

## Pavement Preservation: It's **All** in the Timing

Free web-based preservation training is a new go-to tool



▲ *Structural cracking and potholes must be repaired before surface treatments are placed.*

**S**ome 19 years have elapsed since a blue-ribbon committee from the United States traveled to Sweden, Denmark, Germany, France, and the United Kingdom to observe asphalt pavement construction practices and materials. The committee's report led the U.S. road establishment to question its traditions and methodology of pavement maintenance.

It's been 17 years since the forerunner of the Foundation for Pavement Preservation, or FP2, was founded.

It's been 10 years since the Federal Highway Administration established its Office of Asset Management, and about seven years since the Governmental Accounting Standards Board enacted Rule 34, which compels governments to adopt private sector methods of accounting the value of built infrastructure in their balance sheets, a powerful spur to pavement preservation.

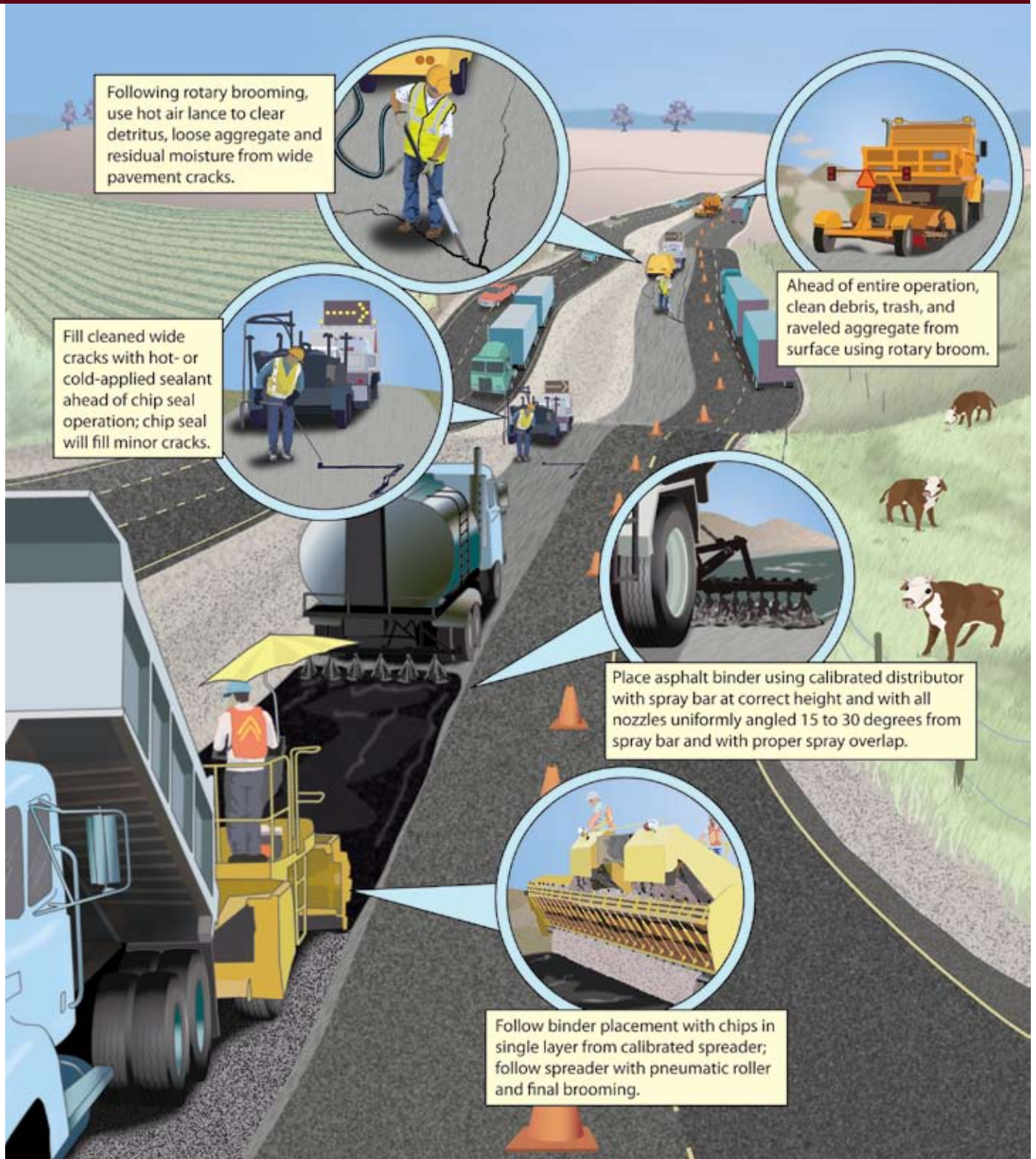
And it's been only six years since the National Center for Pavement Preservation – a world-class resource for road agencies – was founded on the campus of Michigan State University.

The advent of web-based pavement preservation training in 2008 is boosting the spread of pavement preservation best-practice and represents a huge leap forward for the pavement preservation community.

The FHWA's National Highway Institute (NHI) now is offering a free web-based training course on pavement preservation designed for state and local highway agency personnel and contractors.

Thus the industry's come a long way in pavement preservation in less than two decades. To one degree or the other, pavement preservation has percolated down into all the state DOTs and to the cities, counties and

# Placing the Optimized Chip Seal



Following rotary brooming, use hot air lance to clear detritus, loose aggregate and residual moisture from wide pavement cracks.

Fill cleaned wide cracks with hot- or cold-applied sealant ahead of chip seal operation; chip seal will fill minor cracks.

Ahead of entire operation, clean debris, trash, and raveled aggregate from surface using rotary broom.

Place asphalt binder using calibrated distributor with spray bar at correct height and with all nozzles uniformly angled 15 to 30 degrees from spray bar and with proper spray overlap.

Follow binder placement with chips in single layer from calibrated spreader; follow spreader with pneumatic roller and final brooming.

townships. New research is refining materials and placement techniques. And no-cost, active training programs are bringing seat-of-the-pants placements into the 21st century, which will bring added discipline to pavement preservation efforts.

Pavement preservation methods are intended to prolong pavement life, avoiding high future costs of reconstruction or rehabilitation through the expenditure of much 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 dollars 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.

Too early and scarce funds will be spent on a pavement not needing the treatment, while denying those funds to pavements that might.

Too late, and the pavement will disintegrate even underneath the freshly placed treatment, wasting the effort.

One of the worst practices is waiting too long – that is, waiting for damage to develop – before preventive measures are applied, said Larry Galehouse, P.E., P.S., director, National Center for Pavement Preservation (NCCPP).

If preservation is postponed, fatal damage may be inflicted on your road, he said. "You've got to have a good pavement structure for preservation," Galehouse told *Better Roads*. "If the pavement structure is sufficient to carry the load, we must keep the water out, maintain good skid resistance, and provide a smooth ride for the motorist. With pavement preservation techniques we will improve pavement performance and extend its life."

But pavement preservation is not patching potholes or sealing cracks when and wherever they appear. Instead, proponents argue pavement preservation is the *right* treatment for the *right* pavement at the right time. Today, pavement preservation is a planned system of treating pavements at the optimum time to maximize their useful life, thus enhancing pavement longevity at the lowest cost.

Those preventive maintenance treatments include crack sealing, fog seals, chip seals, thin cold mix seals, surface recycling, and hot mix

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asphalt (HMA) thin overlays, including dense-, open- and gap-graded mixes that will bolster ride quality, provide surface drainage and friction, and correct surface irregularities. They're all part of a tool box of treatments that saves taxpayer money and keep motorists happy through improved ride quality and increased lifespans of our existing pavements.

In addition to correct timing of treatment, surface preparation is essential prior to surface treatment placement.

"Experience has shown when proper preparation has been done in areas scheduled for surface treatments (either by contract or by state forces), the life of the surface treatments can be greatly extended and helped in reducing lifecycle cost," Caltrans said in its publication, *Surface Treatment Strategies (Recommended Guidelines)*.

"It is critical that all necessary preparation work such as crack filling, pothole repair, patching, leveling, digouts, etc., be done prior to surface treatments being placed," Caltrans said, adding that crack filling and sealing is "our first line of defense in roadway maintenance."

The agency recommends cracks 0.25 inch or wider be filled or sealed before rainfall seasons or before the application of maintenance surface treatments such as fog seals, sand seals, slurry seals, chip seals, or maintenance overlays.

"Cracks should be cleaned before filling or sealing," the agency says. "When moisture is present or suspected, it is recommended that hot compressed air (hot lance) be used to prepare cracks immediately before filling or sealing materials are applied."

#### **Preservation Tool Box**

That tool box of pavement prevention treatments serves the pavement owner and help prolong his or her pavements' life cycle.

Crack sealing, the placement of bituminous or modified bituminous sealant in a clean, dry fissure or crack, is done to keep water from entering the pavement base via the driving surface. Patching is done for the same reason,

but with the added benefit of keeping roads driveable after they appear. Both techniques may be applied to pavements in use, but also are used in advance of placement of certain surface treatments.

These surface treatments include

chip seals, a 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 asphalt emulsion, sometimes with modifiers or additives, mineral aggregate,

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## RoadScience Tutorial

and proportioned water, mixed and spread on clean pavement free of dirt and loose gravel; and micro surfacing, consisting of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a pavement using specialized equipment.

Variations of these surface treatments include cape seals, application of a slurry seal to a newly constructed surface treatment or chip seal; fog seals, a combination of mixing-type emulsion and approximately 50 percent water, used to seal shoulders and patches; 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; and 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.

Other techniques include pavement rejuvenation, the application of a penetrating, rejuvenating agent in a procedure similar to fog sealing; and thin and ultrathin hot-mix asphalt overlays, consisting of a single-lift surface course, generally with a thickness of 1.5 inch or less.

Preservation techniques for concrete pavements include patching, joint sealing, joint and spall repairs, slab load transfer retrofit via replacement of dowel bars; grooving and grinding to remove bumps and roughness; and white topping, similar to a thin HMA overlay, but using a fast-curing, high-durability concrete mix.

Micro surfacing represents a step beyond chip seals, even seals incorporating polymer modifiers in the binder. Micro surfacing can effectively fill ruts up to 1 inch, improve skid values, cover flushed or bleeding pavement, improve wet-weather characteristics, and reduce noise, but at an added price.

Again, timing is everything. Micro surfacing should only be used on roads with good structural characteristics. Furthermore, the existing highway should have a good seal prior to application, experts say. The final surface should

be clean and free of excessive scratches, marks, and tears while retaining some macro texture for friction. An average treatment will last five years, but if sealed again, could further extend pavement life by six or seven years. Overall, micro-surfacing is very effective when used properly. In particular, micro surfacing can be more appropriate than chip seals for high-volume roads like interstates.

### Web-Based Training

The 6.5-hour course, *Pavement Preservation Treatment Construction (Course No. FHWA-NHI-131110)*, introduces pavement preservation concepts and techniques and provides a solid foundation of knowledge on preservation practices. Registration is necessary through the NHI web site.

The course covers project and treatment selection, including design and construction of crack filling and sealing, joint sealing, patching and edge repairs, chip seals, fog seals, slurry surfacings, micro surfacing, and thin and ultra-thin overlays.

The course also introduces participants to the *Pavement Preservation Treatment Construction Guide*, which was created by FHWA, Caltrans, and NCPP. The guide covers basic pavement preservation concepts, as well as information on specific treatments to extend the life of asphalt pavements and how to best select a treatment.

To take the training course, visit the NHI Web site at [www.nhi.fhwa.dot.gov](http://www.nhi.fhwa.dot.gov) and follow the links. The course is listed in the NHI course catalog as *FHWA-NHI-131110: Pavement Preservation Treatment Construction*. Participants must log in and register but will not be charged for the training. *The Pavement Preservation Treatment Construction Guide* is available online at <http://fhwa-pap34.fhwa.dot.gov/NHI-PPTCG/index.htm>.

For more information on the training course or the online treatment construction guide, contact Chris Newman at FHWA, 202-366-2023 (email: [christopher.newman@fhwa.dot.gov](mailto:christopher.newman@fhwa.dot.gov)), or Joe Gregory at FHWA, 202-366-1557 (email: [joseph.gregory@fhwa.dot.gov](mailto:joseph.gregory@fhwa.dot.gov)). To learn more about pavement preservation, visit [www.fhwa.dot.gov/preservation](http://www.fhwa.dot.gov/preservation).

While many county and city road



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agencies maintain pavement inventories and pavement management systems, not all have been able to integrate the PMS with a pavement preservation program that will show where dollars will be best spent toward riding surface longevity.

Classic pavement preservation will start with a pavement inventory and condition database, which will be used to establish which road surfaces are near the point at which they will begin to fail rapidly. Those pavements – not the worst pavements favored by politicians – are the ones that should be targeted with whatever funds are available, prolonging their service life to a degree not possible otherwise.

But a problem arises for the road manager. To spend money where it will do the most good, pavements that are falling apart should not receive maintenance dollars, but should be allowed to fail and then be rebuilt. That's why adhering to a pavement preservation program may put a road administrator in conflict with elected officials, who may demand quick fixes for failing pavements.

At that point the pavement inventory and pavement management system can be exhibited to show that the road administrator is doing the right thing. The inventory and PMS provide cover for both the administrator and elected official in supporting pavement preservation principles.

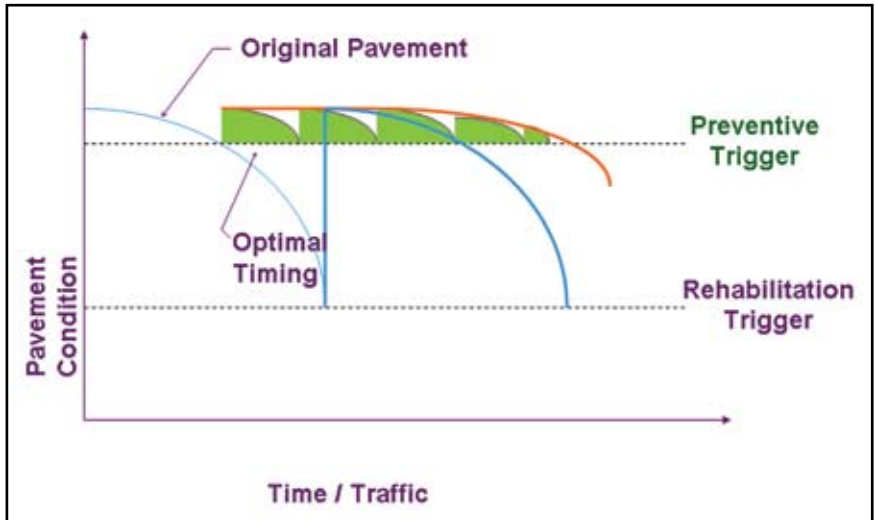
The worst way of responding to complaints is the policy of 'worst first', which is the opposite of proper timing.

Worst-first is a suboptimal strategy and experts say if followed, it can bankrupt an agency. When you wait for worst first, you've waited until structural damage is being done to the road, and you have to do major rehabilitation. Worst-first waits until serious damage is done to most roads, making it the most expensive strategy you can think of.

NCPP wants to redirect the conventional thinking that new construction is most desirable, and that worst pavements should be fixed first. Instead, it wants to promote efficient road preservation programs, adequate long-term

network preservation, the optimization of the benefit/cost relationship, which is not the same as minimizing expen-

ditures, promote cost-effective use of funds, and minimize environmental damage. ❖



▲ Pavements serve well for years under time and traffic, but then fail precipitously. The right timing of periodic pavement preservation activities -- at the 'Preventive Trigger' point -- will prolong the service life of pavements again and again.

Credit: FHWA

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