

# Use of Plastic in Road Construction Ajmer

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## Abstract

India produce 15000 Tons of plastic .Plastics are synthetic organic polymers that can be molded, chains of carbon atoms pure or with addition of oxygen, nitrogen or sulfur. Plastics are used in place of plant material , wood, stone, horn, bone, metal, glass, etc. Because plastic are hard, dense, tensile, strong, and heat resistant. Thermoplastic are plastic when heated do not undergo chemical change and molded again and again. Polythene (PE), Polypropylene(PP), Polystyrene(PS), Polyvenyl chloride (PVC). More than 5.25 trillion particles of plastic weighing 268,940 tons float at sea. Plastic take 500 to 1000 or more years to degrade. 9000 Tons of plastic in India remains untreated.28 MT of plastic products consumed every year. Plastic waste can be used in road construction plastic waste enhance the life of road. This also solve the problem of plastic disposal problem. PVC HDPE waste plastic is ground and mixed with charcoal. These roads are more durable. As compared to normal ordinary roads. This gives strength to roads and also increase the road life and solve the problem of plastic disposal.

Key words: Plastic, Waste, Ajmer, Plastic roads.

## Introduction

Plastic waste is big threat to environment. More than 5.25 trillion particles of plastic weighing 268,940 tons float at sea. Plastic take 500 to 1000 or more years to degrade. India produce 15000 Tons of plastic . 9000 Tons of plastic in India remains untreated.28 MT of plastic products consumed every Year. Plastic bags clog underground drainage system and

escalate the effect of flood. Waste plastic is kibbled and mixed with surface coarse ( Bituminous pavement and concrete pavement). This unconventional technology strengthens road , increase road life, and solve the problem of plastic pollution.

Ajmer is located in the center of Rajasthan (INDIA) between  $25^{\circ} 38''$  and  $26^{\circ} 58''$  north  $75^{\circ} 22''$  east longitude covering a geographical area of about 8481sq km hemmed in all sides by Aravalli hills . About 7 miles from the city is Pushkar lake created by the touch of lord Brahma. The Dargah of khawaja Moinuddin chisti is holiest shrine next to Mecca in the world.

Heavy consumption of bottled water . Many cows graze the dump sites die due to plastic bags in their stomach. More than 30 tons of plastic generated by states in India. It is a big problem how to get rid of this non biodegradable peril.

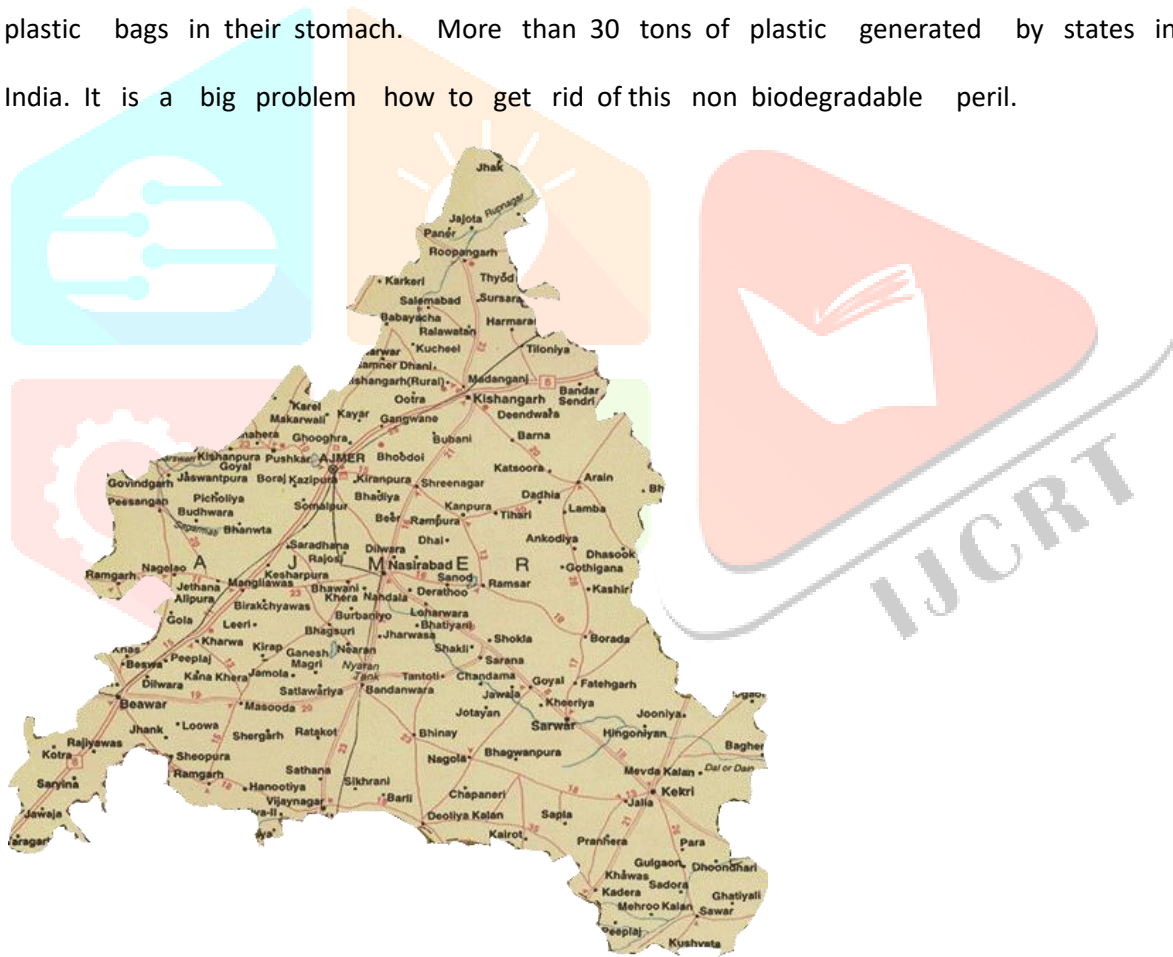


Image 1. Ajmer Map



Image 2. Plastic waste

## 2. Plastic as an additive to Road construction material

Plastic is mixed with surface coarse (Concrete pavement and Bituminous pavement). Plastic increases the melting point of Bitumen and makes the road retain flexibility and makes the life of the road longer. By mixing plastic with surface coarse, the ability of surface coarse to withstand high temperature increases. The plastic waste is pulverized, melted, and mixed with surface coarse at 45 °C temperature. It remains stable even at 55 °C. During flood or rainy season, they are more durable than normal roads.

## 3. Characteristics of Plastic waste and road construction material mixture

Road is stronger than normal road.

During rainy season they are more durable.

Bleeding is reduced during summer.

Plastic disposal problem is avoided.

Less surface course material is required.

Low cost.

#### 4. Use of plastic waste and Road construction material for road construction

##### Materials used

Material used is divided into Concrete pavement and bituminous pavement. The size of both is different.

The aggregate required for research is procured from local construction sites.

##### Road construction material ( Surface Course ).

Surface course act as binding agent for aggregates.

##### Waste Plastic

Waste Plastic is used to enhance property of surface course. Plastic is pulverized and mixed with Surface course It binds surface course and sand and there is no bleeding.

##### Processing

Plastic waste is collected. Ground Mixed with surface course.

## Collection of Waste Plastic

Road side, Garbage trucks, Dumpsites, ragpickers, carry bags, bottles, milk bags, glass cup, polythene etc.

## Mixing of Waste Plastic with Road Construction Material

Heated at  $165^{\circ}\text{C}$ . Surface coarse is heated at  $160^{\circ}\text{C}$

10 % of waste plastic is added to surface course .

## Laying of Road Construction Mix

### Optimal waste plastic mix

And plastic is shredded sprayed over hot plastic within 20-30 sec. plastic is coated over aggregate and oil coating is formed. Coal is heated at  $170^{\circ}\text{C}$  at mixing puddler hot coal and plastic mixture is used for road construction.

### Optimum waste plastic concept

Waste plastic (10%) added into heated surface course.

Different percentage of plastic was mixed to test the stability of the mix.

The Stability value is increased if 4.7 % bitumen plus 10% processed plastic plus and 5 % plastic by weight of mix.

The stability value of mix 10 % plastic by weight of surface coarse .5% plastic by weight of the mix.

Lab studies carried out on mix using this modified mixture with plastic indicate increased Drudgery after repeated loads.

**Dry process**

Macerate plastic waste percentage to be added in mixture is 10%.

**Mini hot mix plant**

Stone aggregate mix is mixed with puddler.

**Economics of Road construction**

Cost of plastic waste 5 per kilogram, Cost of coal 50 per kg,

Road length 3.7 km .

Cost of coal per km 5,00000.

Optimal percentage of plastic is 10%.

Total cost of coal and plastic is around 45-50000 per km.



Image3. Plastic Road are Strong



Image 4. Ordinary Roads are not strong .

## Comparison between plastic road and normal road

The roads laid out with pulverized plastic are more tenacious than traditional roads.

These roads are stronger.

These roads are long lasting. Their binding property makes them long lasting.

The life of road increases twice and less repairs are needed.

During rainy season rain water will not seep through and life span of road will increase.

This will also reduce the menace of non biodegradable waste.

The waste Plastic roads will be a benevolent and beneficial for Ajmer.

There will be no potholes after rainy season.

So Government should also set plants to encourage plastic roads.

In coming time we will have strong, durable and ecofriendly roads. That will also

Reduce plastic waste.

Cows will also get benefit as they will not die because of plastic.

## Benefits of Plastic Roads

1. Life of Plastic Roads is longer.
2. It reduces time of construction.
3. Ecofriendly method.
4. Reduce plastic pollution from environment.
5. High binder content.
6. high resistance to cracking.
7. Age improved.
8. Reduced tyre noise.

## Authors

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