Industrial Engineering Journal
ISSN: 0970-2555
Volume : 52, Issue 12, December : 2023

# STUDY ON UTILISATION OF INDUSTRIAL WASTES FOR PAVEMENT CONSTRUCTION

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***Abstract:*** *The common waste materials are fly ash, blast furnaces lag, cement kiln dust, phosphogysum, waste plastic bags, foundry sand and colliery sand. It\s been used to construct Retaining walls, Embankment, soil loams, heavy building base beds on soft hand etc. The proper handling of industrial wastes is a major issue in today's world. To improve the usage of these industrial wastes, attempts are being made for its usage in construction of Road and buildings in India. So in order to reduce the water content in the soil, partial replacement of waste plastic is utilized. This paper examines the industrial wastes that can be used in pavement design through utilization of all of these waste products which are non-bio gradable. They pollute the Environmental conditions.*

***Keywords:*** *Industrial wastes, waste plastic, pavement design, non-biodegradable.*

## I. Introduction

Studies have established that the roads built using plastic waste are durable and sustainable and increase the life of the bitumen. In a road pavement component structure, the Granular Sub Base (GSB) is adversely packed aggregate layer between the base course and the base course and the underlying subgrade layer. The disposal of plastic waste contributing to pollution and global warming, creating severe ecological problems. The various research studies investigate alternative approaches to addressing these problems by incorporating plastic waste into bituminous mixtures for pavement construction. The problem of waste accumulation every year is all over the world. The wastes represent a major problem for the environment because the air pollution (the dust and very fine particles which spread in atmosphere) and leaching toxic chemicals (arsenic, beryllium, boron, cadmium, cobalt , lead, manganese) when are dumped in landfills, quarries rivers, oceans. The capitalization of waste is difficult because of their variety, as well as their unknown properties over time. The most effective methods of industrial work Management are the ones that aim to reduce, reuse and recycle when possible and that are generalized to cause no harm to the environment. The lack of conventional road materials and the protection of the Environment. Make it imperative to investigate the possible use of industrial. Waste materials carefully. India is having a large network of industries located in different parts of the country and many more is planned for the near future. Several million metric tons' industrial waste materials are produced in these industrial establishments. If these industrial waste materials suitably used in pavement construction, then pollution and disposal problem may be reduced.

Many kinds of recycled materials or by products are exclusively employed in pavement construction such as Reclaimed Asphalt Pavement(RAP), Construction and Demolition (C&D) waste, Waste rocks, glass, steel slag, cement dust, rice husk and straw, wood saw dust, waste plastic bags, crumb rubber, waste engine oil and cooking waste materials.

Rigid (or) Flexible types of plastic containers are liberally used for packaging in consumer market. The material is polyvinyl Chloride (or) Polyethylene tetra phthalate (PET). They have long life and are not biologically degradable, the best way is to recycle and use to the extent possible. Fine threads or ropes can be prepared from used polythene covers. Plastic containers can be made into pieces or panels after proper melting and moulding. Use of plastic bags/covers is banned at some places. Research work should be carried out on a priority basis to recycle and reuse plastic materials and save environmental conditions.

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**MATERIALS USED:**

***Plastic waste:***

Plastic waste also known as plastic pollution; is defined as the buildup plastic objects (such as plastic bottles and other items) the plastic waste such carry bags, cups, disposables, etc. are bags cups, disposables, etc. The world produces around 350 million tonnes of plastic waste each year. Estimates vary, but recent high quality studies suggest that between 1 and 2 million tonnes of plastic enters the oceans annually.


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Plastic was found to be an effective binder for bitumen mixes used in flexible pavements. The plastic wastes are shredded in the shredding machine and then sprayed in different percentages over the hot aggregates.
The details of the process are given below

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***Waste Plastic Shredding:***

Waste plastics cut in two (or) more pieces are fed into a shredder for further cutting, shredded waste is easier to handle( or) lense. Shredding is the process of cutting the plastic into small sizes between 2.36mm to 4.75mm with help of the plastic shredding machine viz. agglomerate and scrap grinder.

The volume of road traffic is increasing and demands a corresponding increment in the load bearing capacities of the road and its service life span. It have been proven possible to improve the performance of bituminous mixes used is the surfacing course of road pavements. With the help of various types of additives or modifiers to bitumen such as polymer, rubber latex, crumb rubber etc.

***Soil:***

The supporting soil beneath pavement and its special under courses is called subgrade. Undisturbed soil beneath the pavement is called natural sub-grade. Soil includes laterite, Morrum /Red soil, desert sand, alluvial, clay and BC soil. Strength and drainage are required in soils beneath pavements.

The soil sample for present study is collected in the outskirts of Telangana Capital from below 1 Meter depth from the ground surface. The obtained soil is dried and later allowed to pass through 4.75mm IS sieve and the soil passed through it is used for investigation.

**GEOTECHNICAL PROPERTIES OF UNMODIFIED SOIL**

| S.No. | Property | Value |
|---|---|---|
| 1 | Sand | 17.5% |

| | | |
|---|---|---|
| 2 | Silt | 20.6% |
| 3 | Clay | 61.0% |
| 4 | Specific gravity | 2.56% |
| 5 | Liquid Limit | 54.20% |
| 6 | Plastic Limit | 27.9% |
| 7 | Plasticity Index | 26.18% |

***Material/Grading:***

Gradation of material is concerned about its shape and size. The gradation analysis The Gradation Analysis of the coarse aggregates and the fine aggregates available is carried out by sieving through the standard IS sieves.

***Sampling:***

Sampling is the process of collection of materials from their resources. Tiles are produced in ceramic industry by metallurgical process. Since construction and demolition waste are producing on large scale and here is the best way to manage these is utilizing it in Road Construction.

***Experimentation:***

For according to IS 2386: 1960 the tests which are carried out on aggregate.

(a) Elongation Index Test
(b) Flakiness Index Test
(c) Crushing Value Test
(d) Impact Value Test
(e) Abrasion Value Test

Above mentioned tests are carried out on 100% aggregate and replacing 50% of aggregate with waste materials.

**PHYSICAL PROPERTIES OF MATERIALS**

| **Test** | **Test Methods** | **Aggregate 50% + Waste 50%** | **Aggregate Test Results** | **MoRTH Specifications** |
|---|---|---|---|---|
| Elongations Index | IS 2386:1960 P(I) | 20.56% | 23.81% | Max 30% |
| Flakiness Index | IS 2386:1960 P(I) | 19.10% | 18.81% | Max 30% |
| Abrasion Test by Deval Machine | IS 2386:1960 P(IV) | 20.00% | 18.00% | Max 30% |
| Abrasion Test by Los Angeles Machine | IS 2386:1960 P(IV) | 18.00% | 14.00% | Max 30% |
| Impact Value Test | IS 2386:1960 P(IV) | 17.50% | 21.80% | Max 24% |
| Crushing Value Test | IS 2386:1960 P(IV) | 18.45% | 24.60% | Max 10.25% |

The comparison is made between the results obtained from 100% aggregate and after replacing 50% it with waste materials.

**Conclusion:**

The Industrial Waste Materials, Construction and Demolition Wastes and Tile's Wastes for use in pavement construction has been reviewed in this paper. Due to scarcity of natural aggregate, it is essential to find its alternative. By using above mentioned waste materials in road construction in place of aggregates, we can save its amount by 50%; since due to the industrialization, the wastes are producing of huge amount and land is used for their dumping. Hence, by these wastes we can save a land from land fill and we can avoid land pollution. Due to less availability aggregate its cost is high. So by using these industrial wastes, utilization of industrial waste is economical for the local area and it is environmentally friendly also.

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