

# IDEAL IMPLEMENTATION OF POLYETHYLENE TEREPHTHALATE RESIN IN FLEXIBLE PAVEMENT

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## ABSTRACT

*This study represents the Experimental Performance on Ideal implementation of Polyethylene Terephthalate (PET) Resin in Flexible Pavement. Good transportation is the important infrastructure for our nation development. Road is the greatest mode of transportation in India. And it is essential to achieve economy in the construction of roads. Along with the economy, quality is also an important factor to be considered. On the other hand, the domestic wastage and industrial wastage disposal are a big problem. Especially the plastic which create many environmental problems cannot be decomposable in nature. It is generally recycled and reused. The present investigation is to utilize the plastic waste: in the form of reinforcement in road construction in order to increase its performance. There are many ways to achieve economy and quality in much. it is used in flexible pavement for stabilization, to reduce the thickness of pavement. It includes eco-friendly road construction, waste management development of innovative material for construction of flexible pavement.*

**Keyword:** - polyethylene Terephthalate PET, Flexible pavement, Modified bitumen, Polymer Geo-synthetics ,etc.

## 1. INTRODUCTION

Roads are very important national investment and require maintenance to keep them in a satisfactory condition and ensure safe passage at an appropriate speed and with low road user cost. within the road foundation or pavement, various sorts of defects are occurring like instability, pot holes etc. thanks to improper proportion of materials, inadequate thickness of pavement & separation or settlement of any layer or any reason then these defects are often overcome by using various Geo-synthetic materials in road pavement to improve such defects this is often our actual study as mentioned above. Geo-synthetics are defined as the manmade or natural fiber, which is useful in construction. they're made from natural fibers or synthetic fibers, which are weaved or bonded with partial melting, needle punching or the addition of chemical agents Generally, the Geo-synthetics are made from Polymer based Polypropylene, PVC, Polyester, Polyethylene, Polyamide, PET High Strength Woven Polyester Geo-textiles. Many plastics common to lifestyle are found in geo-synthetics. The foremost common geo-synthetics are polyolefin and polyester, rubber, fiber, glass, and natural materials are used. The function of Geo-synthetics plays role as a separator, filter, drainage, and reinforcement, protection, as a liquid and gas barrier. It is often also utilized in

construction of road, railway embankment, earthen dam etc. Polyethylene terephthalate is usually referred to as PET or beverages plastic bottle. The PET is common thermoplastic polymer resin of the polyester family is used in fibers for textile, containers, thermoforming for manufacturing, and together with the bulk of the world's PET production is for synthetic fibers in more than 60%, with bottle production accounting for about 30% of worldwide demand. within the context of textile applications, PET is mentioned by its common name, polyester, whereas the acronym PET is usually utilized in reference to packaging. Polyester makes up about 18% of world polymer production and is that the fourth most.

### 1. Objectives of Study

- To study characteristics affecting implementation of PET resin in road pavements.
- To assess chemical & mechanical properties of PET resin in road.
- To conduct experimentation on ideal implementation of PET resin in flexible pavement.

### 2. LITRATURE REVIEW

PET is considered as one of the most important engineering polymers in the past two decades due to rapid growth in its use. It is considered a best material for several applications and is widely used for creating liquid containers (bottles). It has excellent tensile and impact strength, chemical resistance, clarity, process ability, color ability and reasonable thermal stability.

#### 2.1 A.F. Ahmad, A. R. Razali, I. S. M. Razelan (2004)

The quantity of plastics used throughout the world is increasing every year. Municipal solid wastes (MSW), manufacturing processes and repair industries produce tons of waste plastic materials. The increasing awareness among consumers about the environment has contributed to the concerns over disposal of generated wastes. The growing number of plastic materials per year and limited landfill conditions causes many alternatives exist for the disposal of plastic waste. This paper provides a summary of the study on the use of polyethylene terephthalate (PET) in construction. From research that PET can improve properties of modified asphalt mixture. Having considered the economic and environmental prudent angles, utilization of PET as an additive to asphalt mixture is suitable to be used for road pavement.

#### 2.2 Swaptik Chowdhury, Aastha Tashkant Maniar, and Om. Suganya

This paper presents the work on synthetic fiber Polyethylene terephthalate (PET) as alternative construction entity. As plastic is non-biodegradable, its disposal has been a problem. Recently, PET fibers were proposed to be used as either reinforcement in concretes or being casted as blocks. And it can be accepted that PET is a successful building material. PET fiber reinforced concrete offer less compression strength and flexural rigidity than conventional concrete but it offers high ductility thereby increasing deforming capability of the concrete. Also, lightweight materials production because of it reduces the density of the reinforced concrete. This paper also presents the study on some other innovative ideas like PET panels and mattress or direct use of PET bottles for construction of non-load bearing walls with suitable fillers. The solution offered in the paper is one of the answers to long standing menace of waste disposal.

### 3. MATERIAL USED

#### 3.1 Bitumen



**Fig -1:** Bitumen

Bituminous materials or asphalts are extensively used for roadway construction, primarily because of their excellent binding characteristics and water proofing properties and relatively low cost. Bituminous materials consist of bitumen which is a black or dark coloured solid or viscous cementitious substances consists chiefly high molecular weight hydrocarbons derived from distillation of petroleum or natural asphalt, has adhesive properties, and is soluble in carbon desulphated. Tars are residues from the destructive distillation of organic substances such as coal, wood, or petroleum and are temperature sensitive than bitumen. Bitumen will be dissolved in petroleum oils where unlike tar.

### 3.2 Polyethylene Terephthalate PET Resin

PET is the most used thermoplastic polyester. PET is an acronym for polyethylene terephthalate, which may be long-chain polymer belonging to the generic group of polyesters. Polyethylene terephthalate (PET) is a semicrystalline, thermoplastic polyester. PET is the polyesters which formed by a polymerization reaction between an acid and alcohol. PET may be polymer which easy to handle and also durable and strong, has low gas permeability, thermally stable and chemically. PET was used widely in the form of the automobile part, lighting product, food packaging, electronics, sports tools, x-ray sheets, house ware, textile, power tools and photographic applications. There are 60% of PET productions in term of bottles synthetic fibers.

## 4. EXPERIMENTAL TESTS ON MODIFIED BITUMEN

1. Penetration test
2. Ductility test
3. Flash and Fire point test
4. Softening point test
5. Specific gravity test
6. Viscosity test

### 5. RESULT

**TABLE-1:** Result Analysis

SR.NO	TEST ON MODIFIED BITUMEN	EXPERIMENTAL RESULT	BITUMEN RESULT	STANDARD IS VALUE
1.	Penetration Test	32mm	34 mm	35 mm
2.	Ductility Test	45.5 cm	68 cm	75 cm

3.	Viscosity Test	52 sec.	43 sec.	33-55 sec.
4.	Flash Point Test	180°C	168°C	175°C
	Fire Point Test	205°C	175°C	185+5°C
5.	Softening Point Test	76°C	43°C	50°C
6.	Specific Gravity Test	1.2	1.14	0.9-1.3

## 6. CONCLUSIONS

This research showcased the importance of ecofriendly road construction in our quest toward achieving sustainable development in the twenty-first century. It sheds light on the concept of eco-friendly road construction and likewise revealed the factors responsible for its emergence, the obstacles being faced in its adoption by stakeholders, and the benefits derivable from embracing eco-friendly road construction.

- Utilizing of pet improve properties of flexible pavement such as increase stability, stiffness and viscosity.
- Discarded plastic material can be used effectively in the modification of bitumen for construction of flexible pavement.

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