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 (FHWA) 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 (AASHTO) 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 new 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.

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.

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.

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 partnerships include:

- **Midwestern Preservation Partnership**, including 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 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 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;

- **Western Bridge Preservation Partnership**, including the transportation agencies of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah and Washington State.

Also late in 2010, a new, in-state Florida Pavement Preservation Council (FPPC) 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 (NCPP) at Michigan State University. “FPPC’s primary objective is to provide Florida local government agencies with ongoing educational workshops through the NCPP,” says NCPP executive director Larry Gallehouse, 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.
As the tutorial artwork, on page 23, 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);
- Microsurfacing (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 inches 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).
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 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.”

Many of our Recovery Act project contracts were for preservation, including micro surfacing, ultrathin bonded wearing courses and thin HMA overlays.

— Will Wingfield, public information officer, Indiana DOT

Some asphalt roads are so anxious to be recycled that they deteriorate into ruts and potholes in just a few years. Full-Depth Reclamation (FDR) with cement makes better use of these short life-span road surfaces. With most of your materials on-site, FDR recycles the entire asphalt road into a cement-treated base ready for a new surface course. With this solution, your transportation investment is protected for generations and the environment is too. To learn more, visit www.think-harder.org/paving.
RoadScience Tutorial

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 government 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 microsurfacing, 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.