

STUDY OF RECENT TRENDS IN ROAD CONSTRUCTION

Pranav P. Chalke¹, Kajal D. Bhandavale², Sandesh M. Ghagare³, Komal K. Dicholkar⁴,
Prof. S.S.Gujarathi⁵

^{1,2,3,4}Students, Gharda Institute of Technology, Lavel, Maharashtra-India, 415-709

⁵Professor, Gharda Institute of Technology, Lavel, Maharashtra-India, 415-709

ABSTRACT- The aim of paper is to emphasize on sustainable development and environmental protection by promoting green road construction. The paper discusses the significance and scope of green technology with references to road construction. It focus on the viability of using fly ash, waste plastic and marble waste in road construction projects. The main object of paper is to analyze & to make use of mentioned waste material effectively in construction of various aspect of roads.

Keywords- sustainable development, fly ash, waste plastic, marble waste, construction technology.

INTRODUCTION:

Today, in the developing nations, roads play important part of infrastructure of country. Any damage may cause lots of inconvenience to the transportation system which ultimately will affect the future growth of countries. Steady increase in high traffic intensity in terms of commercial vehicles, and the significant variation in daily and seasonal temperature demand improved road characteristics. On the other side with increased global warming and climate change, go green movement is gaining awareness overall. The combined solution for above problems can be green road. Using environmental friendly material in transportation projects implies eco-friendly construction of roads with alternative materials over the conventional materials. Most difficult task in disposal of non-decaying waste material which is hazardous to environment can be solved to some extent by using waste material like plastic, fly ash and marble waste. Advances in science and technology, the use of non-decaying materials such as Plastic, Fly ash, Marble dust etc, offer an economically and sustainable alternative towards increasing demand for better road construction. Hence these materials can be utilized in an eco-friendly way, providing solutions to their disposal with a commitment towards development of infrastructure and contributing for the betterment of society.

REASONS TO USE ECONOMICAL ALTERNATIVE MATERIALS

- Increased global warming and climate changes.

- The problem of creation and disposal of non-decomposing materials.
- Increased demand for infrastructures like road with increase in population
- Limited natural resources for road construction.
- Depletion of good quality material for road construction.
- Increased cost and to achieve economy.
- To reduce bad impact on environment due to increasing construction demand.

A) Plastic Waste

Disposal of waste plastic is major issue. It is nondegradable and it mainly consists of low density polyethylene. Burning of these waste plastic bags cause environmental pollution, thus it can be used as a modifier in bitumen and aggregates to increase its strength.

Methods

• Dry Process

- Plastic wastes are cleaned and dried (For ex: disposed carry bags, glasses etc) with a thickness of 60 microns is shredded into small pieces (2.36 mm - 4.75 mm size).
- Aggregate are weighed and heated to 170°C in mini hot plant.
- This hot aggregates are mixed with plastic and thus plastic coated aggregates (PCA) are formed.
- Finally bitumen (160°C) is added to PCA to form polymer-bitumen-aggregate-mixture.
- Final mixture is used to laying road.

• Wet Process

- Plastic waste is ground and made into powder.

2. Blending of waste plastics with hot bitumen at 160°C.
3. Mechanical Stirrer is needed as the mixing is difficult because of difference in viscosities of molten polymer and bitumen.
4. Aggregates are added to this mixture
5. This mixture is known as waste-plastic-bitumen-mixture and used for road laying.

Advantages

- Strong and durable roads with increased marshall value (measures the maximum load sustained by the bituminous material)
- Provide good drainage system.
- Stripping and potholes on roads are reduced to greater extent.
- The cost of road construction is decreased due to reduction in bitumen consumption.
- Waste plastic in roads increases the stability value and durability to a greater extent as it decreases proportion of voids.

Disadvantages

- May lead to leaching
- Construction of roads releases some noxious gases.
- Wet process required a lot of investment and bigger plants it is not generally used.

B) Fly ash

Coal Fly ash, or pulverized fuel Ash (PFA) has been used for many years in road construction as a fill material, in concrete, lean mix sub-bases and in more recent years as a binder and aggregates in hydraulically bound materials. Around 110 million tonnes of fly ash accumulated every year at the thermal power plant. Its use reduces material being sent to landfill and preserves virgin aggregate reducing overall greenhouses gas emissions.

Advantages

- Fly ash is a light weight material as compared to commonly used filler material (local soil). Helps to prevent settlement.
- Easy to handle and compact because there is no lumps formation.

- High permeability ensures free and efficient drainage.
- Can replace a part of cement and sand in concrete pavements thus making road construction more economical.
- Higher value of C.B.R.

Disadvantages

- The quality of fly ash affects quality and strength of cement concrete.
- Poor quality fly ash increases permeability of concrete.

C) Marble Dust

Indiscriminate disposal of marble slurry dust (M.S.D.), mostly on road sides, is causing problem of drainage, flow regime, air pollution and damage of agricultural land. Marble waste flow in river and streams is hazardous to Aquatic life & this waste has been major pollutant to land, air and water bodies. Research work has been carried out for bulk utilization of this waste in road pavement layers, embankments and concrete work.

- It can be used for construction of road embankments.
- MSD utilized in bulk quantities in laying of pavement.

CONCLUSION:

- Green road construction technology aims at low cost road construction, offering employment opportunities to the masses- generating income at the disposal of the people involved

Thus improving the standard of living of the community at large.

- The durability of the roads laid out with the waste material is much more compared with roads with asphalt with the ordinary mix. Roads laid with plastic waste mix are found to be better than the conventional ones.

REFERENCES:

1. A.K. Mishra et.al, A new technology of marble slurry waste utilization in road, Journal of scientific and industrial research vol.69, January 2010, pp. 62-67.

2. Guidelines for use of fly ash in Road Embankments, IRC: SP: 58-2001
3. Lindon K. A. Ijmu, Using coal fly ash in road construction, 2008 annual international conference
4. Dr. Namita S. Sathe et.al, Recent trends in transportation projects: the need for economically viable & eco-friendly road construction, National Conference on Recent Trends in Engineering & Technology.
5. Rajasekaran, S., Vasudevan, R. and Paulraj, S., Reuse of Waste Plastics Coated Aggregates-Bitumen Mix Composite for Road Application—Green Method. American Journal of Engineering and Research, 2, 1-13, (2013).
6. Raj Singh Kushwah et.al, Utilization of 'Marble slurry' in cement concrete replacing fine aggregate, American journal of engineering research (AJER) vol-04, issue-1, pp-55-58.
7. Sandip Basak et.al, Utilization of Fly Ash in Rural Road Construction in India and Cost Effectiveness, eje paper 2004-0436.
8. Shibashish P. Mukherjee and Dr. Gaurang Vesmawala, Exploring Fly Ash Utilization in Construction of Highways in India, IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, Volume 8, Issue 4, PP 23-32.
9. Panel discussion on "use of non-conventional material in road construction, irc.vol.70-4 April-June-2010
10. Dr. V. Vasudevan, Guidelines for the Use of Plastic Waste in Rural Roads Construction, TEC, Madurai, and CRRI, New Delhi. National Rural Roads Development, Agency Ministry of Rural Development.
11. Yash Menaria, Rupal Sankhla, Use of Waste Plastic in Flexible Pavements-Green Roads, Open Journal of Civil Engineering, 2015, 5, 299-311.