More Youthful Pavements

with

Preventive Preservation

Ken Holton, P.E.
Pavement Technology, Inc.

Objectives

- Review the concept of Pavement Preservation
- Review asphalt binder components and the aging process
- Review the role rejuvenation can have in a pavement management and preservation program

The Issue

Across the Country the trend has often been to differ or even eliminate important preventive maintenance on our pavements

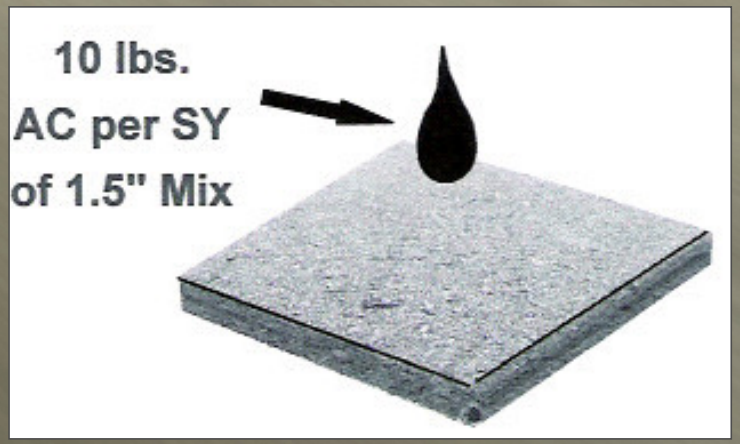
Unfortunately the longer we wait the deeper the hole and reminders such as bridge collapses are becoming more frequent

Funding is going down, people are driving less while driving more fuel efficient cars, construction prices are going up, pavement conditions are worsening and most folks are unaware of the scope of the problem

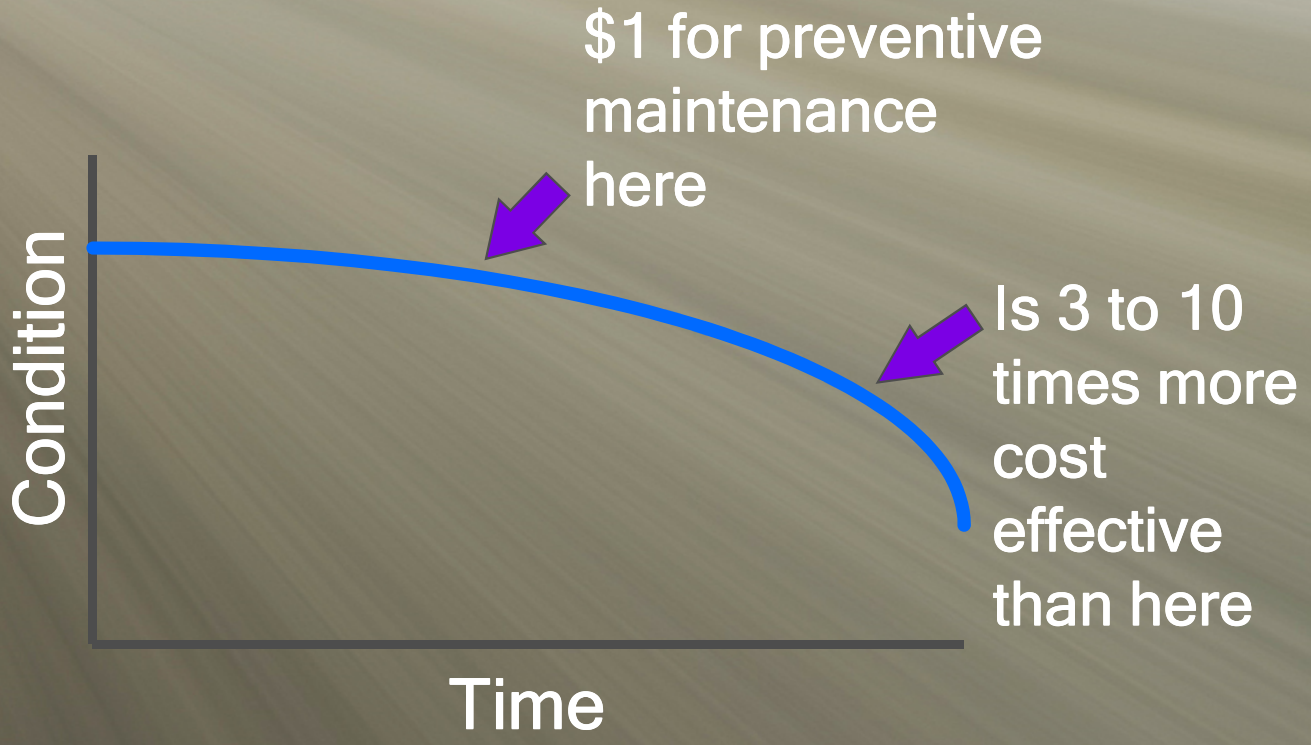
Concerns

- *Typically AC makes up approximately 6% of hot-mix asphalt.*
- *One SY of 1-1/2" compacted hot-mix, weighs approximately 168 lbs.*
- *6% of 168 lbs = 10 lbs.*

Thus, 10 lbs. of AC per SY of hot-mix



Effective preventative maintenance "Right Road with the Right Treatment at the Right Time"



Why Asphalt Deteriorates

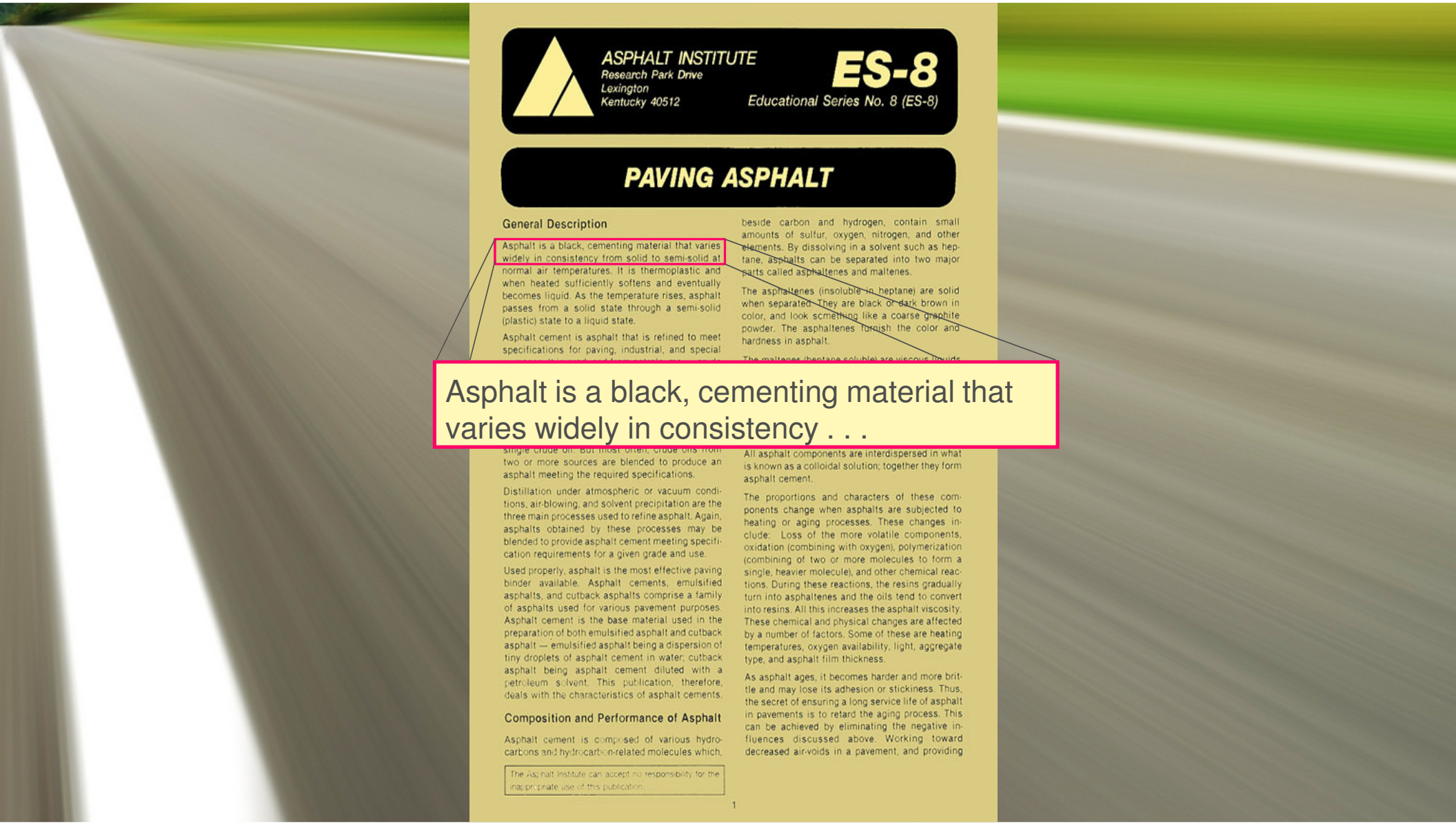
Aging Begins

The first significant hardening of the asphalt cement takes place in the pugmill or drum mixer where heated aggregate is mixed with hot asphalt cement. During this short mixing time, the asphalt cement, which is in very thin films, is exposed to high temperatures ranging from 275 to 350º F.

Oxidation takes its toll

The roadway begins to deteriorate the moment it's paved. The worst part is it's exponential. The viscosity of the asphalt binder can go from 10-15K poise when it's only a few months old to several hundred thousand after only a few years. In our area this is how most roads fail.

Aging continues



ASPHALT INSTITUTE
Research Park Drive
Lexington
Kentucky 40512

ES-8
Educational Series No. 8 (ES-8)

PAVING ASPHALT

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Asphalt cement is asphalt that is refined to meet specifications for paving, industrial, and special

single crude oil. But most often, crude oils from two or more sources are blended to produce an asphalt meeting the required specifications.

Distillation under atmospheric or vacuum conditions, air-blowing, and solvent precipitation are the three main processes used to refine asphalt. Again, asphalts obtained by these processes may be blended to provide asphalt cement meeting specification requirements for a given grade and use.

Used properly, asphalt is the most effective paving binder available. Asphalt cements, emulsified asphalts, and cutback asphalts comprise a family of asphalts used for various pavement purposes. Asphalt cement is the base material used in the preparation of both emulsified asphalt and cutback asphalt — emulsified asphalt being a dispersion of tiny droplets of asphalt cement in water; cutback asphalt being asphalt cement diluted with a petroleum solvent. This publication, therefore, deals with the characteristics of asphalt cements.

Composition and Performance of Asphalt

Asphalt cement is composed of various hydrocarbons and hydrocarbon-related molecules which, beside carbon and hydrogen, contain small amounts of sulfur, oxygen, nitrogen, and other elements. By dissolving in a solvent such as heptane, asphalts can be separated into two major parts called asphaltenes and maltenes.

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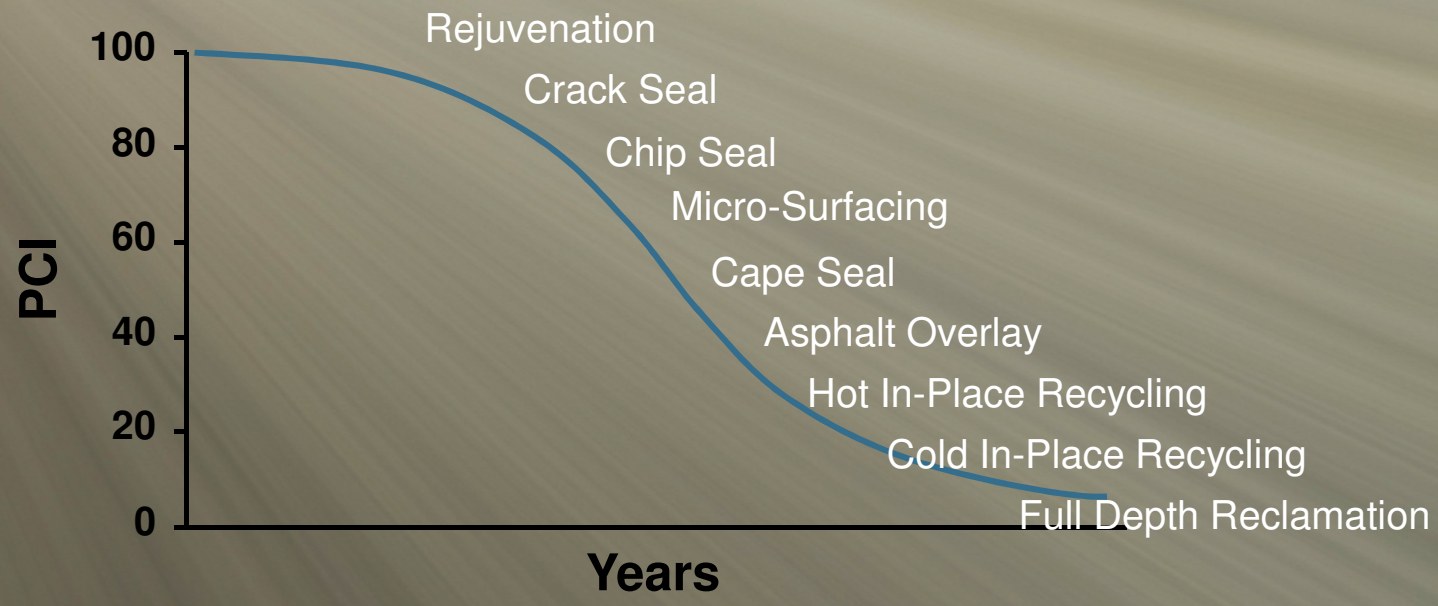
Alternative Processes

- We call it the “Mix of Fixes” or the “Right Road at the Right Time with the Right Treatment”
- This approach is not only perpetual it is also sustainable
- Many alternative processes reuse existing material and are considered “green”

“The Right Time” Pavement Strategies



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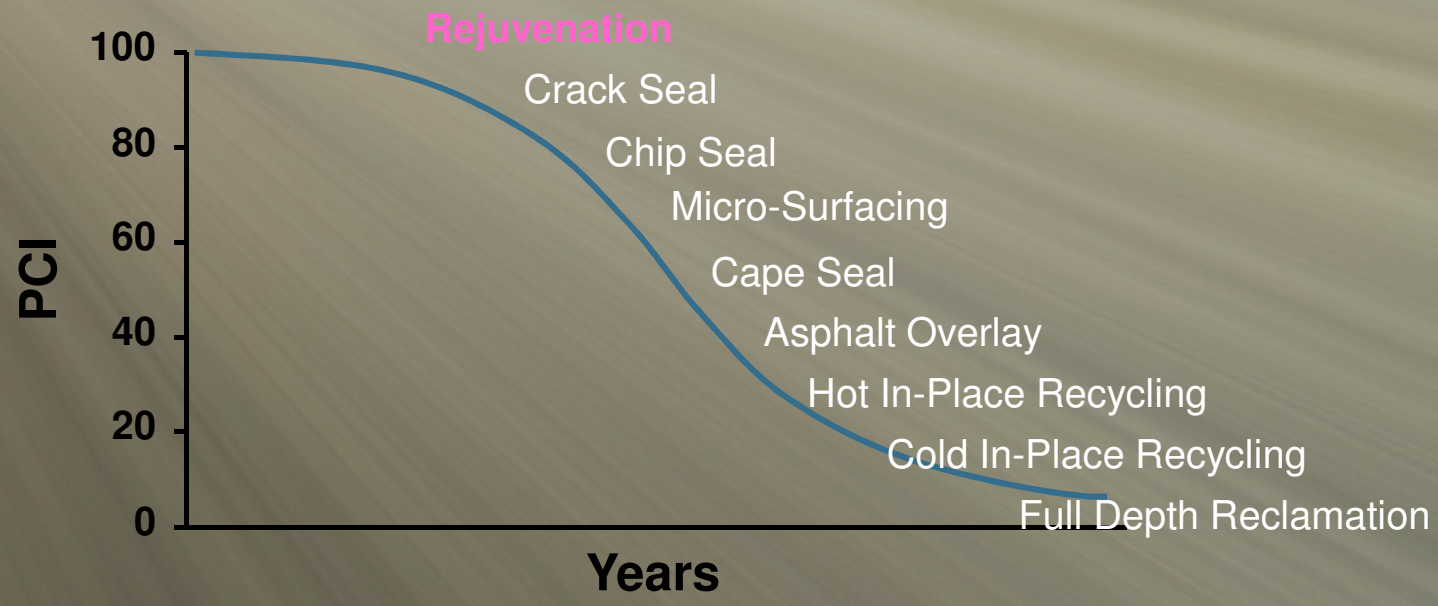
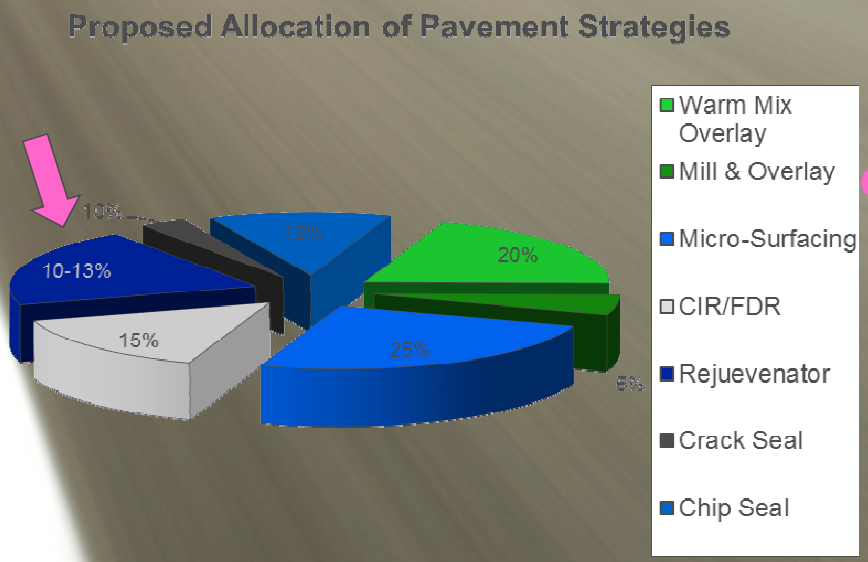


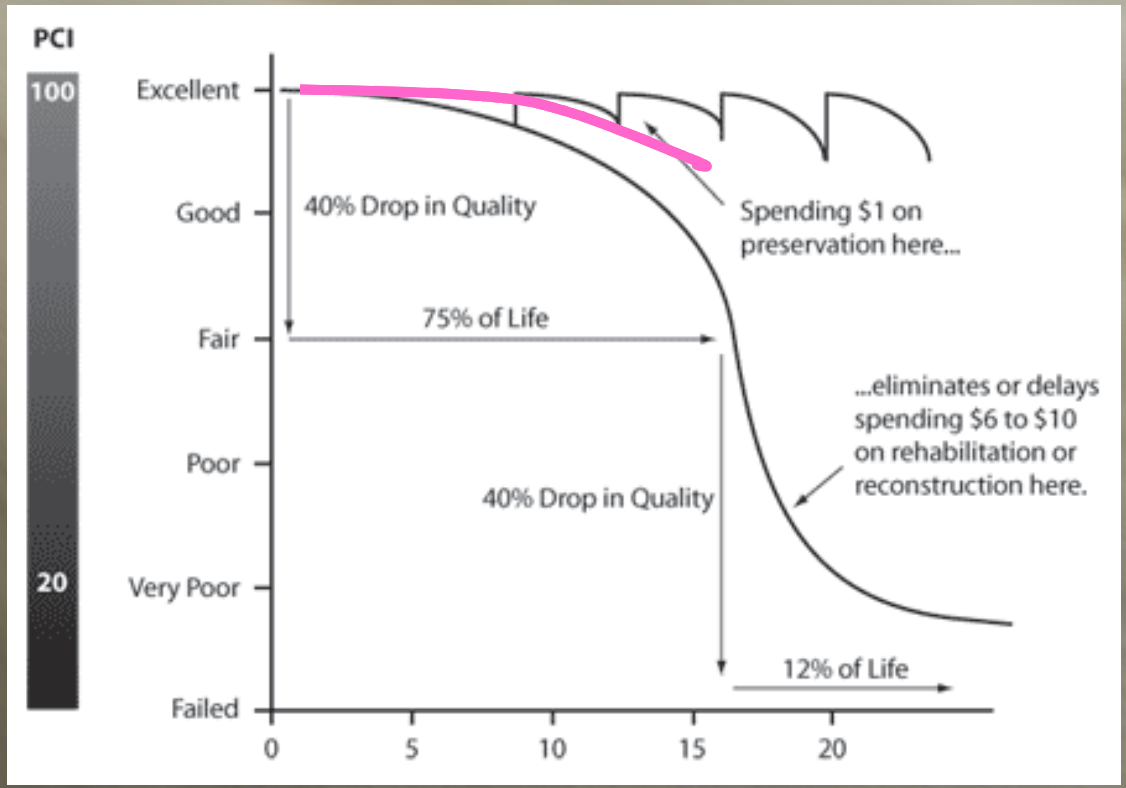
Proposed Pavement Program



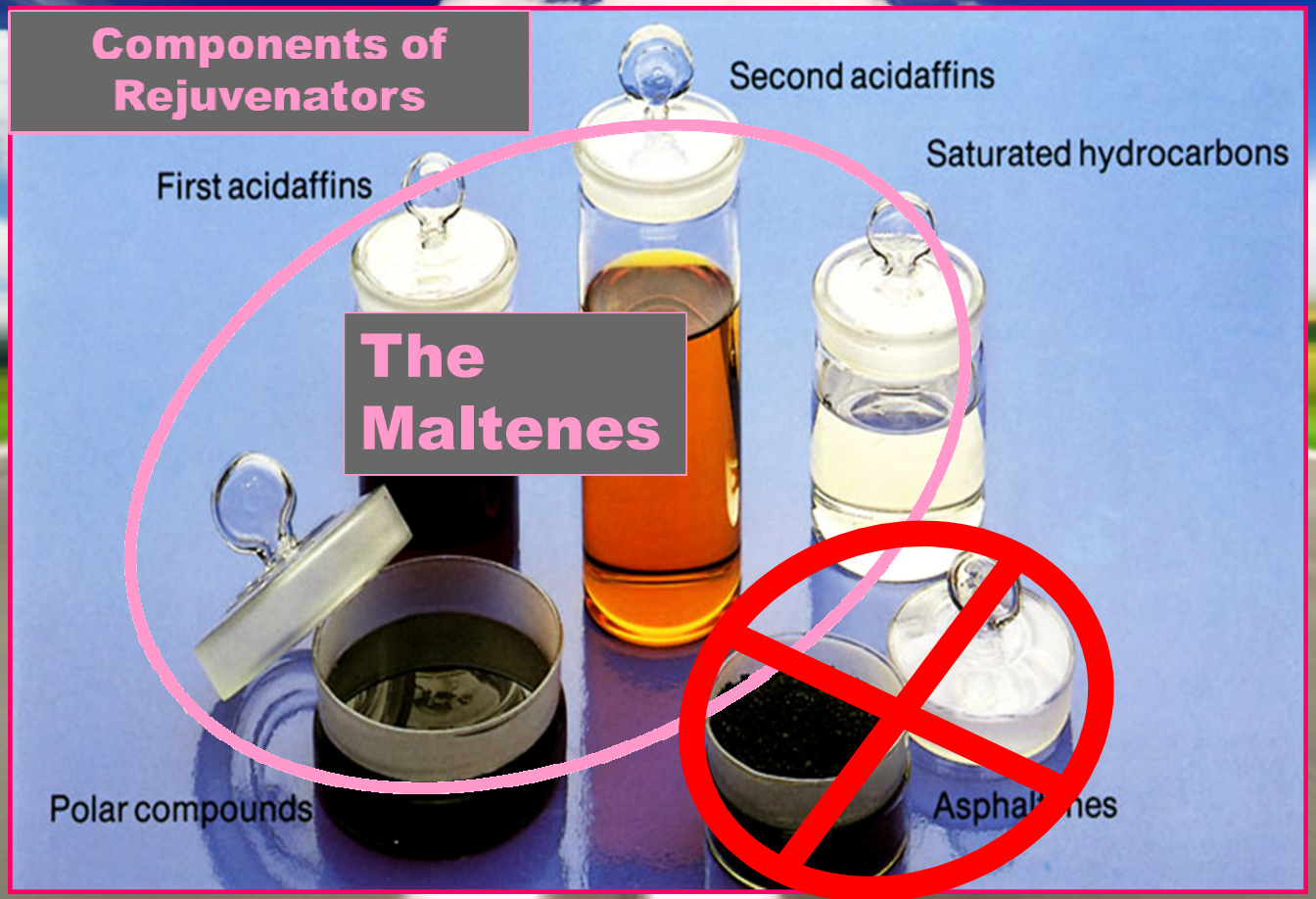
Proper Use of Strategies

- Overlay
- Mill & Overlay
- Micro
- CIR/FDR
- Rejuvenation
- Crack Seal
- Chip Seal

FHWA has been preaching preservation for awhile now



Rejuvenation



- **Maltenes** are the unstable component of asphalt binder and they are affected by air, UV rays, water, temperature changes, etc.

- It is the loss of the **Maltenes** from the asphalt binder in the upper 3/8”-1/2” of asphalt pavements that start the asphalt deterioration process.

Rejuvenation

- Since perpetual pavement works to maintain the structural strength from the bottom up, focusing on the surface becomes our top task
- You can't be perpetual without preservation
- And preservation starts with the asphalt binder

The 2018 Corvette Stingray MSRP $55,000

- Cost to change the oil?
- Cost to replace the engine?

Pretty easy choice right?

Imagine not changing the oil in your taxpayer funded $** piece of equipment, every year!

Example of Preservation

Reclamite® Maltene Based Rejuvenating Emulsion Applied at .08 gal./sq.yd.


COLOR INDICATES UNIFORM COVERAGE

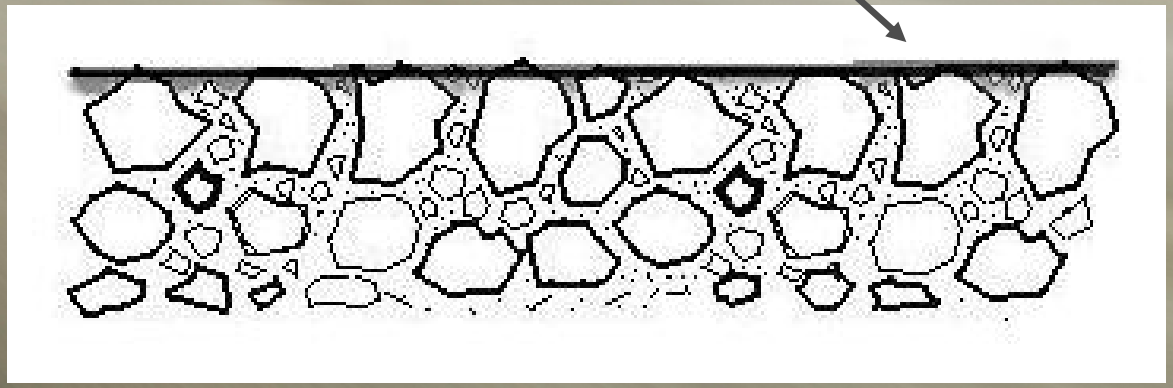

COLOR DISAPPEARS INDICATING ABSORPTION

LIGHT COATING OF SAND APPLIED

SAND SWEPT WITHIN 24 TO 48 HOURS

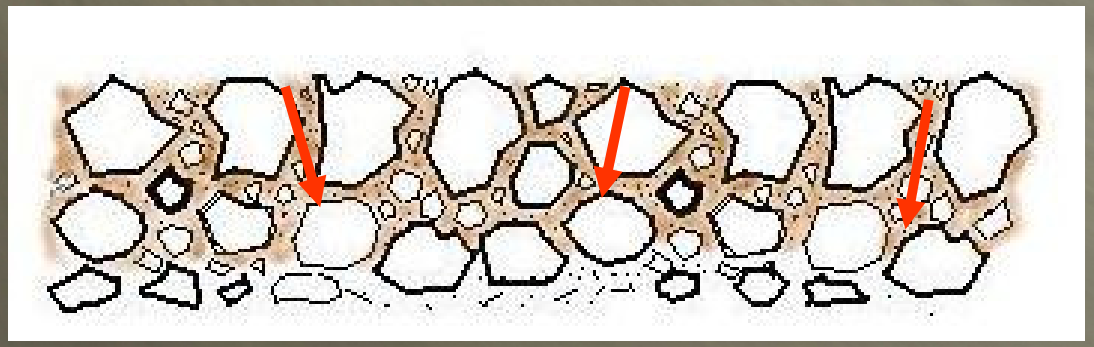
Fog Seal COATING -

Seals the surface

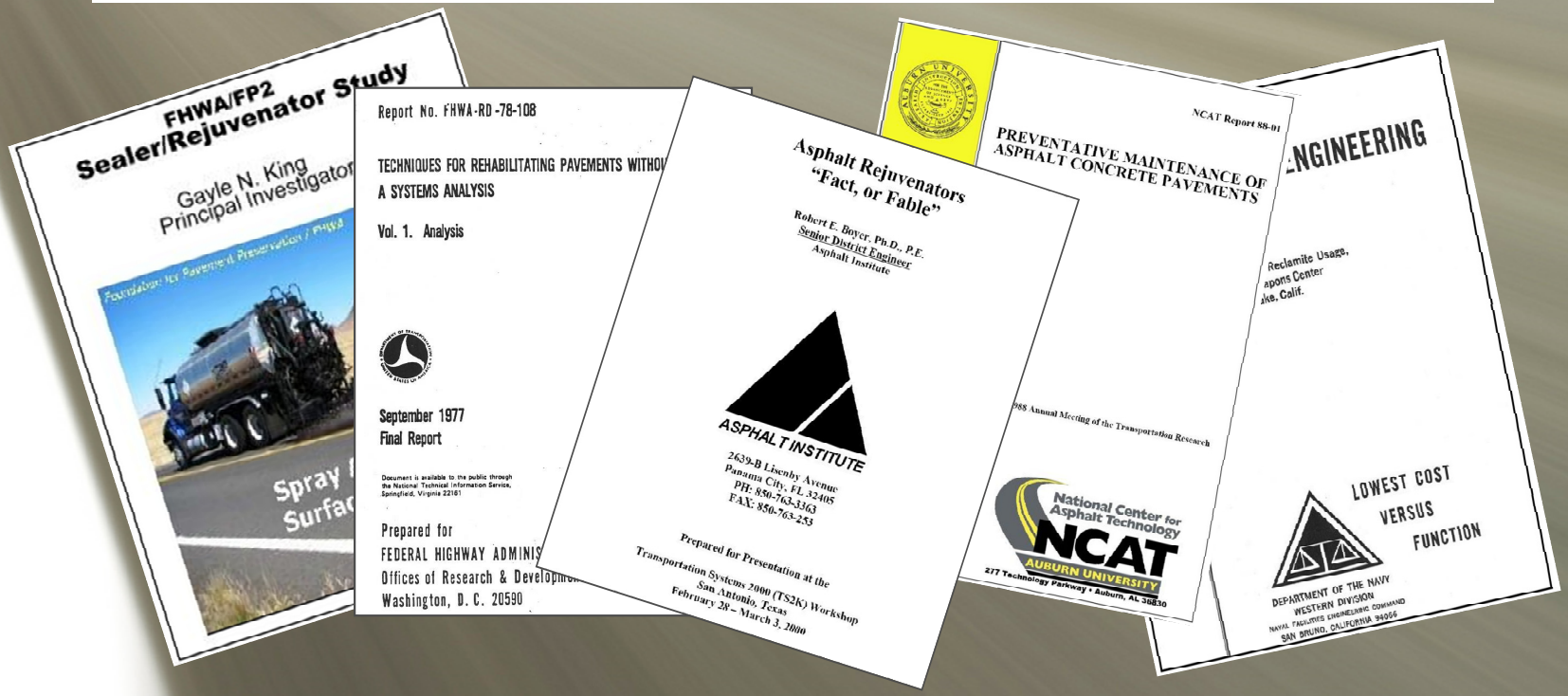


Petroleum Maltene Based REJUVENATOR -

Penetrates down into pavement & seals the surface, CANNOT be worn away



- **Numerous studies and reports conducted over the past 30+ years have confirmed the effectiveness of fog seal rejuvenators in extending pavement life.**



Rejuvenators

- These products also work to provide a long lasting in-depth seal of the pavement's surface preventing the intrusion of air and moisture.

Rejuvenators

- Pure maltene based rejuvenators are translucent and leave pavement markings visible with generally no need for restriping.

Rejuvenators

- Test areas demonstrate the long term effectiveness of a maltene based rejuvenator.

How Rejuvenators work

11 year old pavement treated two times vs. no treatment of the cross street

How Rejuvenators work

14 year old pavement treated
one year after resurfacing


Ross Street Waynesville, NC
Reclamite 1yr.
After Paving
Reclamite 5yr.
After Paving
Paved 2009. Photo 2016.
7yrs old pavement

Residential streets are excellent candidates for rejuvenators

Paved Shoulders are excellent candidates for rejuvenators

Urban collector streets can be candidates for rejuvenators

Rural Routes and Airfields can be candidates for rejuvenators

New Pavement Construction Seal

Project Selection

- Roads in Excellent Condition
- Typically 1-5 years old with little distress
- Older pavement can be treated if low environmental distress and wheel path densification is not a factor

Project Selection

- High Speed Roadways or Expressways are typically not considered for treatment.
- They can be treated with specialty pretreatment procedures.


PAVEMENT TECHNOLOGY INC.
SINCE 1972
Real Science. Real Results.
Wait a minute …
SLOW
Ken Holton, P.E.
Pavement Technology, Inc.
Come back for Part Two

Asphalt Pavement And Recycling Technologies, Inc.
(APART, Inc.)

5207 Minter Field Avenue — Shafter, CA 93263
Telephone: (661) 393-2748 — Fax: (661) 393-2804
e-mail: apart@hughes.net

Report: 08-1118 — December 2, 2008

Customer: Pavement Restoration, Inc. – Rob Wiggins

Project: RECLAMITE® Preservative Seal – City of Cottonwood Heights, UT

Samples submitted: 12 pavement core samples (6 before and 6 after treatment) identified as follows:

Newport Way	Farmbrook Way
Summerhill Drive	3726 Brighton Place
9055 South	Danforth Drive

Application rate for treated materials was reported as being 0.07 gallons/square yard.

Testing:

The top 3/8-inch of each core was removed for testing. The asphalt was extracted and recovered as prescribed by California Test Method 365 (CTM 365). Viscosities were determined on the recovered asphalt binder using a sliding plate microviscometer (CTM 348). Penetrations were calculated from a nomograph. Test results are reported by Table I.

Conclusion:

Reported data are based on the testing of limited sample submitted as being representative the treated and untreated pavements.

Table I
Pavement Restoration

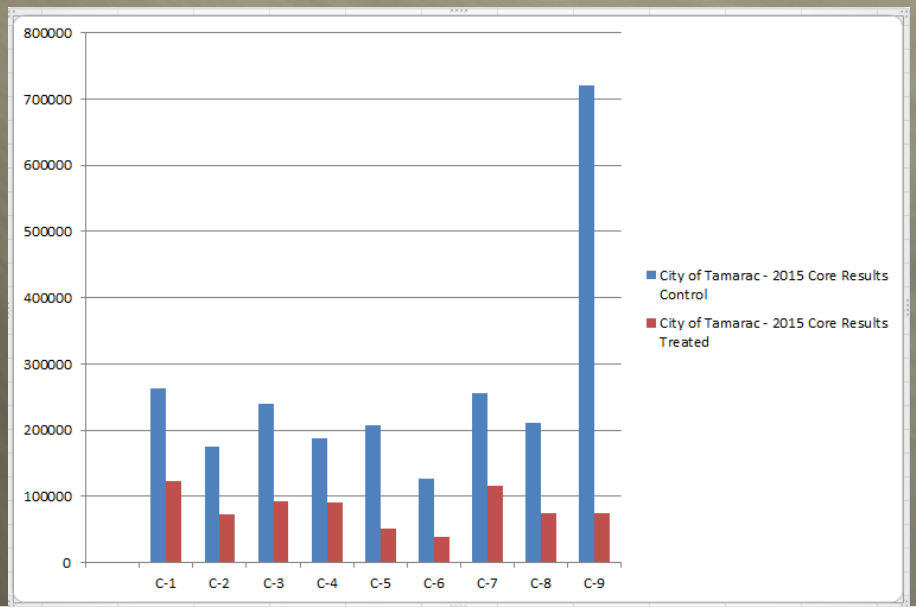
City of Cottonwood Heights, Utah
Top 3/8" of Core Samples

Sample Identification	Microviscosity, 25°C, MP		Equivalent Penetration
	0.05 sec^{-1}	0.001 sec^{-1}	
Newport Way			
Before	102.8	238.9	10
After	58.71	111.5	13
Farmbrook Way			
Before	89.78	284.5	11
After	25.11	35.43	20
Summerhill Drive			
Before	41.75	63.33	16
After	2.71	3.03	53
3726 Brighton Place			
Before	79.31	60.87	16
After	13.80	18.47	27
9055 South			
Before	79.31	138.9	12
After	13.84	17.81	27
Danforth Drive			
Before	28.53	39.26	19
After	7.28	8.21	36

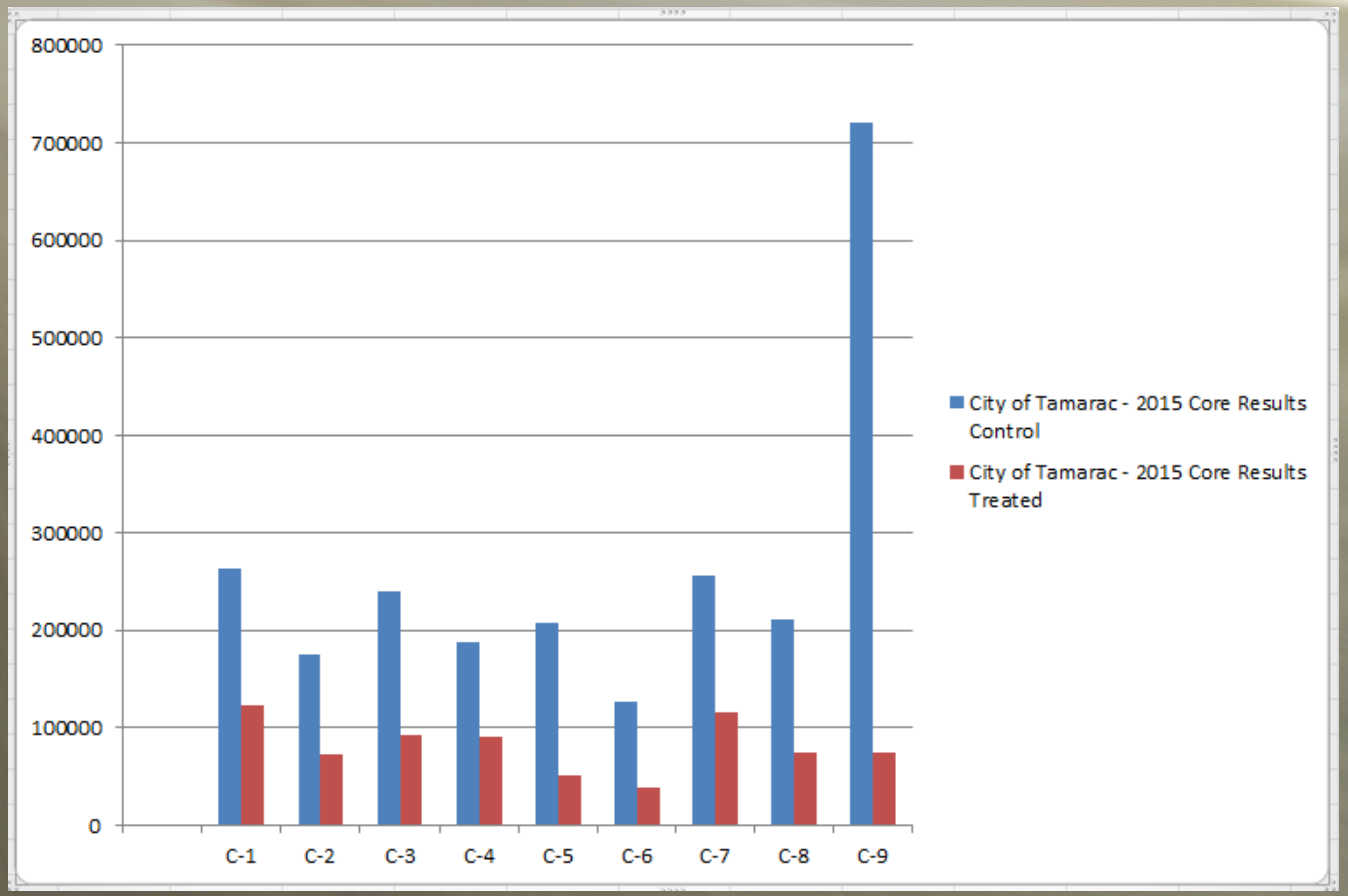
Reclamite Program

Below you can see the results of the viscosity tests before treatment with Reclamite

The higher the number the harder the extracted asphalt binder was and the more oxidized and brittle it has become



Reclamite Results



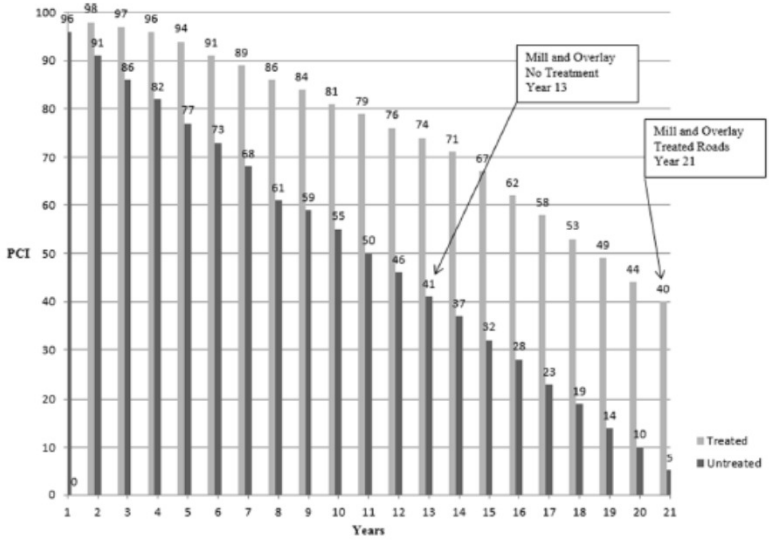


Figure 1: Life cycles of treated with a rejuvenator vs untreated roads

By using the pavement life results from table 4 and figure 1 above, an average cost per square yard per year is determined to study the feasibility of the method. The City of Roswell historical cost values were used to calculate these costs and it should be noted that no inflation or price fluctuations are taken in consideration. The values used are $12.00 per square yard for mill and overlay and $0.79 per square yard per application of the rejuvenator, these costs include materials and labor

Table 5

Pavement life cost analysis

Method	Per sy	Years of Life	Average Yearly Cost Per sy
Resurfacing	$12.00	13	$0.92
Adding rejuvenator applications (2)	$13.58 ($12.00 + $1.58)	21	$0.65

Table 5 above shows a savings of $0.27 per square yard per year of pavement life when using rejuvenators which represents a 29% savings.

video