International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 3.45 (SJIF-2015), e-ISSN: 2455-2584
Volume 3, Issue 4, April-2017

Proposal Of Nanotechnology In Flexible Pavement Construction For Waterlogging Area

Prajapati Jay [1] , Nazimali Chinwala [2], Jayesh Juremalani [3]

[1] *Civil Department, Parul University Limda, Vadodara,*
[2] *Civil Department, Parul University, Limda, Vadodara.*
[3] *Civil Department, Parul University, Limda, Vadodara.*

Abstract—We know that waterlogging damages the pavement heavily. Use of Nanotechnology nano silane and acrylic co-polymer in waterlogging area to make soil water proof, results in increment of CBR under wet condition and reduces the damages and can control capillary rise of water, too. The other benefits achieved are likely negligible maintenance and increase in overall life span of road. As the thickness of pavement decreases, material requirement reduces ultimately which is an added advantage. Zycosile is added in dense bituminous macadam and semi dance bituminous carpet it can feel all the voides so water can't get penetrated in pavement. This paper discusses the recent developments in use of nanotechnology in pavement construction.

Keywords— Nanotechnology, Flexible Pavement Design, Improving C.B.R in wet conditions, saline and acrylic co-polymer, Zycosile

I. INTRODUCTION

Saline and Acrylic co-polymer are used to control water damages and here it used to control capillary rise of water. Saline size 20-100 nm and acrylic co-polymer sized 100-300 nm. Saline : acrylic co-polymer : water is used in 1kg : 0.5kg : 200lit. it get sprayed on compacted soil in the rate of 3 lit/sq. mt. after it can control capillary rise of water and increase Soaked CBR 3 to 17.

Zycosile added bitumen while getting ready of bituminous concrete mix. In the rate of 0.1% of the volume of the mix. The cost of zycosile is 1400rs/lit. it's a yellowish transparent liquid looks like a food oil. Having size of 5 nm.

II. RESULTS

Table 1
Before treatment

			Density			Particle Size				Consistency Properties			Soil	Strength test
Sample	Type of Sample	Depth	Bulk	MDD	OMC	Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	IS Classification	Soaked CBR
No.		m	gm/cm³	gm/cm³	%	%	%	%	%	%	%	%		%
1	DS	1.1	1.74	1.55	12.4	5.5	21.50	24	49	33	19	14	CI	3.53
2	DS	1.2	1.70	1.64	20.77	5.5	21.25	24.25	49	33	19	14	CI	3.52
3	DS	1.3	1.68	1.50	12.9	5.7	21.50	23.30	49	33	18	15	CI	3.68

Table 2
After treatment

			Density			Particle Size				Consistency Properties			Soil	Strength test
Sample	Type of Sample	Depth	Bulk	MDD	Water contents	Gravel	Sand	Silt	Clay	Liquid Limit	Plastic Limit	Plasticity Index	IS Classification	Soaked CBR %
No.		m	gm/cm³	gm/cm³	%	%	%	%	%	%	%	%		
1	DS	1.1	1.79	1.70	11.37	5.5	21.50	24	49	33	19	14	CI	17.01
2	DS	1.2	1.79	1.69	18.14	5.5	21.25	24.25	49	33	19	14	CI	17.03
3	DS	1.3	1.78	1.68	10.81	5.7	21.50	23.30	49	33	18	15	CI	17.01

Table 3
Marshal Test Results for VG-30 + 0.1% Zycosil

Test	Design Mix	Specifications
1. No. of Compaction blow on each side of specimen	75	75
2. Stability Kg	1648	900 (MINIMUM)
3. Flow (mm)	3.55	2 – 4
4. % Air voids	3.84	3-6
5. % voids in mineral aggregate	13.18	
6. % Voids filled with Bitumen (VFB)	67.47	65 – 75
7. Density in gm/cc	2.449	-
8. Binder Content	5.0+0.1 % Zycosil	5.0-7.0%

III. CONCLUSION

As we know pavement based design and thickness depends upon CBR value so increment in CBR value results in reduction of thickness 710 to 600mm, which means materials require are having less quantity.

Conventional method of pavement making is having less initial cost but it requires the high maintenance costs. Roads are very susceptible to water hazards every year, which is a huge headache to all contractors and developers, on the other hand pavement making using nano technology may have high initial cost but it has nearly no maintenance costs which will affect the economy of road long-time.

Durability As we know the conventionally made roads are not very long lasting, they hardly remain in good conditions for 10 years. But having Nano-technology as all problems due to water are eliminated, the roads life for good conditions increases up to 20-25 years.

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