Preserving Municipality Roadways
Less than 100 years ago…
We’ve come a long way...
Pavement Preservation

Federal  = 3%
State    = 20%
Local    = 77%

94% of paved roads have an Asphalt surface

Source: Stephen R. Mueller, P.E., Federal Highway Administration
EXAMPLE: Changes in Utah from 1990 to 2007

- Population Growth: 47%
- Increase in Miles Driven: 71%
- Highway Capacity Growth: 4%

Shift: New Construction to Preservation

![Graph showing the increase in Vehicle Miles Traveled and Lane Miles from 1980 to 2020.]

Source: Stephen R. Mueller, P.E., Federal Highway Administration (FHWA)
It’s no wonder why there’s confusion.
The Basics of Asphalt Preservation

• Asphalt pavement (or Asphalt cement) is made up of primarily two components:
  • Aggregate – rock
  • Asphalt Binder – by product of refining crude oil
The Basics of Asphalt Preservation

- The key to extending pavement life is to preserve the asphalt binder. STOP OXIDATION!
  - Oxidation causes:
    - Raveling (loss of bond between aggregate and binder)
    - Cracking
The Basics of Asphalt Preservation

• Primary causes of OXIDATION:
The Basics of Asphalt Preservation

- Primary causes of OXIDATION:
  - UV Rays
  - Moisture
Preventive maintenance is typically applied to pavements in good condition having significant remaining service life.

...preventive maintenance is a strategy of extending the service life by applying cost-effective treatments to the surface... of structurally sound pavement.
Life Cycle of a Road

1 Design — This stage deals with dimensions, type of materials, thickness of base and top surfaces, and the drainage system. Investments made at the design stage affect the long-term durability of the pavement surface. If, however, sufficient funding is not available to upgrade the design, the road starts out and stays mediocre.

2 Construction — A high-quality construction process produces a longer-lasting pavement surface.

3 Initial Deterioration — During the first few years of use, the road surface starts to experience some initial deterioration caused by traffic volume, rain, snow, solar radiation, and temperature changes. At this stage, the road appears in good condition, providing a smooth ride. Preservation strategies during Stage 3 will sustain the smooth ride, preserve the foundation, extend the life, and reduce the need for costly reconstruction later on.

4 Visible Deterioration — At Stage 4, visible signs of distress such as potholes and cracking occur. Repairs made at this stage using overlays and milling to eliminate ruts will restore a smooth ride and extend the life of the road.

5 Disintegration and Failure — Roads not maintained at Stage 3 and repaired at Stage 4, eventually will fail and need costly reconstruction. Once a road’s foundation disintegrates, surface repairs have an increasingly short life.
Pavement Life Curve

- Most Effective Preservation
- Intermediate Rehabilitation
- Late Rehabilitation

Pavement Condition vs. Time

Simplified Natural Aging Curve
Pavement Life Curve

**Most Effective Preservation**
- Highest return on investment
- Higher cost, lower return on investment

**Intermediate Rehabilitation**

**Late Rehabilitation**

Time

Pavement Condition

Simplified Natural Aging Curve
Cost of Delaying Maintenance

Timing Belt Replacement: $400

Engine Replacement: $2,500
Cost of Delaying Maintenance

Teeth Cleaning: $75

Root Canal: $1,000
“A pothole is like a tooth cavity. Left untreated it gets more decayed, more painful, takes more time and money to care for, and sometimes you end up having to urgently call in a specialist. But like cavities, potholes can be prevented.”

“The Fine Art of Pothology: Preventing and Repairing Potholes”
Better Roads, March 2009
Motivation for Better Asset Management

- Funding Constraints
- Aging System
- Increasing User Demands
- Loss of Senior Experienced Staff
- Public Demands on Government
  - Accountability
  - Return-on-Investment

Source: Stephen R. Mueller, P.E., Federal Highway Administration
“Delayed and deferred maintenance leads to higher repair and reconstruction costs—pay me now or pay me more, lots more, later.”

Michigan DOT Director
Kirk L. Steudle

Source: Rough Roads Ahead, ASSHTO/TRIP 2009
The key to maximizing pavement life…

“The Right Treatment, on the Right Surface, at the Right Time!”

Larry Galehouse, Director
National Center for Pavement Preservation
Michigan State University
Become familiar with common treatment types and pros/cons of each:

- Fog Seal / Rejuvenators
- Slurry (Types I, II, and III)
- High Density Mineral Bond (HA5)
- Micro–surface
- Chip Seal
Pavement Preservation Toolbox

Fog Seal

Price: $$$$$$

Pavement Extension: ★★★★★

Public Acceptance: ★★★★★

Summary: A fog seal is an asphalt emulsion spray applied that is most appropriate as a short-term assistance to a dry pavement or as a temporary binder on top of a chip seal treatment.
Slurry (Types I, II, and III)

Price: $$$$$

Pavement Extension: ★★★★★

Public Acceptance: ★★★★★

Summary: Slurry is effective on moderately distressed roadways requiring minor rehabilitation. Good skid resistance. Type III can be used on heavy load, high volume, high speed roadways.
High Density Mineral Bond (HA5)

Price: $$$$$$

Pavement Extension: ★★★★★

Public Acceptance: ★★★★★

Summary: Specifically for local roads, HA5 is comprised of a mixture of a dense mixture of fine aggregates and polymers suspended in an asphalt emulsion. Reduces cracking and raveling by effectively preserving the existing asphalt binder. Effectively deflects UV rays. Depending on pavement condition, installations guaranteed for 5-years. Aesthetically pleasing “surface friendly” finish.
Pavement Preservation Toolbox

Chip Seal

Price: $$$$$$

Pavement Extension: ★★★★★

Public Acceptance: ★★★★★

Summary: A chip seal consists of a layer of asphalt binder that is overlaid by a layer of aggregate. Chip seal is a cost effective treatment for high traffic roadways. Good durability and life extension for high volume, heavy load, and high speed roadways. Very good skid resistance. Good for sealing small to moderate surface cracks.
Micro-surface

Price: $$$$$$

Pavement Extension: ★★★★★

Public Acceptance: ★★★★★

Summary: Micro-surface is effective on moderately distressed roadways with requiring minor rehabilitation. Capable of rut filling and can be applied at varying thicknesses. Good durability and life extension. Good skid resistance.
“Every $1 spent in keeping a good road good precludes spending $6–$14 to rebuild one that has deteriorated.”
# Cost of Deferred Maintenance

Example: 250,000 SF of asphalt pavement

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<tr>
<th>Pavement Condition Index</th>
<th>$10,000</th>
<th>$20,000</th>
<th>$30,000</th>
<th>$40,000</th>
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<td><strong>93% more budgeted per year</strong></td>
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<td><strong>144% more budgeted per year</strong></td>
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<td>$52,000</td>
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<td><strong>407% more budgeted per year</strong></td>
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“The **Right** Treatment, on the **Right** Surface, at the **Right** Time!”

*Larry Galehouse, Director*

*National Center for Pavement Preservation*

*Michigan State University*
Questions?
Pavement Preservation

Rocky Mountain
Pavement Preservation Partnership

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