



USE OF PLASTIC WASTES IN ROAD CONSTRUCTION

BY

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PROBLEMS DUE TO PLASTIC WASTE

1.

Land Filling



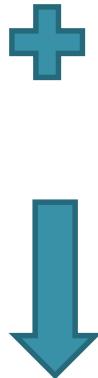
2. Incineration



VARIOUS BITUMINOUS ROAD DEFECTS

- 1. Block Cracks
- 2. Crocodile Cracks
- 3. Diagonal Cracks
- 4. Slippage Cracks
- 5. Corrugations
- 6. Depression
- 7. Rutting
- 8. Shoving
- 9. Flushing
- 10. Polishing
- 11. Raveling
- 12. Delimitation
- 13. Potholes
- 14. Kerb Defects

SOLUTION



RAW MATERIALS FOR ROAD CONSTRUCTION

- ❖ Aggregate
- ❖ Bitumen (Tar)
- ❖ Waste Plastics

ROAD AGGREGATE CHARACTERISTICS

Colour	Black > Grey>White
Strength	Need to be Good
Surface Roughness	More Preferred
Porosity	2% - Tolerance
Moisture Absorption	2% - Tolerance



BITUMEN CHARACTERISTICS

- ❖ Structure- long molecules
- ❖ Viscosity – not suitable beyond 160°C

PROCESS INVOLVED IN PRODUCING WASTE PLASTIC FLAKES



SEGREGATION .



CLEANING.



SHREDDING PROCESS



COLLECTION PROCESS

CHARACTERIZATION OF WASTE PLASTICS

- ❖ Plastic is a good binder.

% OF PLASTIC COATING OVER AGGREGATE	COMPRESSIVE STRENGTH (MPA)	BENDING STRENGTH (MPA)
10%	250	325
20%	270	335
30%	290	350
40%	320	390

❖ THERMAL STUDY

Polymer	Solubility		Softening Temp in Deg.C	Products reported	Decom position Temp Deg.C	Products reported	Ignition temp. range in Deg. C	Products reported
	Water	EPT*						
PE	Nil	Nil	100-120	No gas	270-350	CH ₄ ,C ₂ H ₆	>700	CO,CO ₂
PP	Nil	Nil	140 - 160	No gas	270-300	C ₂ H ₆	>700	CO,CO ₂
PS	Nil	Nil	110-140	No gas	300-350	C ₆ H ₆	>700	CO,CO ₂

FIELD TRIALS

There are two type of field trials

1.Dry process

2.Wet process

DRY PROCESS



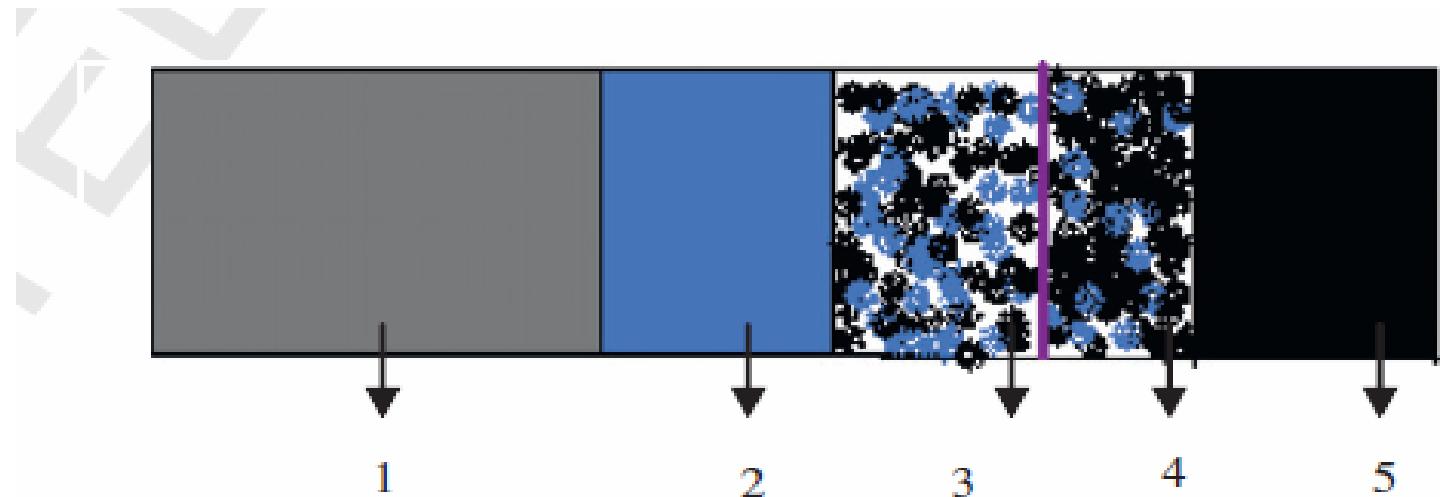
Heated aggregates



Adding shredded plastic



Aggregate-plastic- Bitumen Mix



Key: Black- Bitumen; Blue- Polymer; Grey - Aggregate

1. Aggregate.
2. Area of Plastics bonded with aggregate (polymer ^{coating}).
3. Area of ^{bitumen-plastics} blend (due to diffusion ^{between} molten plastics ^{and} hot bitumen).
4. Area of Loosely bonded bitumen with dispersed ^{plastics}.
5. Area of Plain bitumen ^{layer}.

CHARACTERISTICS OF POLYMER MODIFIED BITUMEN

- ❖ The use of higher percentage of plastics in polymer modified bitumen is not favorable.

<i>% of Plastics</i>	<i>Ductility (cm)</i>	<i>Penetration (mm)</i>	<i>Softening Point (°c)</i>
1%	64	95	54
2%	55	90	50
3%	20	80	50
5%	11	55	72
10%	7	Nil	75

CHARACTERISTICS OF PLASTIC COATED AGGREGATE

- ❖ Plastics improves aggregate impact value.

Helps to improve the quality of flexible pavement

<i>Percentage of Plastics</i>	<i>Aggregate Impact value</i>
Nil	25.4
1%	21.20
2%	18.50

COST ROAD BENEFIT ANALYSIS FOR CONSTRUCTION

MATERIAL NEEDED	MATERIAL NEEDED	PLASTIC-TAR ROAD
80/100 Bitumen	11250Kg	10125Kg
Plastic waste	NIL	1125Kg
Cost	Rs.393750	(BIT)Rs.354375+(plastic)Rs.13500 = Rs. 367875
Cost Reduced	NIL	Rs. 25875.00
Carbon Credit Achieved on avoiding burning of plastics	NIL	3.5tonnes

COMPARATIVE STUDY OF PERFORMANCE

TEST	BITUMEN ROAD	PLASTIC TAR ROAD	REASONING – PLASTIC TAR ROAD
Skid Resistance <65	More than the expected value 76	Within the limit 45	Not very smooth – supported by texture value
Sand Texture .6-.8	More depth 0.83	Less depth >0.6	Due to bonding- in permissible limit
Roughness 4000	More bumps 5200	Less Bump >4000	Better binding- less rutting and raveling
Benkelman beam 0.5-l	Rebound slightly High 1.55	Rebound Less 0.5-l	Supported by bonding base surface defect is taken care of by the plastic tar road
Density 2.86	Moderate 2.88	Moderate Value 2.55	Better binding

ADVANTAGES OF PLASTIC ROAD

- ❖ Use higher percentage of plastic waste.
- ❖ Reduce the need of bitumen by around 10%.
- ❖ Increase the strength and performance of the road.
- ❖ Reduce the cost
- ❖ Generate jobs for rag pickers.
- ❖ Develop a technology, which is eco-friendly.

DISADVANTAGES OF PLASTIC ROADS

- ❖ Toxics present in the co-mingled plastic waste would start leaching.
- ❖ But the presence of chlorine will definitely release HCL gas.

CONCLUSION

- ❖ Plastic road would be a boon for India's hot and extremely humid climate where durable and eco-friendly roads which will relieve the earth from plastic waste.



**THANK
YOU**