

Advantages of using plastic aggregate in Flexible Pavement

Prof. N.M. Patil¹, S.S. Shinde², Bhavesh Bafna³, Poonam Bhandare⁴

N.M. Patil, Assistant Professor, Sanjay ghodawat Institute, Atigre

S.S. Shinde, Professor, Sanjay ghodawat Institute, Atigre

Abstract – Plastics have become a vital asset for humanity. Though extensive research and new technologies have led to invent of newer and safer plastics, but drawbacks and challenges of plastics have never been resolved and impact is on the rise. Recycling is one of the most convenient and easiest ways. Smarter sorting, energy efficient ways, developing smarter plastics and research to develop certain effective disposal of conventional plastics are some of the present era needs. Source reduction (Reduce and Reuse) can occur by altering the design, manufacture or reduced use of plastic products. Hence by developing an alternative solution for the disposal can reduce the environmental impact to certain extend.

Development of the country is measured by the level of infrastructure of country. According to World Bank 1% investment in infra leads to 1% increase in gross domestic product of the country. (Gdp)

Therefore after studying the pollution problems and the need for better infrastructure they have to be blended and a solution to the problem needs to develop the plastic wastes.

Key Words: plastic wastes.

1. INTRODUCTION

The main roads in India are under huge pressure and in great need of modernization in order to handle the increased requirements of the Indian economy. In addition to maintenance, the expansion of the network and widening of existing roads is becoming increasingly important. This would then enable the roads to handle increased traffic, and also allow for a corresponding increase in the average movement speed on India's roads.

Currently India's annual expenditure on the road sector is around Rs 20,000-30,000 crore. One of the major reasons behind this huge expenditure on maintaining roads is due to the problems of overloading and poor maintenance.

2. PROBLEM STATEMENT

In India, 80% of total plastic consumption is discarded as waste and official statistics say the country generates 25,940 tonnes of waste daily. At least 40% of this is uncollected. We almost always take the suffocation warning on plastic bags and packages seriously, keeping plastic packaging out of reach of babies and children. But we have not been as

mindful with the planet. Of the 8.3 billion tonnes of plastic produced, 6.3 billion tonnes have been discarded. Every year, nearly 13 million tonnes of plastic waste are added to oceans. Given their durability, plastics do not decompose. The Indian plastic industry is among the fastest growing ones. According to a 2017 knowledge paper by FICCI, a business and industry lobby, Indian plastic processing industry saw compounded annual growth rate of 10% between 2010 and 2015. Annual plastic consumption is expected to increase from 12 million tonnes to 20 million tonnes by 2020. If we continue to move at same pace without any solution to the current issue then soon we may be buried under self-created muck.

It seems rather obvious that this amount of a material that isn't meant to break down can wreak havoc on natural environments, leading to long-term issues for plants, animals, and people. Some of the major long-term effects of plastic pollution are:

1. Food Chain disturbed
2. Ground Water Pollution
3. Air Pollution
4. Land Pollution
5. Fatality of Animals
6. Toxicity

According to a September 2017 report by the Central Pollution Control Board (CPCB), which extrapolated data from 60 major cities, the country generates around 25,940 tonnes of plastic waste a day. About 94 per cent of this comprises thermoplastic, such as PET (polyethylene terephthalate) and PVC (polyvinyl chloride), which is recyclable. The remaining belongs to thermoset and other categories of plastics, such as sheet molding compound (SMC), fiber reinforced plastic (FRP) and multi-layer thermocol, which are non-recyclable. According to the latest report on the Implementation of Plastic Waste Management Rules published in 2016, the plastic waste generated across the country (barring six states where data was not available) is close to 1.6 million tonnes a year, with almost half of it coming from Maharashtra and Gujarat. However, the volume of plastic waste generated seems suspiciously low when compared with the data of Plastindia Foundation—a body of major associations, organizations and institutions connected with plastics. The Foundation estimates that in 2017-18 alone, India consumed 16.5 million tonnes of plastic. Worse, according to industry body FICCI, 43 per cent of India's plastics are used in packaging and are single-use plastic.

Consumption has clearly outstripped India's capacity to recycle.

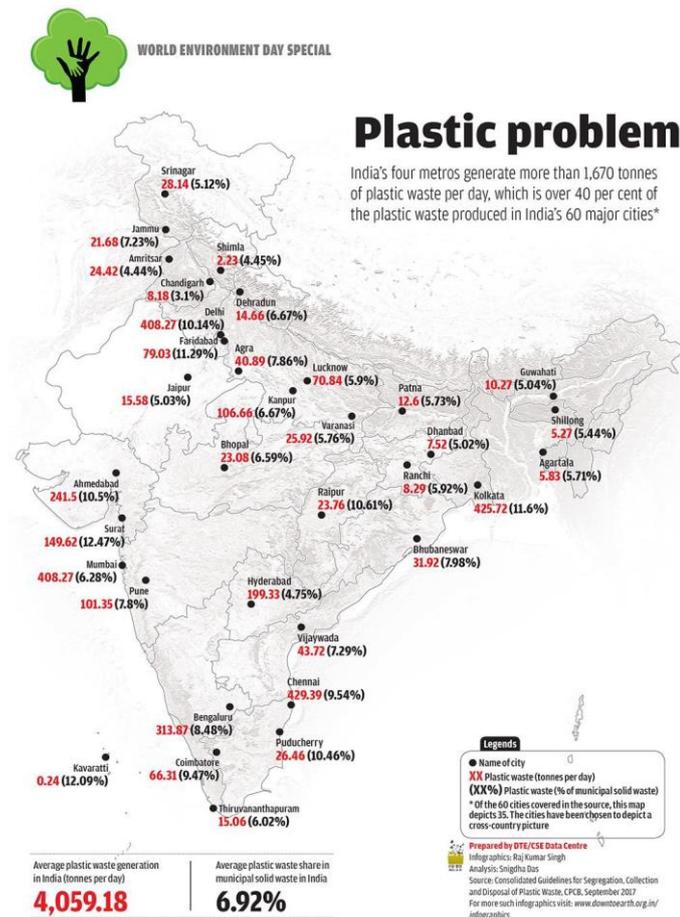


Fig: 1 Plastic Production in India

Hence there was a need for development of effective method of safe disposal

3. OBJECTIVES

The basic intention behind the proposed work is to make use of the plastic waste being produced in overall development of the country infrastructure and reduce the haphazard on human health.

1. To make effective utilization of the plastic waste being generated.
2. To reduce the environmental impact by certain extend.
3. To reduce the demand of the conventional stone aggregates by its replacement by plastic aggregates.
4. Generate jobs for rag pickers for collection of more and more plastic waste.

4. EXPERIMENTAL WORK

The tests are conducted as per the standard recommended by the Indian Standard code for corresponding tests and these obtained results are then compared. Following tests were conducted:

1. Aggregate Crushing Value [IS: 2386 (Part 4) 1963]
2. Aggregate Impact Value Test [IS: 2386 (part 4) 1963]
3. Aggregate Abrasion Test [IS: 2386 (Part 4) 1963]

5. RESULT ANALYSIS

Table: Comparison of properties of aggregates

Sr No	Property	Conventional Stone Aggregate	Plastic Aggregate
1	Aggregate Crushing Value	6.23	4.95
2	Aggregate Impact Value	5.87	5.1
3	Aggregate Abrasion Value	19.1	0.4

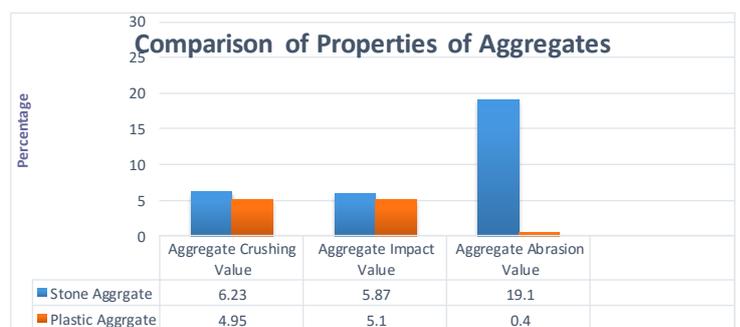


Fig: 2 Comparison of properties of Aggregates

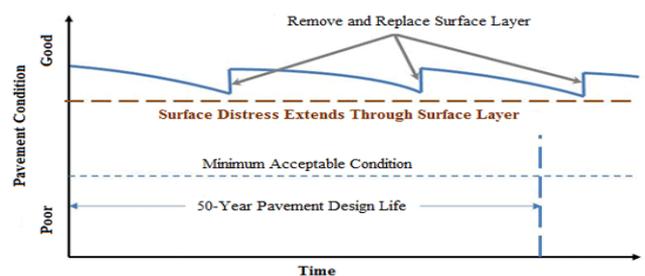


Fig: 3 Design Life of Pavement

6. CONCLUSIONS

After analyzing the results we can conclude that:

1. The aggregate crushing value is an indirect measure of crushing strength of the aggregates. Low aggregate crushing value indicates strong aggregates, as the crushed fraction is low. Hence plastic aggregates serve better as compared to stone aggregates.
2. Aggregate Impact value is dropped to a certain extent hence it increases the resistance of the roads to the pounding action of the moving vehicles.
3. By using plastic aggregates road can be made more durable as its resistance is increased and the periodic maintenance can be reduced as shown in fig:3
4. As the abrasion value is increased by a significant amount hence it increases its wear and tear action and hence serves better for the desired life span.
5. When plastic waste and food waste are burned, they produce dioxin and furan. These elements, even in small quantities, can cause death. Hence by using this technique the hazard to human health is reduced.

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