NANOTAC

A New System for Tack Coat based on Nano Technology

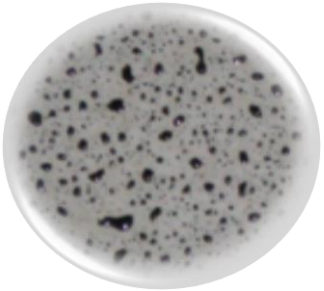



NANOTAC

QUICK SET, ALMOST ELIMINATES TIRE PICK UP, 100% COATING

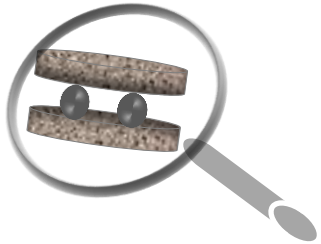



CRITICAL CHALLENGES WITH CURRENT SYSTEM



Uneven coating

Poor coating reduces load transfer



Poor wetting

Too thick bitumen film cause slippage

Water seepage & dust

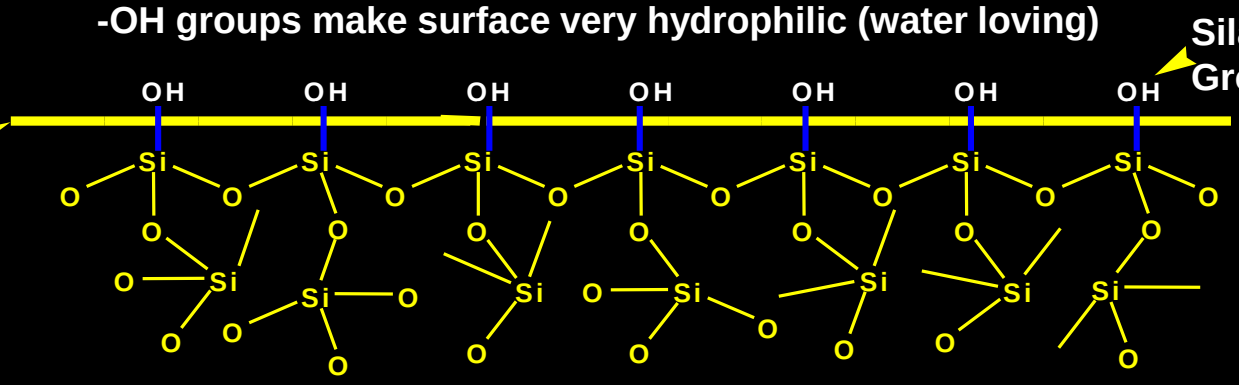
Poor coating of dust is a cause for bond failure

Long Setting time

Risk of rain will reduce pace of construction

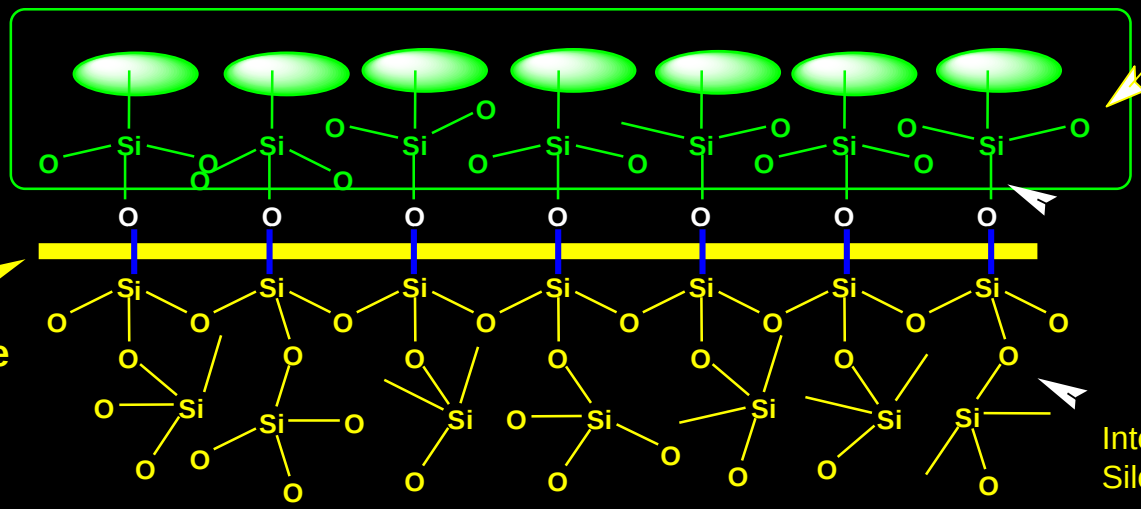
THE CHEMICAL ACTION

-OH groups make surface very hydrophilic (water loving)



Aggregate / Soil / Clay / Sand surface silicate structure

ZycoTherm creates molecular level hydrophobic zone (water repellent) and bitumen loving



Aggregate / Soil / Clay / Sand surface silicate structure after ZycoTherm reaction

NANOTAC

- Waterproofs and modifies the old and/or milled surface chemically to a bitumen loving surface.
- Ensures bitumen to adhere to the surface permanently
- Enables reduction in bitumen due to its wetting ability.

FEATURES

- Converts water loving dust / dirt, aggregates to bitumen loving surfaces
- Bonds the tack coat chemically with higher bond strength at lower residual binder
- Waterproofs the surface by deep penetration of micro cracks
- Ensures 100% Coating & Stress Transfer
- Sets quickly and eliminates tire pick-up

BENEFITS

- ✓ Resolves issue of top layer cracking and reduces fatigue failures due to 100% coating & chemical bonding
- ✓ Trackless Tack
- ✓ Gives 100% coating with less bitumen
- ✓ Eliminates slippages of the new layer and paver due to an even but thinner bitumen film

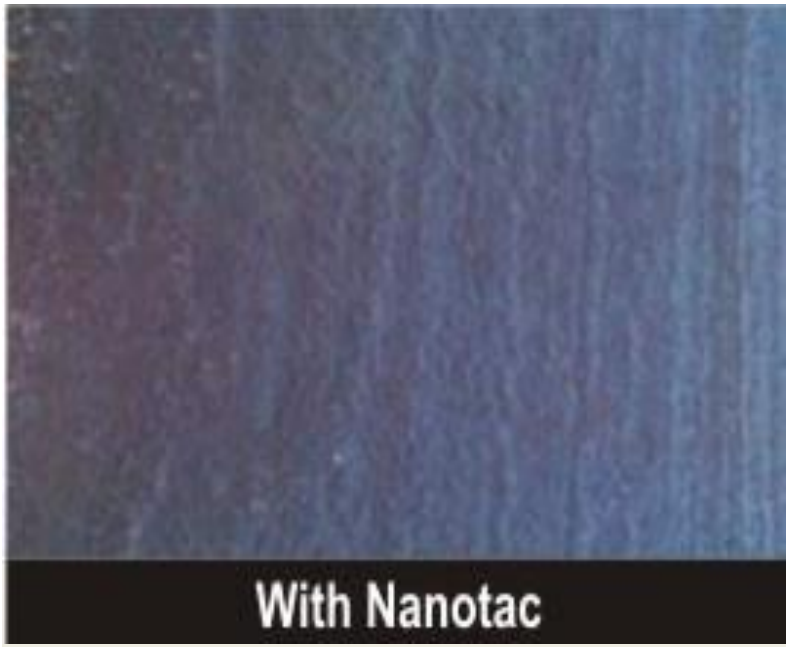
REDUCED SURFACE TENSION OF BITUMEN EMULSION

- Reduces droplet size and improves spray coverage area

EXCELLENT WETTING

- Reduces surface tension of cationic bitumen emulsion
- Improved surface coating for same spray rate

Uneven Tack Coat



Even Tack Coat

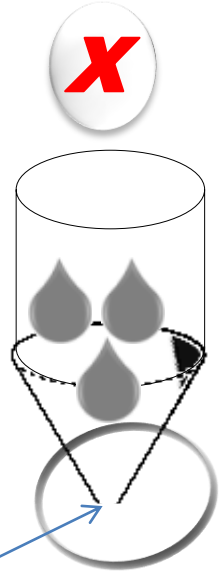
Tack Coat on a milled surface

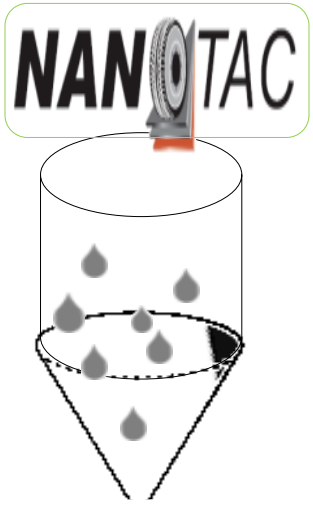
The milled surface is 100 % coated with the Tack Coat

HEATING TIME + POOR STABILITY → CLOGGED NOZZLES

Longer heating time to reach an emulsion temp of 60-70^{0}C. Larger droplets leads to a risk of an unstable emulsion and clogged nozzles.

Nozzle clogging





Reduced heating time to achieve an emulsion temp of 40-50^{0}C. Improved stability with NanoTac modified emulsion due to smaller bitumen droplets

Eliminates nozzle clogging

Skanska;Sweden

After 12 minutes

TACK COAT SPECS WITH NANOTAC

- NanoTac Modified Emulsion:
  - Cationic emulsion (60%) 1/3
  - Water 2/3
  - NanoTac; 2,3% calculated on bitumen in diluted emulsion

- Spray rate of above solution:
  - Old HMA Surface → 0,40 ltr/m2
  - Milled Surface → 0,45 ltr/m2
  - Depends very much on the surface condition.

- Setting time → 15 - 20 minutes
  - Due to excellent spreading & penetration

- Trackless Tack
  - Eliminates tire pick-up due to quick reactive bonding to surface

BOND STRENGTH : THREE DAY CURING

Surface	Sample	Residual Bitumen (%)	Bond Strength (PSI) Application Rate Ltr/m2		
			0,3	0,6	0,9
HMA New Surface	Control	30	212.4	141.4	180.9
	Nanotac	10	197.8	160.4	170.6
Milled Surface	Control	30	248.5	186.5	202.8
	Nanotac	10	157.5	205.5	195.6

National Center for Asphalt Technology NCAT at Auburn University

TRADITIONAL TACK COAT

- Slippage between the two layers as only 60-70% area available to transfer the stresses
- Poor drying rate and longer setting time due to too thick bitumen layer
- Waste of bitumen
- Costly
- Too thick film does not add any value. Is in fact a negative thing.

NANOTAC MODIFIED SYSTEM

- ✓ Fine spray gives 100% coating
- ✓ Improved wetting and coating on the applied surface
- ✓ Optimize the use of bitumen
- ✓ Penetrates into the fine cracks. Particularly important on milled surfaces with Micro cracks.
- ✓ Reduced consumption of bitumen
- ✓ NanoTac is a GREEN application as it reduces the consumption of ending resources
- ✓ NanoTac can be part of a construction system that provides a technology for GREEN ROADS

OTHER APPLICATIONS WHERE NANOTAC IS USED

- ✓ Fog Seal
- ✓ Dust Binding

Fog Seal

Final product is prepared at the job site. NanoTac is added to the diluted emulsion direct into the sprayer.

2,3% of NanoTac is added calculated on the residual binder.

44 % bitumen content in the emulsion.

Fog Seal

A Tack Coat sprayer is used for the application of the modified emulsion.
0,35 Ltr/m2 is applied. The target is 0,30 Ltr/m2
The surface is quite moist due to lots of rain earlier in the week
Temperature is quite low 12-13 ^{o}C.

Fog Seal

A spray truck is used for the traditional fog seal application.

The application rate is 0,30 Ltr/m2

Fog Seal

A very fine crusher dust is added after the emulsion is almost broken.
With NanoTac it gives a much quicker break and an improved wetting.
With NanoTac the application rate can be reduced.

Dust Binding

A diluted emulsion is used. Formulation:
1/5 60% emulsion
4/5 water
1,0% NanoTac
Heat to ca 50 ^{o}C

Dust Binding

The application rate is approx. 1,0 Ltr/m2.

The lane far right is a non diluted emulsion with no NanoTac. Hence too rich in bitumen.

Dust Binding

Finished application. The lane far right needed a sand choke to prevent pick-up on tires.

Dust Binding

Dust binding on a local gravel road.

The emulsion diluted to 25% bitumen + 1,0% NanoTac. This is higher then the recommended 10-15 % bitumen content.

The application rate is approx. 1,0 Ltr/m2.

Dust Binding

The emulsion could have been diluted a bit more which would have allowed us to increase the application rate a bit.

It is important the emulsion will not stick to the tires.

Green Roads → Use Nanotac