TRI Technologies

Asphalt Rejuvenation

TriTechnologies

GREEN PAVEMENT PRESERVATION SOLUTIONS

www.TriTechAsphalt.com

Asphalt Pavement Composition

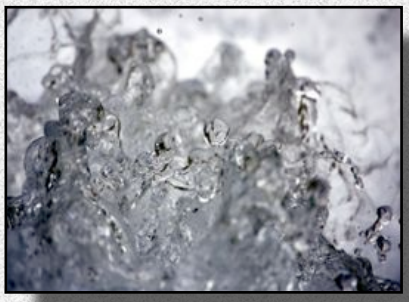
Asphalt is a complex material derived from the Petroleum refinement process. Asphalt composition can vary widely and there is no single formula that completely defines it. In general, asphalt pavements consist of stone aggregate, mineral fillers and asphalt cement (binder). The asphaltic binder consists of crystalline compounds called asphaltenes and viscous compounds maltenes.

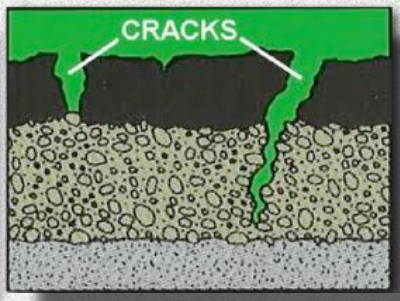
Below is an image of maltene and asphaltene fractions of asphalt cement from a paper by Dr. Robert E. Boyer, Retired Senior District Engineer for the Asphalt Institute (a trade association that is the world's leader in asphalt research), entitled "Asphalt Rejuvenators "Fact, or Fable".

Asphaltenes are the bodying agent of the binder, once they have been removed, what is left are the maltenes. There are four known types of maltenes that perform a certain function in the binder. Polar compounds are peptizers for asphaltenes. First acidaffins and second acidaffins dissolve the peptized asphaltenes. Saturated hydrocarbons act as a jelling agent. These functions of the maltenes in the asphalt binder are what give asphalt its characteristic softness and flexibility.

Pavement Deterioration

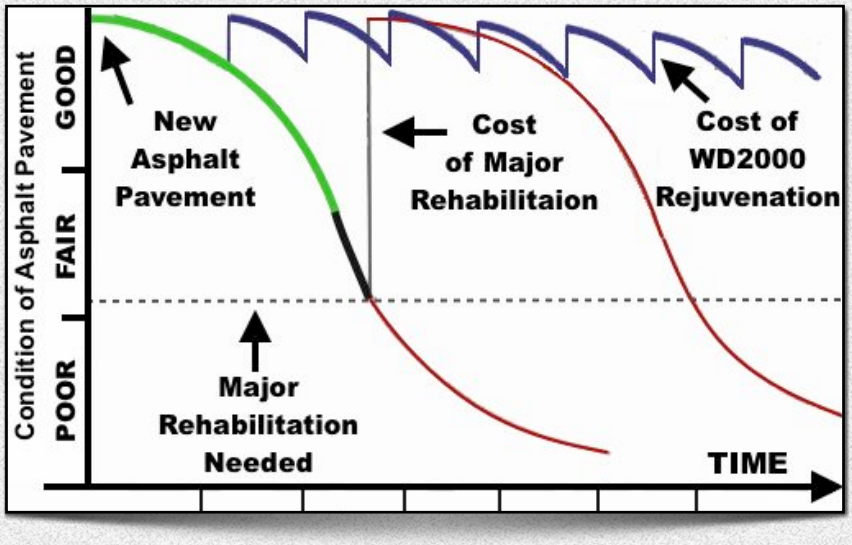
The moment it leaves the plant and comes in contact with air, asphalt begins to oxidize. The Asphalt Institute and Army Corp of Engineers say that no matter where a pavement is in the world the sun's rays penetrate the one-inch surface of the asphalt pavement and dry it out. As the maltene components of the asphalt binder dwindle the asphalt cement becomes brittle. The binder breaks down, and the pavement surface begins to ravel and show cracking. Water penetrates cracks and can lead to sub-base damage and increased cracking. Sub-base damage due to water infiltration will require reconstruction. The effects of fuel also accelerate the deterioration of the binder. Subsequent repairs are inevitable, costly and time consuming.





Pavement Preservation

Prevent deterioration of the asphalt binder and costly rehabilitation by performing regularly scheduled preventative maintenance to preserve the integrity of the surface and stop cracking before it starts. Investing in preserving your pavement while it is still in good condition will extend the life of your asphalt pavement at a fraction of the cost of rehabilitation such as milling and overlay, or reconstruction. Furthermore, it will eliminate unexpected complaints and safety hazards associated with a deteriorating pavement surface.



Reversing the Age of Asphalt

The Asphalt Rejuvenator/ Sealer is the best pavement preservation option available. The rejuvenator penetrates the asphalt surface replenishing the oils lost to oxidation and the effects of the sun. It becomes incorporated into the binder and balances the maltene and asphaltene ratios, literally reversing the chemical age of the asphalt cement by four years. Furthermore, our rejuvenator also provides a seal on the surface to protect the underlying pavement from the oxidative effects of the air, sunlight, water and fuel. Because cracking is the major sign of pavement surface deterioration and reduction of surface integrity, Rejuvenating before cracks appear will extend the serviceable life of your pavement by many years. Rejuvenation seals hairline cracks and its replenishing effects on the binder restores the flexibility that prevents cracking. A pavement preservation plan including asphalt rejuvenation is vital not only to extending the life of the pavement, but also to maximizing your financial investment. Rejuvenating before visible signs of deterioration and every four years can yield more than 80% savings in maintenance costs over a span of 30 years. Perpetually preserve your pavement with Rejuvenation.

Road Condition	Recommended Maintenance
Very Good: 1-3yrs No cracks	Application of Rejuvenation is exceedingly beneficial, providing a seal on the surface protecting the underlying pavement and preventing oxidation. Rejuvenation will seal hairline cracks. Four Year Performance Warranty.
Good: 4-6yrs Cracks forming	Ideal condition to receive the time reversing benefits of rejuvenation. Includes Four Year Performance Warranty. Use rejuvenation before crack sealing.
Fair: 6-8yrs Surface cracking	Rejuvenate to restore the flexibility of the pavement and prevent further deterioration. Backed by Four Year Performance Warranty. Crack seal as necessary.
Poor: 9-12yrs Block cracks	Use rejuvenator instead of tack coat in our Fuse Bonded Overlay to prevent reflective cracking and provide improved adhesion. Includes Three Year Performance Warranty.
Very Poor: 12+yrs Extensive alligator cracks	Surface reconstruction and possible base repair needed. Use our Fuse-Bonded Overlay to prevent reflective cracking and improve adhesion. Includes Three-Year Warranty.

"Comparing the cost of Rejuvenation with that of re-paving, the break-even point is 9 ¼ months, i.e., Rejuvenation pays for itself if it extends the life of the road surface by 9 ¼ months or more."

-Amy Rispen
Retired Chemist for US EPA

4 Year Performance Warranty: Rejuvenation

We are please to offer you the same Four-Year Warranty we offer the FAA. Because our rejuvenator/sealer incorporates into the binder we are able to guarantee that it will not flake, peal or chip off. We further warranty that the viscosity will be lowered (a measurement of the chemical youth) in the surface of the asphalt pavement and that you have the right to have this verified by a chemist.

3 Year Warranty: Fuse-Bonded Overlay

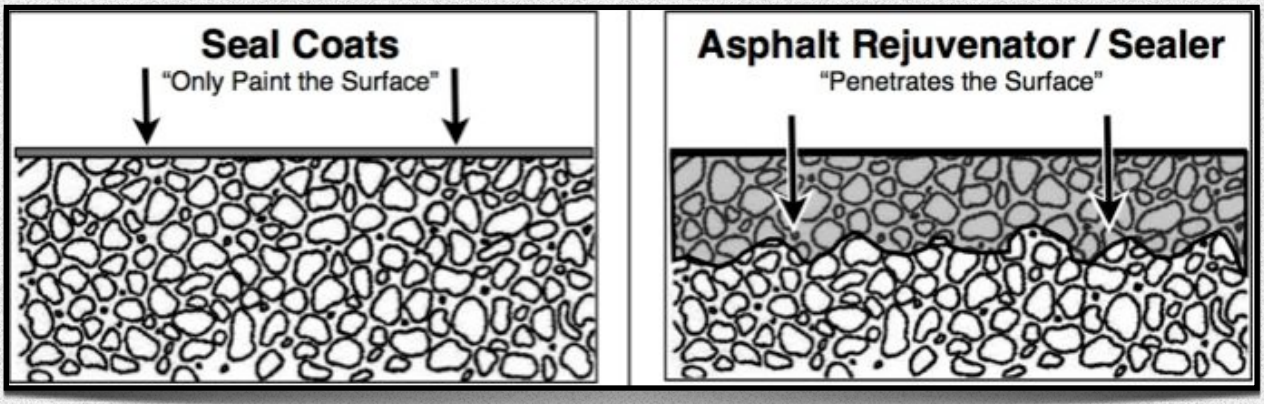
We offer an optional extended warranty on overlay projects that choose to use an application of rejuvenator instead of tack-coat. Reflection cracks usually appear within 6 months to a year of an overlay. We warrant that using the rejuvenator will prevent reflection cracks from forming and if any come through in 3 years we will seal them at no cost to you.

Crack Sealing

The rejuvenator will seal hairline cracks, all other cracks are sealed with a rubberized sealant to protect the pavement from water penetration and further deterioration. Seal cracks as soon as they appear to prevent accelerated damage.

Seal Coat vs. Rejuvenator

Seal coats and oil seals have been used in the past as a method of protecting the asphalt from oxidation. The purpose of the coat is to provide a barrier on the surface of the pavement between air, water, and sunlight preventing their oxidative effects on the asphalt pavement. However, what has been observed throughout the decades is that this does not seem to help the pavement. Research has shown that seal coats actually dry out the pavement they were intended to protect. Furthermore, the seal coat and the underlying asphalt expand and contract at different rates, causing the seal coat itself to crack and eventually chip off. The table below contrasts Seal Coats and Rejuvenators.



Water is added to alter the mix and sanding is need for traction. **Paying for filler**	Water is not added and sanding is not need. **Paying for material**
Two applications plus the primer coat are needed. The product adheres to the surface like paint, expanding and contracting at different rate. **Causes cracking**	One-step application penetrates into surface and becomes a part of the asphalt, expanding and contracting at the same rate. **Prevents cracking**
Accumulates buildup, causing more cracking and can wear off as soon as six months! **Doesn't look good for long**	No build up or chipping off of material because it penetrates the surface and incorporates into the binder. It ages uniformly. **Looks great for years!**
Has no healing properties and is no longer recommended by the Asphalt Institute or FAA. **One-Year Warranty?**	Heals minor surface damage including raveling and hairline cracking. Desired by FAA and Asphalt Institute. **Four-Year Performance Warranty!**

Rejuvenator Chemical Lab Report

WD 2000 Bituminous Pavement Cores; Received May 16, 2011
2007 Cores 2 Year History Test; FAA P-632-2.2a Rejuvenation
Project: Natchitoches Regional Airport – Runway Seal Coat
Date of Project; April 24, 2007; AIP #3-22-0034-014-2007
Airport Manager: Mr. Larry Cooper; Engineer: Denmon Engineering; Mr. Terry Pullin
Manufacturer: Lone Star Specialties LLC; Manufacturers Representative; Mr. Warren B. Doussan Jr. and Mr. Ryan Simmons.; Consultant: Mr. Warren B. Doussan Jr.

Two sets of bituminous pavement cores were received Lone Star Specialties LLC, the manufacturer of WD 2000 on May 16, 2011 with identification and testing instructions from Mr. Doussan. Testing instructions were that they be tested for viscosity per Item P 632 "Bituminous Pavement Rejuvenation". The treated cores were marked "Untreated" and "Treated".

The top 3/8" of the cores were sawed and a composite of each set of the tops was tested using the following procedures.

Extraction, ASTM D 2172, Method A, using trichloroethylene as the solvent and a high speed centrifuge to remove suspended mineral matter from the extract.
Asphalt Recovery, ASTM D 1856
Absolute Viscosity, ASTM D 2171
Complex Modulus, Viscosity & Phase Angle, AASHTO T315

Laboratory Number	1105054	1105058	% Softening
Treated	No	Yes	
Absolute Viscosity @ 140F, P	119,540	21,720	81.8
Complex Modulus @ 60C, G*, kPa	62.22	16.65	73.2
Viscosity @ 60C, G*//sinô, kPas	65.05	16.88	
Phase Angle @ 60C, °	73.0	80.4	

Respectfully submitted,

CHICAGO TESTING LABORATORY, INC.

G. G.
George J. Giroux

This report shows a reduction in viscosity from119,540 poise to 21,720 poise four years after the initial application. WD-2000, Asphalt Rejuvenator increased the softness (flexibility, ductility) of the pavement by 81.8%. An application of our Asphalt Rejuvenator took a 9 year-old asphalt pavement and chemically restored it to a 3 year-old pavement. Testing done by the Army Corps of Engineers has shown that this restorative effect lasts 4-5 years and the process can be repeated indefinitely.

History of Rejuvenation & TriTechnologies

Jeff Pokorny, President of TriTechnologies, "I started in the pavement preservation industry with my father & brother over 25 years ago. Initially, we used seal coat to protect the surface of the pavement, but quickly realized that seal coat was not truly protecting the pavement, it was drying it out and chipping off causing more cracking. We recognized the need for a superior product and began a search that led us to Dr. Robert "Bob" Boyer of the Asphalt Institute and learned about studies conducted in the 1970s by the Army Corps of Engineers. The Army Corps of Engineers was evaluating products for Air Force runways, aprons, and taxiways that could rejuvenate the asphalt and provide a seal to protect the asphalt from jet fuel. They discovered that only two of the products could penetrate the surface, lower the viscosity and provide a seal on the surface. Since then, for more than 40 years, Asphalt Rejuvenator/Sealers have been repeatedly tested and proven. Hundreds of FAA regulated airports have been rejuvenated. Our Rejuvenator, WD-2000 meets the FAA specification P-632 for rejuvenator/sealers and has been used on hundreds of airports since 201. Globally, more than 40 billion yards of asphalt pavement have been protected and revitalized by rejuvenators. Our expertise includes airport facilities, county roadways, and commercial parking lots".

"With the proven performance of asphalt rejuvenators to revive an aging pavement, the pavement engineer has an economical method to extend pavement life. This type asphalt pavement treatment has the potential to extend the life of an asphalt pavement for several years beyond the point where rehabilitation, or major reconstruction would normally be required; thus significantly decreasing the pavements annual maintenance costs."

—Dr. Bob Boyer,
Senior District Engineer, The Asphalt Institute

Reference Publications

Boyer, Dr. Robert E. "Asphalt Rejuvenators 'Fact, or Fable'". Web. Transportation System 2000 Workshop. Feb-March 2000.

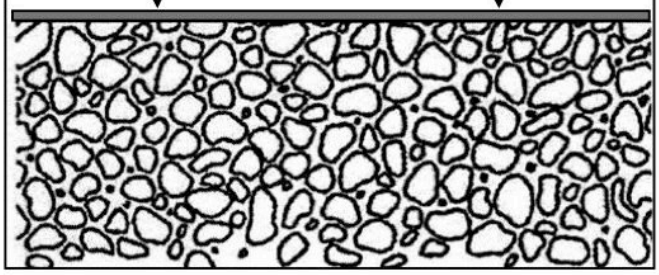
Rispen, Amy. "Rejuvenation vs. Re-Paving our Drum Point Subdivision Roads". Web. March 2012.

Walker, Donald. "Asphalt Roads PASER Manual" University of Wisconsin-Madison Transportation Information Center. 2013 Revision.

The Facts Sheet

Seal Coats

"Only Paint the Surface"

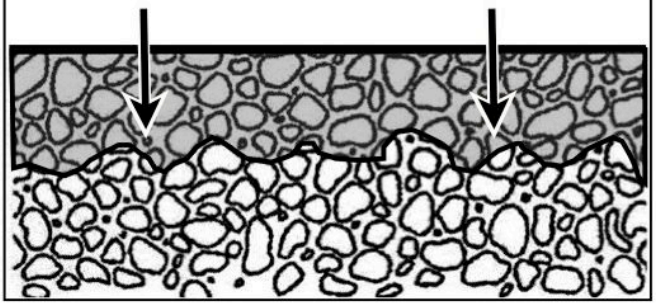


- Needs sand added to mix for traction
- Water added to alter mix
  (How much water & not material are we paying for?)
- Two applications plus primer coat are needed
- Adheres to the top of the asphalt like paint and does not expand and contract at the same rate as the asphalt; resulting in the surface cracking in the sealer.
- Accumulates buildup which leads to more cracking
- Wears off surface unevenly in 6 months to a year !
- No rejuvenating oils to extend asphalt life, shown to dry out the pavement even faster compared with untreated pavement.
- Has no healing properties that it adds back into asphalt
- No longer recommended by FAA or The Asphalt Institute; due to the damaging effects to asphalt pavements
- One Year Warranty, If any Warranty ?

Seal Coats effects over time
surface cracking & peeling
One Year Warranty? - (One Day Warranty)

Asphalt Rejuvenator / Sealer

"Penetrates the Surface"



- No sand added to mix - Not needed
- No water added to alter material mix
  (Paying for the material and not water)
- One step application
- Penetrates into the asphalt surface. Becomes a part of the asphalt allowing for the surface to expand and contract as the asphalt surface heats up and cools down resulting in no surface cracks
- No buildup of material, penetrates into the surface
- Ages uniformly - Looks great after years of use
- Chemically rejuvenates asphalt binder that extends asphalt life up to four years per application shown per independent test data
- Heals minor surface damage including raveling
- Desired & recommended by FAA & The Asphalt Institute, rejuvenators are the only alternative to costly overlays of new asphalt
- Four Year Performance Warranty !

Rejuvenator / Sealer
Blacker longer, adds oils back into asphalt
Four Year Warranty - (See Certificate)

(800) 495-5679
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