

Partnerships Promote Preservation Philosophy

Regional Partnerships Link State, Local Agencies
with State-of-the-Art Pavement Preservation Practice.

As road agencies strapped for cash look for ways to optimize their limited dollars, many are taking a much closer look at the practice of pavement preservation.

And standing there to help is a host of regional partnerships across the United States and Canada that bring together representatives of state and local agencies, contractors, suppliers, academic institutions, consultants and the Federal Highway Administration to promote pavement preservation while advancing research.

Pavement preservation techniques are being promoted by the FHWA and the American Association of State Highway & Transportation Officials as cost-effective and environmentally sustainable strategies designed to extend the life of existing pavements before they deteriorate substantially.

These techniques include nonstructural preventive maintenance surface treatments such as crack sealing, chip sealing, micro surfacing and thin-lift hot-mix asphalt paving.

Pavement preservation methods are intended to prolong pavement life, avoiding high future costs of reconstruction or rehabilitation through the expenditure of lesser amounts of money at critical points in a pavement's life.

Pavement preservation pays off in both the short and long term. Experience shows that spending a dollar on pavement preservation can eliminate or delay spending \$6 to \$10 on future rehabilitation or reconstruction costs.

But because pavement preservation techniques must be applied at a critical point, their long-term successful use depends on the timing of the treatment. Pavement preservation dollars also may cannibalize dollars that might be used for capacity improvements or new construction.

If done too early, preservation techniques may mean scarce funds will be spent on a pavement not needing the treatment, while denying those funds to pavements that

might. Done too late, the pavement will disintegrate even beneath the freshly placed treatment, wasting the effort. Research and education may be needed to implement the right program, and that's where the regional partnerships are helping transportation agencies.

Regional Partnerships

The partnerships – which meet at least once a year and sponsor workshops – are supported by AASHTO via its **Transportation System Preservation•Technical Services Program (TSP•2)**, which maintains a “help desk” for pavement and bridge preservation problems, manages a website, facilitates the regional pavement and bridge preservation partnerships, and digitally records partnership meetings and posts them online, including technical presentations.

In late 2010, nine existing pavement and bridge preservation partnerships were enhanced by the consolidation of the three-state Western Pavement Preservation Partnership into the Rocky Mountain Pavement Preservation Partnership, to create a new **Rocky Mountain West Pavement Preservation Partnership**, for a total of eight regional partnerships.

“We encourage all involved in pavement preservation in any way within the western states, including state highway agencies, local governments and metropolitan planning organizations, suppliers, contractors, academia and others, to get involved in the partnership,” says Lloyd Neeley, P.E., deputy maintenance engineer, Utah DOT, and western partnership chair for 2010–2011. “We especially want to encourage wider participation from local governments and MPOs.”

The new Rocky Mountain West partnership includes the transportation agencies of Alaska, Arizona, California, Colorado, Hawai'i, Idaho, Montana, Nevada, New Mexico, Oregon, Utah and Washington State, and through three task forces will focus on promoting the pavement preservation concept, refining terminology, definitions and communication, and affirming standard guidelines for chip seal materials.



Paths to Pavement Preservation

Preservation Begins with Pavement Inventory, Management

Roads perform well and deteriorate slowly up to a certain point in time, beyond which they deteriorate rapidly. Cost-effective pavement preservation practice times appropriate treatments to just before that point, which boosts pavement condition index and prolongs life

The survey and PMS also will show which pavements are gone too far for preservation treatments; these should be allowed to fail before complete reconstruction. Preservation treatments applied to failed pavements will squander precious funds



Pavement preservation begins with a pavement condition survey, with the survey data rolled over into a pavement management system, which lets pavement owners know the exact condition of pavements and economical timing of treatments



To optimize the life of the subsequent preservation treatment, pavements scheduled for work should be patched or crack sealed prior to placement of "the right treatment to the right pavement at the right time"



Classic chip seals are a very common surface treatment for asphalt low-volume roads, but they can be enhanced with polymer-modified binders, high-performance aggregate, "sandwich" seals and fibers; slurry seals are a durable mixture of slow-setting emulsified asphalt, well-graded fine aggregate, mineral filler and water



Ride quality of rough portland cement concrete pavements can be improved by joint repair and crack sealing, followed by diamond grooving and grinding using specialized equipment; repairs address structural issues such as cracked panels and spalled joints while the diamond grinding addresses functional deficiencies



Micro surfacing elevates the chip and slurry seal to a higher plane; it's an engineered mixture of polymer-modified asphalt emulsion, mineral aggregate, mineral filler, water and other additives, properly proportioned, mixed, and spread on a paved surface. It differs from slurry seals in that it can be used on high-volume roadways to correct wheel-path rutting and provide a skid-resistant pavement surface



The other partnerships include:

- **Midwestern Pavement Preservation Partnership**, the first of the partnerships, joining the agencies of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin in the United States, and Alberta, Manitoba and Saskatchewan in Canada;
- **Northeast Pavement Preservation Partnership**, including Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York State, Pennsylvania, Rhode Island and Vermont in the United States, and Nova Scotia in Canada;
- **Southeast Pavement Preservation Partnership**, including the DOTs of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia;
- **Midwestern Bridge Preservation Partnership**, including Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin;
- **Northeast Bridge Preservation Partnership**, including Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont;
- **Southeast Bridge Preservation Partnership**, including the DOTs of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia; and
- **Western Bridge Preservation Partnership**, including the transportation agencies of Alaska, Arizona, California, Colorado, Hawai'i, Idaho, Montana, Nevada, New Mexico, Oregon, Utah and Washington State.

Also late in 2010, a new, in-state **Florida Pavement Preservation Council** was launched. This new statewide partnership is a collaboration of agency, industry and academic professionals who focus on the promotion of pavement preservation principles through education and training. The council's efforts are being supported by the National Center for Pavement Preservation (NCP) at Michigan State University.

"FPCC's primary objective is to provide Florida local government agencies with ongoing educational workshops through the NCP," says NCP executive director Larry Galehouse, P.E. "The council is resolute in advocating high-quality preservation treatments, properly applied by competent contractors. Furthermore, the council firmly adheres to the standard and ethics of honesty, integrity, quality, dedication, inclusiveness and highly developed competency."

Within Florida, the partnership seeks to promote pavement preservation principles through training and education, provide recommended regional specifications and guidelines for preservation techniques, and foster beneficial technology transfer between academia, industry and agencies.

Coordinating Thin-Lift Research

The regional groups do more than just meet once or twice a year and conduct regional workshops. For example, this year the Northeast Pavement Preservation Partnership is coordinating field demonstrations of thin-lift hot asphalt mix pavement applications incorporating highly polymer modified asphalt binders.

NEPPP members Vermont Agency of Transportation, and the New Hampshire, Rhode Island and Pennsylvania DOTs, are being joined by Midwest member Minnesota DOT, and Southeast member Tennessee DOT, to make this research on highly polymer modified, thin-lift asphalt overlays happen in 2011.

At press time, planning for four thin-lift asphalt mix field demonstrations was underway, to be executed in 1- to 3-mile sections included in existing asphalt overlay or mill-and-fill transportation agency contracts.

The demos will follow regional mix design specifications with testing protocols developed by NEPPP participating agencies, with guidelines for the new specifications distributed by Dr. Walaa Mogawer, P.E., professor, and director of the Highway Sustainability Research Center at the University of Massachusetts-Dartmouth.

Kraton Polymers is funding the project to minimize participating agency expenses, and also is donating the cost of Mogawer's lab services, as well as the additional polymer needed for demonstrations.

The NEPPP regional specifications, titled *Superpave 9.5 mm Highly Polymer-Modified Thin Overlay Specifications (PMTOL)*, describe the mix design as a pavement preservation strategy used to extend a pavement's service life without improving its structural capacity. It further says the mix design is a preventive

maintenance strategy that can be applied to pavements in good condition that do not require structural rehabilitation.

The thickness of the PMTOL ranges from 0.75 to 1.5 inches (19.0 mm to 37.5 mm), and consists of coarse aggregate, fine aggregate, mineral filler if needed, and a polymer modified asphalt binder. Specifications allow the use of up to 25 percent recycled asphalt pavement in the mixture. In addition, the performance grade of the polymer modified asphalt binder must be either PG 76-34 or PG 82-28, with PG 76-34 recommended for roadways exhibiting low-severity cracking and PG 82-28 recommended for roadways with little or no distresses.

However, for these demonstrations, a 1-inch-thick lift is planned. The concentration of polymer – a styrene-butadiene-styrene (SBS) polymer – allowed in the asphalt binder will be up to 8 percent, more than twice the polymer content usually allowed in traditional polymer-modified binder.

Although the modification of asphalt binders with polymers improves resistance to rutting and raveling in asphalt mixes, there is a practical limit to polymer concentration. Usually, as the concentration exceeds 3 percent, the viscosity of the binder increases, making the mix more difficult to produce in the plant and less workable for the paving crew. The polymer being used in the demonstrations will be a new type of polymer manufactured by Kraton Polymers that meets the requirements of the new regional specifications without increasing viscosity.

Indiana Embraces Preservation

The state of Indiana has embraced pavement preservation as a means of optimizing its program funding, and is implementing it from border to border.



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"We have a comprehensive pavement preservation approach for Indiana statewide, using both in-house and contract work," says Will Wingfield, public information officer, Indiana DOT. "It's part of a larger, asset management approach to how we manage our transportation network."

Two distinct programs are ongoing at Indiana DOT, Wingfield says.

"We have the *Major Moves* program, brought about by the 75-year lease of the Indiana Toll Road," Wingfield tells *Better Roads*. "For that we received an upfront payment of \$3.85 billion. Once our bonds were paid off, the rest of the money was dedicated to economic development and transportation infrastructure, much for state highways. In 2006 this provided a program for major

reconstruction and capacity increases that had been discussed for decades, but never were able to move forward due to funding."

In 2008 a separate *Major Preservation* program was started. "One of the people who helped bring it about now is our DOT commissioner [Michael B. Cline, P.E.], and he initiated the program in part to maintain and preserve both



▲ **Slurry surfacing is a step beyond** conventional chip seals and requires specialized application equipment, but with potential benefits. *Photo courtesy of VSS Macropaver*



▲ **A rubberized thin wearing course** is placed by Sunland Asphalt on California State Highway 99 south of Fresno; high-performance surface treatment prolongs highway's life while standing up to brutal California traffic. *Photo courtesy of Vögele America*



▲ **The essence of pavement preservation** is the application of the right treatment, to the right pavement, at the right time to save or delay future expenditures. *Photo courtesy of FP²*

Preservation Techniques

As the tutorial artwork shows, effective pavement preservation must begin with a pavement inventory, the data of which must be rolled over into a pavement management program that will compare the condition of existing pavements. This program can be used to establish a preservation regimen that can be applied selectively to improve the pavement condition index (PCI) of the pavements, depending on their age, rideability, traffic volume and loadings.

For flexible (bituminous asphalt) pavements, that regimen might include:

- **Crack sealing and patching;**
- **Fog seals** (a combination of mixing-type emulsion and approximately 50 percent water, used to seal shoulders and patches);
- **Rejuvenation** (application of a rejuvenator agent in a procedure similar to fog sealing);
- **Sandwich seals** (application of asphalt emulsion and a large aggregate, followed by a second application of asphalt emulsion that is in turn covered with smaller aggregate and compacted);
- **Sand seals** (application of liquid asphalt or emulsions, covered with fine aggregate or sand, to improve skid resistance, prevent oxidation, and to seal against water infiltration);
- **Chip seals** (surface treatment in which the pavement is sprayed with asphalt emulsion and then immediately covered with aggregate and rolled);
- **Slurry seals** (an application of mixing-type asphaltic emulsion, sometimes with additives, mineral aggregate and proportioned water, mixed and spread on clean pavement free of dirt and loose gravel);
- **Micro surfacing** (polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a pavement);
- **Cape seals** (application of slurry seal to a newly constructed surface treatment or chip seal); and
- **Thin and ultrathin hot-mix asphalt overlays** (HMA overlay with one lift of surface course, generally with a thickness of 1.5 in. or less).

For rigid (portland cement concrete) pavements, preservation techniques include:

- **Patching, joint sealing and joint and spall repairs**, followed by diamond grooving and grinding to restore ride quality;
- **Full-depth patching with load transfer retrofit**, followed by diamond grooving and grinding; and
- **White topping** (not unlike a thin HMA overlay, but using a fast-curing, high-durability concrete mix).

our existing infrastructure, and the new infrastructure coming online from Major Moves."

The American Recovery and Reinvestment Act of 2009 provided even more funds for Indiana DOT, and those were used principally for preservation projects. "Many of our recovery act project contracts were for preservation, including micro surfacing, ultrathin bonded wearing courses and thin HMA overlays," Wingfield says. "We also undertook joint patching and sealing projects for our concrete pavements. We were able to 'have our cake and eat it too,' as we were able to address a lot of the pavements that were in terminal condition with Major Moves, as well as begin to preserve those that weren't with ARRA funds."

The preservation efforts have turned out well for Indiana, Wingfield says. "Indiana still has more recovery act projects in the system than any other state in the union, in part because we had many pavement preservation projects that were smaller in dollar figures, and these projects don't involve significant design

and environmental work. As a result we were able to invest the money in more projects, more quickly, than anyone else."

Indiana uses available pavement data such as roughness, age of pavement or date of last rehab and traffic volume to anticipate the rate at which the pavement might deteriorate or rut. "If you look at those four parameters at the system level, it will indicate what the candidate projects will be," Wingfield tells *Better Roads*.

"We then turn that information over to our districts, which are much more familiar with the maintenance requirements and specifics of each of the road segments, and they refine the list further," he continues. "We follow that up with field checks, in which the pavements are driven or walked to confirm condition, and lastly we may undertake coring or falling weight deflectometer tests to better assess the structural condition of the pavement layers beneath the surface."

Further, a new Capital Asset Management department within the state gov-

ernment now identifies funding based on need. "A bridge, roadway, mobility and safety asset team analyzes the data and identifies which projects are of the highest priority, are most cost-effective, and make sure they get executed in the proper time frame," Wingfield said.

In-house preservation techniques include crack filling and sealing. "In recent years we've been using our inhouse crews to do chip sealing," Wingfield says. "There have been some public education challenges with chip seals, because they are identified with gravel roads or county highways, whereas, we now are using them on state highways that may be less rural and get more, higher-speed traffic."

Contracted services will include micro surfacing, ultrathin bonded wearing courses and HMA overlays 3/4-inch deep with finer gradations, Wingfield says. ❖

Information contributed by Kraton Polymers appears in this article.

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