Extending the Life of Asphalt Longitudinal Paving Joints

Sustainable Proactive Paving Joint Preservation

100th Anniversary Purdue Road School – RejuvTec, Inc. 2014
Paving Joint Preservation

TODAY’S TOPICS

Preservation Terminology.

What is liquid asphalt?

What is an asphalt rejuvenator?

Benefits of a rejuvenator.

Pavement preservation source documents

Paving joint overview.

How to preserve paving joints?

Questions

Photos

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Preservation Terminology
SUSTAINABLE

Ability to last or continue for a long time.

Involving methods that do not completely use up or destroy natural resources.

Ability to be used without being completely used up or destroyed.
PROACTIVE

Controlling a situation by making things happen or by preparing for possible future problems.

Serving to prepare for, intervene in, or control an expected occurrence or situation.

Tending to initiate change rather than reacting to events.
REACTIVE

Done in response to a problem or situation.

Reacting to problems when they occur instead of taking action to prevent them.
The progressive disintegration of an HMA layer from the surface downward as a result of the dislodgement of aggregate particles.

Raveling occurs when the stone aggregate that was originally part of the pavement begins to break free from its bonds with the asphalt. Typically this tends to occur on older pavements that have already oxidized.

Loss of bond between aggregate particles and the asphalt binder as a result of:
- Dust coating on aggregate particles.
- Aggregate segregation.
- Inadequate compaction during construction.
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Examples of Raveling

Segregation Raveling

Low Density Raveling

Snow Plow Raveling

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Surface condition is the most vital element in any pavement management system. The asphalt PASER rating system provides agencies with a simplified visual inspection to evaluate pavement surface conditions.

There are four major categories of common asphalt pavement surface distress:

**Surface defects:** Raveling, flushing, polishing.

**Surface deformation:** Rutting, distortion – ripping and shoving, settling, frost heave.

**Cracks:** Transverse, reflection, slippage, longitudinal, block, and alligator cracks.

**Patches and potholes**
In addition to indicating the surface condition of a road, a given rating also includes a recommendation for needed maintenance or repair. This feature of the rating system facilitates its use and enhances its value as a tool in ongoing road maintenance.

**RATINGS ARE RELATED TO NEEDED MAINTENANCE OR REPAIR**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>9 &amp; 10</td>
<td>No maintenance required</td>
</tr>
<tr>
<td>8</td>
<td>Little or no maintenance</td>
</tr>
<tr>
<td>7</td>
<td>Routine maintenance, cracksealing and minor patching</td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>Preservative treatments (sealcoating)</td>
</tr>
<tr>
<td>3 &amp; 4</td>
<td>Structural improvement and leveling (overlay or recycling)</td>
</tr>
<tr>
<td>1 &amp; 2</td>
<td>Reconstruction</td>
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Courtesy of PASER manual
PASER manual rating system.

Additional information available from Richard Domonkos.
The La Brea Tar pits in Los Angeles is one of the few natural asphalt places in the world.

Asphalt is a natural substance that has been used since before Roman times. It is sticky and able to bend, stretch and flex without breaking. At air temperature it is very thick, but when heated it becomes thin and easier to use.
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Refined Asphalt

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Asphalt is a black, cementing material that varies widely in consistency from solid to semi-solid at room temperature. It is sticky and when heated sufficiently, changes and eventually becomes liquid. As the temperature rises, asphalt passes from a solid state through a semi-solid plastic state to a liquid state.

Asphalt cement is asphalt that is refined to meet specifications for paving, industrial, and special purposes. It is produced from petroleums—crude oil—that come from around the world. The composition of asphalt is varied and contains small amounts of sulfur, oxygen, nitrogen, and other elements. It is obtained by distillation in a solvent such as naphtha. The asphalt can be separated into two major parts called asphaltene and saturates.

The saturates (molasses in hogsheads) are solid when cold. They are black or dark brown in color, and look something like a coarse graphite powder. The asphaltene contains the color and hardness in asphalt. The materials petroleum naphtha are various liquids that are composed of asphaltitic materials and oils.

Asphalt is a black, cementing material that varies widely in consistency...
Asphalts can be separated into two major parts called asphaltenes and maltenes.
Asphalt Institute
Research Park Drive
Lexington
Kentucky 40512

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

PAVING ASPHALT

General Description
Asphalt is a black, cementing material that varies widely in consistency from solid to semi-solid at normal air temperatures. It is thermoplastic and when heated sufficiently softens and eventually becomes liquid. As the temperature rises asphalt passes from a solid state through a semi-solid (plastic) state to a liquid state.

Asphalt cement is asphalt that is refined to meet specifications for paving, industrial, and special purposes. It is produced from petroleum crude oil. The asphaltine portion of the asphalt cement contains carbon and hydrogen, contains small amounts of sulfur, oxygen, nitrogen, and other elements. By dissolving in a solvent such as hexane, asphalt cements can be separated into two major parts called asphaltines and maltenes.

The asphaltines (insoluble in heptane) are solid when separated. They are black or dark brown in color and look something like a coarse graphite powder. The asphaltines include the color and hardness in asphalt.

The maltenes that are soluble are various liquids that are composed of asphaltene residues and oils.

Asphalt ages, it becomes harder and more brittle and may lose its adhesion or stickiness.
Thus, the secret of ensuring a long service life of asphalt in pavements is to retard the aging process.
Components of Petroleum Asphalt

Petroleum Asphalt is comprised of two fractional components:

- MALTENES
- ASPHALTENES

First acidaffins
Second acidaffins
Saturated hydrocarbons
Polar Compounds
Asphaltenes
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94% = Sand & Stone
6% = Liquid Asphalt Binder
An asphalt rejuvenator is a maltene based solution used to prolong the life of asphalt. It restores and preserves the plasticity and durability in asphalt.
Asphalt rejuvenators have the same chemical composition as asphalt minus the asphaltenes.
“It’s important to get the true, maltene-based rejuvenator if a change in binder chemistry is desired.”

Larry Galehouse
Director, National Center for Pavement Preservation
Maltene rejuvenators penetrate the pavement “In-depth” restoring the components lost in production and through the UV action of the sun.
Helps prevent joint deterioration, separation, cracking and raveling.

Addresses both lack of density and binder deficiency.

Quickly penetrates into the pavement.

Benefits of using a Maltene Based Emulsion

Treated area becomes less susceptible to water and salt brine intrusion.

Replaces lost asphalt compounds that are essential for a long service life.

Is not water soluble and will not flush from the surface.
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An asphalt rejuvenator is much like using a hand cream to keep our skin healthy or using “armor all” to protect your car’s plastic and rubber surfaces.
For a more in-depth look at how an asphalt rejuvenator works please watch the RejuvTec - Schneider Engineering, Shawn Strange, Avon Case Study video on YouTube.

http://www.youtube.com/watch?v=dYIDAA2Ey4k
The U.S. Department of Transportation Federal Highway Administration has a detailed document regarding pavement preservation available on their website.

“Using a rejuvenator on new construction does not seem to be logical at first glance. However, it has been established that the greatest change in composition of an asphalt binder takes place during the manufacture of hot mix asphalt (HMA). Applying a rejuvenator to a new surface a few weeks after it has been laid does several things to the pavement. Besides restoring the original asphalt properties that were lost in the HMA manufacture, the chemical assists in sealing the pavement as well as in improving the durability of the surface course.”
What is a Paving Joint?

What causes a Paving Joint deterioration?

Why should we preserve our Paving Joints?

How do we preserve our Paving Joints?
A paving joint is the interface between two adjacent and parallel hot-mix asphalt (HMA) mats.

A paving joint is either longitudinal or transverse.
A longitudinal paving joint runs parallel to the roads’ centerline.
A transverse paving joint runs perpendicular to the pavement's centerline or laydown direction.

A transverse paving joint is used when the placement of the asphalt mix is to be suspended for a period of time.
“In recent years, it has become evident how critical longitudinal joint construction is to the life of the pavement structure... Many pavements have been or are in the process of being resurfaced as a direct or indirect result of longitudinal joint deterioration.”

- Kentucky Transportation Center
  College of Engineering, 2002
What causes Paving Joint deterioration?

Air, water and the sun’s UV rays cause the road to oxidize.

Oxidization causes the asphalt to lose the oily resinous of fraction of the hydrocarbon molecules known as bitumen. Thus increasing the viscosity and decreasing the ductility of the asphalt.

Prolonged untreated exposure to these conditions creates small cracks that will eventually lead to larger cracks and potholes. Ultimately resulting in high re-paving costs.
The progressive disintegration of an HMA layer from the surface downward as a result of the dislodgement of aggregate particles.

Raveling occurs when the stone aggregate that was originally part of the pavement begins to break free from its bonds with the asphalt. Typically this tends to occur on older pavements that have already oxidized.

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Without proper preservation, longitudinal paving joints will crack.

Over time the small crack will expand to a larger crack.

The larger crack will form a pothole and thus requiring more repair and more money.

**Prevent the pothole, preserve your paving joints.**
Benefits of preserving our Paving Joints

- Paving joint preservation is the PROACTIVE approach to maintaining our roads.
- Timely preservation provides the public with longer lasting smoother pavements.
- It reduces costly, time consuming reconstruction and traffic disruptions.
“The agencies that have pursued the traditional ‘worst first’ strategy, giving priority to rebuilding bad pavements, are feeling the budget shortfalls most acutely. Agencies that have given priority to prevention – to keep good pavements in good condition – are in much better shape.”

– Larry Galehouse, Director, National Center for Pavement Preservation
Any agency can afford to implement a pavement preservation program by simply deferring the resurfacing of one or more street and then use that money to fund a pavement preservation program.
WE CANNOT SOLVE OUR PROBLEMS WITH THE SAME THINKING WE USED WHEN WE CREATED THEM

-Albert Einstein
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RejuvTec
Asphalt Preservation Services
Preserving Roads. Conserving Budgets.

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The following photos show treated and untreated surfaces. Note the results of fluxing and consolidation of the surfaces.
Tippecanoe County treated in 2010. Photo taken in 2012.
This picture is proof pavement preservation works. The top lane was treated on 3-1-72 and the picture was taken almost 3 years later. Courtesy of Robert Boyer, PhD, PE
Asphalt rejuvenators can also be used to preserve a road’s rumble strips.
Untreated area shows loss of aggregate and cracking.

Reclamite treated area shows retention of aggregate with surface contact.
Paving joint preservation in British Columbia.
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City of Angola
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