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NEW TECHNIQUES ADOPTED IN CONSTRUCTION OF PAVEMENT

Vaidehi R. Deshmukh[1], Akshay M. Pudke[2], Safal A. Wankhade[3]
[1]*UG Student, Civil Engineering Department, Institute J.D.I.E.T., Maharashtra, India,vaidehi.deshmukh4444@gmail.com*
[2]*UG Student, Civil Engineering Department, Institute J.D.I.E.T., Maharashtra, India, akshaypudke12@gmail.com*
[3]*Asst. Professor, Civil Engineering Department, Institute J.D.I.E.T., Maharashtra, India, safalwankhade2@gmail.com*

Abstract
It is undeniable that the road construction industry every day is looking for a greater effectiveness and efficiency in its techniques and methods. However, change in the construction environment is not willingly embraced by the construction industry and this conflict to change compromises innovation performance, and unenthusiastically impacts customer and industry goals. In other words, with rising globalisation, roads have become a very vital infrastructure in enabling the transfer of freight as well as people, making the better and sustainable development of roads very important.
Innovation in road construction offers important industry and community benefits. This refers to the use of better materials for the purpose of road construction, such as eco-friendly roads, recycled materials, foamed bitumen etc. It can be technology innovation that includes the usage of better technologies for the combination of successful innovation in this sector. Moreover, the government has spending high cost in road construction as well as maintenance, so there is also a need for the use of innovation to find methods that will be cost effective. Also, environmental concerns around reduction in the emission of reduction in pollution encourage the use of innovation for the adoption of greener methods of road construction as well as maintenance.

Keywords: *foamed bitumen, globalisation, sustainable development, infrastructure*

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1. INTRODUCTION

1.1General

Innovation in road construction offers important for industry and community benefits, innovation in the road construction sector is very beneficial, This refers to the use of better materials for the purpose of road construction, such as eco-friendly road, recycled materials, as it is certain to bring better results, better performing roads with lower adverse environmental impacts and lowered costs and improved quality that would require low maintenance.

The process of improving the strength and durability of soil is known as soil stabilization. The main aim of stabilization is cost reduction and to efficiently use the locally available material. Enzymes enhance the soil properties and provide higher soil compaction and strength. Terrazyme is non-toxic, non-corrosive and inflammable liquid which can be easily mixed with water at the optimum moisture content.

Permeable pavement is a best solution for problem of increased storm water runoff and decreased stream water quality. Permeable pavements are an emerging technology. Permeable pavement systems have been shown to improve the storm water quality by reducing the pollutant concentrations and pollutant loading of suspended solids, heavy metals, hydrocarbons and some nutrients.

Plastic is everywhere in today's lifestyle. It is used for packaging, protecting, serving, and even disposing of all kinds of consumer goods. With the industrial revolution, high production of goods started and plastic is to be a cheaper and effective raw material. Plastic in different form is found, which is toxic in nature. It is commonly collected both urban and rural areas. It creates stagnation of water and associated hygiene problems. Plastic waste hazard to the environment Plastic waste can be reused productively in the construction of road.

2.0 LITERATURE SURVEY

2.1 Use Of Terrazyme In Soil Road

Terrazyme is an liquid enzyme which is organic in nature and is formed from the vegetable and fruit extract. It improvises the quality of soil like CBR, durability and decreases the OMC, plasticity index of soil. The effect of Terrazyme on soil is permanent and that soil becomes bio-degradable in nature. The reason behind the improvement of soil properties is the cat ion- ion exchange capacity of the clay soil. Friction between the soil particles increases as the water is eliminated out from the soil. Terrazyme provide a protective coating around the clay particles and thereby making clay particles water repellent. These organic enzymes come in liquid form and are perfectly soluble in water, brown in colour and smells like molasses. Eyesirritation may be caused by Terrazyme sometimes but the handling of this enzyme is easy i.e., masks and gloves are not required. Dosage of Terrazyme is of allmost importance, if less amount of Terrazyme is mixed with soil the effects will not be satisfying which means soil will achieve less

stability and if Terrazyme is overdosed it will result in the higher cost and stabilization will become noteffective. In order to find out the optimum dose of Terrazyme in particular soil type of CBR test is performed on each sample with different amount of Terrazyme.

Fig.1: Terrazyme Stabilizer

Fig. 2: Soil Road After Applying Terrazyme

2.1.1 Mechanism of Stabilization

Terrazyme reacts with absorbed water layer of clay particle and causes reduction in the thickness around particle of soil, this result in the reduction of voids between the particles of soil, thereby giving soil particle a closer orientation with low compaction. This ultimately resultsin the decrease in swelling capacity of soil and it also reduces permeability of soil.

2.1.3 Advantages of Terrazyme Road

1. The soil treated with Terrazyme renders improved density values by reducing voids ratios to a large extent which result in an overall improvement in CBR.
2. Terrazyme replaces soling and WBM of conventional road structure Terrazyme also reduces the crush thickness of asphalt layers.
3. Terrazyme treated road can be used all weather roads.
4. Terrazyme also proves to increase the road quality and decrease the maintenance cost.
5. Lower the maintenance cost by 32-50% saves construction time by 50% environment friendly and bio-degradable product.
6. Maintenance cost of road is reduced by 75% pavement thickness is reduced by 30-50%, being semi rigid in nature.

2.1.4 Environmental Benefits

1. Minimise material loss of surface gravel on soil road ways due to erosion or abrasion by traffic.
2. Reduces the on-going cost and environmental impact of the purchase transport and spreading of replacement gravel.
3. Minimise the harmful production and use of crushed rock and historical mineral stabilizers in road construction and maintenance.
4. Reduces fuel usage associated with frequent, short interval road repairs.

2.2 Permeable Pavement

Permeable pavement systems are suitable for wide variety of applications like commercial, residential, industrial, yet for light duty and less usage, even though this systems can be used for much wider range of usage. The areas where there is possible mitigation of pollutant in the groundwater, permeable pavement should be constructed and infiltrated water should be discharged into a suitable drainage system.

Fig. 3: Permeable Pavement

General applications of permeable pavement systems are as follows:

1. For residential driveways, roadway shoulders, service and access driveways
2. Parking areas
3. Bicycle paths, Jogging paths
4. Erosion control and slope stabilization
5. Land irrigation
6. Cart paths and Parking of Golf course

2.3 Types of Permeable Pavements

Numerous types of permeable pavement are available. Now a days Pervious concrete is most commonly used, but porous asphalt, interlocking concrete pavers, concrete grid pavers, and plastic reinforced grids filled with either gravel or grass are also available. Other types and variations exist, but these are the most popular and multifacted designs. The pavement type itself typically only to the surface layer of a structure consisting of multiple layers. To prevent clogging, only cleaned,

washed stone that meet the municipal roadway standards should be used. Depending on design needs, perforated pipes can be added near the top of the stone reservoir to discharge excess storm water from large events. Also, instead of allowing storm water to infiltrate into the underlying soil or where the permeability of the underlying soil is not optimal, perforated under drain pipes can be installed to route water to an outflow facility structure. It is recommended that an observation well to be installed at the down-gradient end of the permeable pavement to monitor performance.

2.3.1 Porous asphalt

Porous asphalt is a standard asphalt mixture of fine aggregate and coarse aggregate bound together by a bituminous binder except it uses less fine aggregate than conventional asphalt. The void space in porous asphalt is similar to the 15 to 35 %of pervious concrete. The surface of porous asphalt is similar to conventional asphalt, though porous asphalt has a rougher texture. The surface layer of asphalt is thinner as compare installation of pervious concrete. Where the compressive strength of pervious concrete is less than that of conventional concrete, the compressive strength of porous asphalt is comparable to that of conventional asphalt. Porous asphalt can be used for pedestrian applications such as greenways and low volume, low speed vehicular traffic applications such as parking lots, curbside parking lanes on roads, and residential or side streets.

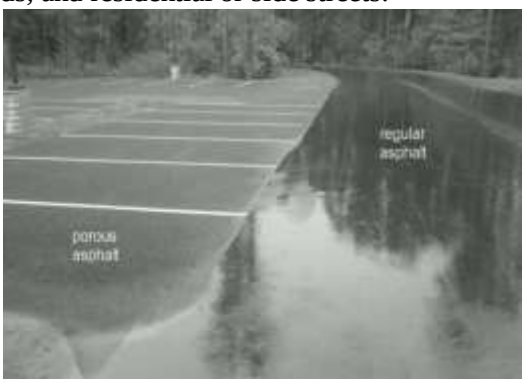

Fig. 4: Porous Asphalt

2.3.2 Pervious Concrete:-

It is a mixture of Portland cement, coarse aggregate or gravel, and water. Unlike conventional concrete, pervious concrete contains a void content of 15 to 35 % that is achieved by eliminating the finer particles such as sand from the concrete mixture. This smallspace allows water to infiltrate the underlying soil instead of either pooling on the surface or being discharged as runoff. Sidewalks and parking lots are the common applications for pervious concrete. The structural strength of pervious concrete, or typically less than standard concrete mix designs, can easily withstand the relatively light loads generated by pedestrian and bicycle traffic. The loads placed on pervious concrete in parking lots can be more substantial and require consideration when selecting the concrete mix and pavement thickness.

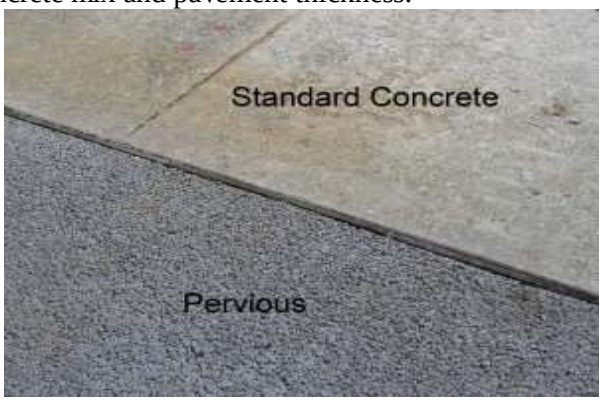

Fig :5: Pervious Concrete

2.3.3 Pavers

Permeable interlocking concrete pavers and clay brick pavers as well as concrete grid pavers are similar in installation and function but are made from different materials. PICPs are solid concrete blocks that fit together to form a pattern with small aggregate-filled spaces in between the pavers that allow storm water to infiltrate. These spaces typically account for 5 to 15 % of the surface area. Permeable interlocking clay brick pavers as the same as Permeable interlocking concrete pavers except the material is brick instead of concrete. With CGPs, large openings or apertures are created by the CGPs lattice-style configuration. These openings, which can account for 20 to 50% of the surface area, usually contain soil or grass, though small aggregates can be used. While CGPs have larger openings than PICPs & PICBPs, they are not designed for use with a stone reservoir but instead can be placed directly on the soil or an aggregate base. As such, the infiltration rate of PICPs and PICBPs is much higher than that of CGPs. Plastic turf reinforcing grid are made of interlocking plastic units with large open spaces. PTRG are generally used to add structural strength to topsoil and reduce compaction.

Fig.6: Concrete Paver

2.3.4 Need of Permeable Pavement:

1. To solve traffic jam problems in highly developed areas due to problem of water logging.
2. To reduce the imbalance in natural ecosystem.

3. By using permeable paving system, we can collect the rainwater or Storm water by this system and store to ground water table or by constructing a tank.
4. Permeable pavement can reduce the concentration of some pollutants either physically (by trapping it in pavement or soil), chemically (bacteria and other micro-organisms can breakdown and utilize some pollutants), or biologically(plants that grow in some types of pavements).

2.3.5 Life Span

The life span of porous pavement is mainly depends upon the size of air voids in the media. Due to more voids, there is more possibility of oxidation, so durability is less. It can be expected that the life span of permeable pavement is shorter than the impermeable pavements due to oxidation, subsequent stripping, deterioration by runoff and air infiltration.

2.4 Use Of Plastic Waste In Road Construction

Plastic is everywhere in today's lifestyle. It is used for packaging, protecting, serving, and even disposing of all kinds of consumer goods. With the industrial revolution, mass production of goods started and plastic seemed to be a cheaper and effective raw material. Today, every vital sector of the economy starting from agriculture to packaging, automobile, building construction, been virtually revolutionized by the applications of communication or InfoTech has plastics. Plastic in different form is found, which is toxic in nature. It is commonly collected both urban and rural areas. It creates stagnation of water and associated hygiene problems. Plastic waste hazard to the environment .Plastic waste can be reused productively in the construction of road.

Fig.7 : Plastic Road

2.4.2 WHY USE OF PLASTIC?

Polymers have a number of vital properties, which exploited alone or together make a significant and expanding contribution to construction needs.

1. Durable & corrosion resistant.
2. Good insulation for cold, heat & sound saving energy and reducing noise pollution.
3. It is economical and has a longer life.
4. Maintenance free.
5. Ease of processing/ installation.
6. Light weight.

2.4.3 Advantages Of Plastic Road

1. Strength of the road increased.
2. Better resistance to water & water stagnation.
3. No stripping & have no potholes.

2.4.4 Disadvantages Of Plastic Road

1. Cleaning process -Toxic present in the co-mingled plastic waste start leaching.
2. During the road laying process- the presence of chlorine willrelease thenoxious gas.

2.4.5 How Much Plastic? How Many Roads?

Each 5-member family's use of 5 gm plastic bags a week, all India = 52,000 tons a year. Assume 50% of this is available for roads.1.5 tons plastic goes into average 1 km road. So resurfacing just 35,000 km of roads a year will absorb all this littered waste. This is just 3.5 % of India's 1 million km surfaced roads. (1.1 million km more roads are un-surfaced).

CONCLUSIONS

1. Bio Enzymes are non-poisonous, organic and biodegradable in nature. The product formed after the application of Terrazyme is bio-degradable in nature and the effect is permanent. Terrazyme eliminates the use of granular sub base and sub grade course
2. The water quality and life span aspects were outlined for permeable pavement systems. The permeable pavement systems are changing the way of human development with natural environment. Its applications towards highways, road shoulders, parking lots and airport runways in India are all improvements in terms of water quantity, water quality and safety.
3. Plastic will increase the melting point of the bitumen. This innovative technology not only strengthened the road construction but also increased the road life. Plastic roads would be boon for India's hot & extremely humid climate, where temperature frequently cross 50°C .

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