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USE OF PLASTIC WASTE MATERIAL IN RURAL ROAD CONSTRUCTION

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ABSTRACT: The Waste Plastic and its disposal is a fundamental hassle to the surroundings and for all world. It is cause for pollution and international warming. Waste plastic is used for kind avenue construction is satisfactory solution of waste plastic material. Plastic waste used for road construction because it is a performing a better bonding material with bitumen. Plastic waste in bituminous combine decorate its homes and is also strength, in adding it will also be solution to plastic disposal and a number of defects in pavement, pot holes etc. It is used and format for the flexible pavement. To graph the asphalt pavement with aggregate, plastics bituminous mix used for rural avenue construction. Rural connectivity a integral aspects in the socio-economic improvement of rural areas by means of offering get admission to like education, health advertising and marketing and help for all skill requirement in rural areas. The waste plastic easily handy in this areas and its answer is competitively priced and eco-friendly helped .Plastic waste used are polyethylene is polystyrene and polypropylene. The plastic waste is a shredded and covered over aggregate and combined with hot bitumen used for pavement construction ,it is will increase strength and potential , pavement and better resistance toward rainwater and cold weather.

Keywords:-*Plastic waste, rural road construction, strength, durability, resistance rain water.*

INTRODUCTION

The plastic road construction is the best solution is used of waste plastic material. In this time plastic products used in large amount in daily life like plastic bags, plastic cups, bottles, packing materials etc. are used in large amount .Plastic product or plastic Easley available in every where .Use of plastic waste material for road construction the best solution for waste plastic material and this is eco-friendly for environment. This type of road perform better then ordinary one and the waste material of plastic considered to be a pollution menace. The plastic road is helpful for rural area in countries. Rural connectivity a critical components in the socio economic development of rural areas like educational, health facilities, business purpose and marketing etc. Requirement of development facilities in rural areas depends on his road networking. This is helpful for good transporting system in rural areas because low traffic in this areas. The plastic road is eco-friendly for nature and environment. Use are plastic waste is generally polyethylene, polystyrene and polypropylene . Plastic waste material is shredded and coated over aggregate and mixed with hot bitumen at specific temperature foe flexible pavement construction. This is help for increasing strength and providing good durable quality of pavement and perform better resistance against rain water and cold weather. This technology will be boon for Indian hot humid climate. Bituminous Concrete (BC) is a composite the cloth typically used in building tasks like avenue surfacing, airports, parking lots etc. It consists of asphalt or bitumen (used as a binder) and mineral mixture which are mixed collectively & laid down in layers then compacted. Now a days, the regular increment in high site visitors intensity in phrases of commercial vehicles, and the big variant in daily and seasonal temperature put us in a ,demanding situation to assume of some choices for the improvisation of the pavement traits and fine by means of applying, some fundamental for modifications which shall satisfy Both the energy as properly as economical factors.

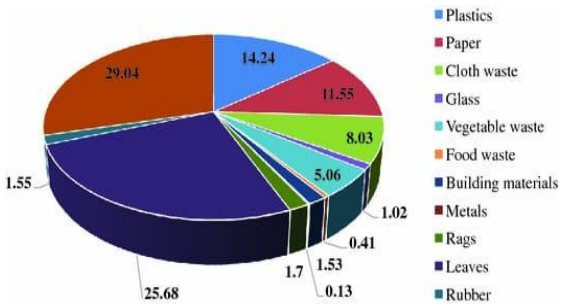

Fig 1: showing solid waste

LITERATURE REVIEW:-

1. FransisHveem (1942) "Optimum quantity of bitumen inroads" who was a project engineer of California Department of Highways, has developed theHveemstabilometer in 1927. He did not have any previous experience on judging, the required mix of its colour, hence he decided to measure various mixture parameters to find the optimum quantity of bitumen [Vallerga and Lovering 1985]. He had used the surface area calculation concept, (which was already in use, at that time for the
CemenTconcrete mix design).

2.Anzar Hamid Mir (2015) "Plastic waste in pavement construction" studied the visco-elastic nature of binders and found that the complex modulus & phase angles of the binders, need to be measured, at temperatures and loading rates which different resemble climatic and loading conditions.

3. Vatsal Patel et al (2014**)** "Utilization of plastic waste in road" described that the effect of wax in bitumen can be reduced by adding EVA (Ethyl Vinyl Acetate), aromatic resin and SBS in the waxy bitumen. The addition of 4% EVA or 6% SBS or 8% resin in waxy bitumen effectively reduces the Susceptibility to high temperatures, bleeding at high temperature and brittleness at a low temperature of mixes.

4. KurmadasuChandramouli et al (2016) "Plastic waste: its use in the construction of roads " reported that asphalt concrete using polyethylene modified binders were more resistant to permanent deformation at elevated temperature and found improvement in stripping characteristics of the crumb rubber modified mix.

METHODOLOGY

Waste plastic is made powder and various percent plastic is blended with bitumen. Plastic amplify the melting factor of the bitumen and makes the avenue flexible all through winters ensuing in its lengthy life. By mixing plastic with bitumen the brittleness overcomes and elastic nature enhances. The plastic waste is melted and blended with bitumen in a unique ratio. There are two important tactics used for bitumen combine flexible pavement, they are

(i) Dry Process:

For the flexible pavement, warm stone aggregate (170°C) is combined with warm bitumen (160°C) and the combine is used for road laying. The combination is chosen on the groundwork of its strength, porosity and moisture absorption potential as per IS coding. The bitumen is chosen on the basis of its binding property, penetration fee and viscous elastic property. The aggregate, when coated with plastics accelerated it s excellent with admire to voids, moisture absorption and soundness. In this method the shredded plastics are poured

over the heated aggregates accordingly forming plastic coated aggregates which are then mixed as with hot bitumen to structure plastic lined aggregate bitumen combination for laying roads .The coating of plastic decreases the its porosity and helps improve the nice of the aggregate and its performance in the bendy pavement.

(ii) Wet Process:

1. These are the technique used for formation of polymer primarily based modified bitumen, in which the waste polymer directly brought with is bitumen and heated up to temperature of 1700C so that acceptable combo is to be fashioned, with perfect dispersion of waste polymer into bitumen, then the hot -mix is then cooled upto 1200C into some other chamber, as which is then added the combination in paddling, chamber. The mix is to be cooled due to the fact when a hot combine poured on aggregate then there are as possibilities to shape air pocket into the small gap of aggregate and possibilities in decrease the electricity of rods and chances. of rutting of roads.

- ❖ Followed important steps of before mixing of waste plastic

(a) Segregation – waste plastic accrued from varies sources is separated from different material and thick ness is 60 micron. The segregation work is may be proceed after collecting plastic waste from varies sources.

Fig 2 -Segregation

(b) Cleaning :- Wet grinding: the cleaned plastic bottles are shredded to 1 cm flake Washing: the use of waste water from the close by waste website and our patent pending cleaner, shredded plastics are cleanedina especially designed washing shredded plastics are cleaned in a specifically designed washing unit.

Fig 3- Cleaning

(C) Shredding:- In wet system , shredded plastics are directly added to the hot asphalt of binder, and they are heated and combined thoroughly to obtain as uniform mixture .Polymer-modified asphalt binders are prepared in this manner, commonly with the help of a sophisticated equipment. High power stirring may be indispensable to attain a

Fig 4 - shredding

uniform combo with is suitable bonding between the constituent materials. Another problem associated with this process is it concerning shelf existence of the organized asphalt binder.

(d). Collection :-After shredding process we are getting shredded plastic for applying collection process and getting waste plastic retaining on 2.36 mm for mixed with hot and warm bitumen.

Fig 5 – Collected plastic after shredding

TESTING OF MATERIALS

- Following the test to be for aggregate:-
  a) Aggregate impact value test.
  b) Los Angeles abrasion test.
  c) Specific gravity test
  d) Water absorption test
  .
- Following the test to be for bitumen:-
  a) Penetration value test.
  b) Ductility test.
  c) Softening test.
  d) Marshal stability test.

❖ **RESULT**

❖ Aggregate Test -

Table 1 – Aggregate test

Aggregate	Waste plastic content(%)	Aggregate impact Value	Los Angeles Abrasion value	Specific gravity	Water absorption
With out plastic	0	10.66%	13.24%	2.4	3.6%
With plastic	10	8.98%	11.98%	2.65	2%
With plastic	15	8.67%	10.67	2.76	1.6%

❖ Bitumen Test

Table 2 – Bitumen Test

Test	Result	Range
Ductility test	78.65 cm	Minimum 40 cm
Penetration value	86 mm	80-100 mm
Softening point	49.37^{0}C	46-60^{0}C

❖ Table 3 - Marshallstability test

Sample no	Bitumen content	Plastic content (% by weight)	Marshall stability(kg)	Flow value
1	4	0	950	3.1
2	5	0	1160	3.4
3	6	0	1220	3.6
4	4	5	1560	3.8
5	5	10	1770	4.6
6	6	15	1990	5.1

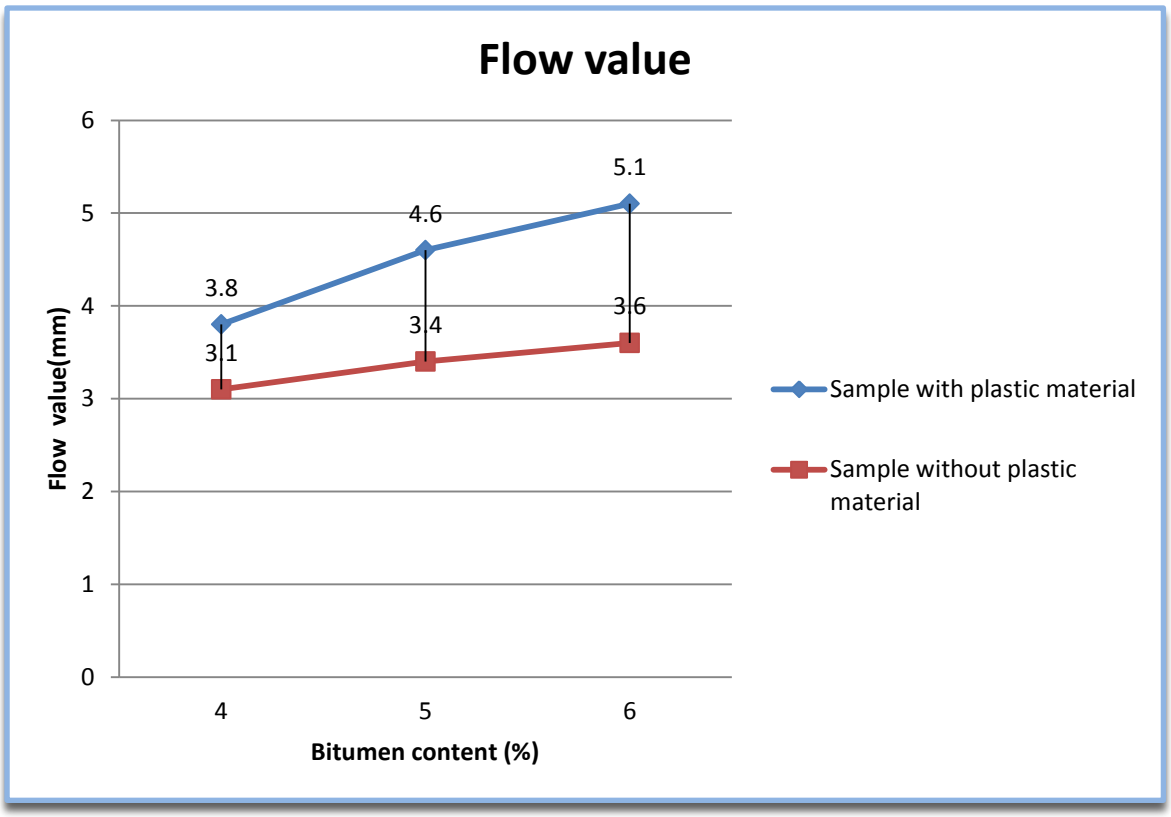

Chart 1 – Flow value and bitumen content

❖ **Advantages of plastic road**

1). Use the excessive percentages of waste plastic material.
2). Reduce the need of bitumen by round 10%.
3). Increase the high electricity and overall performance of the road.
4). Reduce the cost.
5). Develop a science which eco- friendly.
6). Improvement in lifestyles of road.
7). Better resistence in opposition to rain water and cold weathers.

❖ **Disadvanteges of plastic road**

1). While burning PVC plastic release damaging toxic gases .
2). Some detrimental gases for existence is released.
3). During the cleaning time toxic present in the plastic waste would start leaching.
4). During the road laying procedure release noxious HCL gas.

CONCLUSION

Polymer Modified Bitumen is used due to its higher performance. In the modified manner (dry process) plastics waste is lined over aggregate. This helps to have higher binding of bitumen with the plastic-waste covered combination due to expanded bonding and elevated vicinity of contact between polymer and bitumen the polymer coating additionally reduces the voids. This prevents the moisture absorption and oxidation of bitumen by way of entrapped air. This has resulted in decreased rutting, ravelling, and there no pothole formation. The avenue can stand up to heavy traffic and exhibit higher durability. The use of the progressive science will now not solely improve the street construction however will also increase the road existence as nicely as assist to improve the surroundings and will additionally create a source of income.

FUTURE SCOPE

- To eradicated patholes.
- To limit the global warming ,green house and pollution
- The life span of avenue can be increased
- Eco-friendly in nature.

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