitumen, also the los abrasion value of plastic-coated aggregates were 21%less and there is about10°C decrease in softening point. It was also observed that the polymer-coated aggregates reduced the voids and moisture absorption. Due to this, there is no potholes formation and reduction in ruts. The plastic pavement can tolerate heavy traffic and are durable than those of flexible pavement. In this study researcher concluded that the use of plastic mix will reduce the bitumen content up to 10% and increases the strength and performance of the road. Also, this new technique is eco-friendly. The use of material which is smog absorbent such as titanium dioxide by ten percentage of polymer content can reduce vehicular pollution.

5. **Kumar, et al., (2019) [11]** used waste polyethylene in bituminous paying mixes. Various tests were conducted and from those tests following conclusions were drawn. It was observed that Marshall Stability value increases with polyethylene content up to 9% and thereafter decreases. A regular road requires 10 tonnes of bitumen for each kilometer. A plastic road however, requires only nine tonnes of bitumen and one tonne of waste plastic for coating. So, for every km, the plastic roads save as much as one tonne of bitumen.

6. **Hake, et al., (2020) [12]** studied procedure to utilize plastic waste. In Regular Street making process bitumen is utilized as folio. Such bitumen was adjusted with squander plastic pieces and bitumen blend was made which could be utilized as a best layer of adaptable asphalt. The plastic from PET jugs was utilized in blends for examine work. The measurements of plastic of 5 %, 7.5%, 10 %, 12.5% and 15 % was utilized as substitution of bitumen. The advance plastics content was kept 10% with 5.25 % of bitumen content. In this examination work it was explored that the general cost of plastic blends bitumen spared 5.18 % cost as contrast with customary bitumen. Subsequently it was efficient and earth advantageous for development of plastic blend bituminous streets.

OBJECTIVES

1. To compare the experimental outcomes of Bitumen lying on the highways with and without the use of PVC waste.
2. Percentage of PVC waste which gives the best results for the Highway Pavement Durability.

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