

Standing Committee on Pavement Preservation (AHD18)
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Pavement Preservation to Sustain Roadway Health at Minimal Costs

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BACKGROUND

Prior to 1900, only 4% of roads in the United States were paved. With the development of automobiles, and especially with the development of relatively low-cost automobiles using “modern” assembly line techniques, the number of vehicles increased rapidly, and with it, the demand for paved roads.

The end of WWII saw increased industrialization and a growth in both population and urbanization. These changes increased public demand for paved roads. In 1956, a major highway bill called for construction of a four-lane interstate system, for which 90% federal funding would be available. Thirty-six years later, the originally planned interstate system was complete, although additional segments continue to be added. This was an era of major road system expansion. During the system expansion era, existing roads were allowed to deteriorate to poor condition before actions were taken. This approach, called “Worst First”, is a philosophy that continued for many decades.

The number of vehicles increased steadily from 1960 to 2006, increasing an average of 3.69 million vehicles per year. Why the steady growth in vehicles? One contributing factor is the growth in the number of women in the workforce. Women supplied the workforce for many industries during WWII, and in 1948, made up almost a third of the U.S labor force. That percentage increased to 46.3% in 2000 and is estimated to reach 47.2% in 2024. (1) The increase in women in the labor force caused increased demand for transportation, and many families became two-car (or more) owners. Other factors included the growth of suburbs and population growth.

Both truck traffic volumes and gross vehicle weights have increased dramatically over time. Since the 1990s, the percentage of trucks on the Interstate Highways have increased from 10 percent to 50 percent, largely due to just-in-time shipping. Federal limits for gross vehicle weight have gone from 58,420 pounds in the 1940s to 72,000 pounds in the 1960s, to 80,000 pounds in the 1980s. Tire pressures also increased over time.

Road construction was funded primarily by federal and state levied fuel taxes. Sufficient funds were generated to maintain the system and construct roads to meet capacity demands. When fuel prices increased dramatically in the 1970s, the public demanded vehicles that had higher fuel efficiency and the automobile industry responded. The Clean Air Act (1970) also led to vehicles that had lower emissions and were lighter and more compact. The result was a steady decline in fuel tax revenues, which reduced federal and state road budgets. In addition, the federal fuel tax did not keep up with inflation.

There are currently about 8.3 million lane miles of public roads in the United States. Only 3% of the road system is owned and operated by the federal government; 19% is state owned and maintained; and 78% is owned by local and municipal government. (2) About 76% of those lane miles are two-lane rural highways. Only 55,000 lane miles were constructed between 1987 and 1997. Currently, 80% of all system expansion is from road widening. (3)

Federal legislation in 1991 made system preservation and proactive maintenance eligible for federal funding. In 1992, FHWA created the initial Expert Task Group on Pavement Preservation. Industry created the Foundation for Pavement Preservation (FP2) to provide advocacy for preservation funding and to further preservation use by agencies at all levels. (2) Industry and FHWA pooled resources to create a series of National Highway Institute (NHI) courses on pavement preservation. States that led the way in pavement preservation included California, Georgia, Michigan, New York, and Texas.

The United States is in a period of system maintenance and preservation. With reduced budgets and workforces and a large system to maintain, it is critical that roads remain in good condition as long as possible to avoid much costlier reconstruction and rehabilitation. “Keeping good roads good” is the mantra for use of efficient and effective preservation treatments.

TODAY- TECHNICAL COMMITTEE ON PAVEMENT PRESERVATION

With pavement preservation programs having a history of only about 30 years in the United States, the TRB Pavement Preservation Committee (AHD18) is a young committee. It began as the Task Force on Roadway Pavement Preservation and was elevated to full committee status as the Committee on Pavement Preservation in July 2008.

The committee’s scope was carefully crafted to avoid duplication with the Pavement Maintenance Committee. The scope is as follows:

This committee is concerned with identifying and promoting the proactive use of cost-effective treatments to extend the life of existing pavements through research, education activities, and discussions among practitioners, researchers and industry representatives. The committee identifies, promotes and supports research that quantifies the impact of preservation activities, identifies their optimal pavement condition and application timing, quantifies performance outcomes, and quantifies and documents the benefits of pavement preservation to the transportation roadway infrastructure.

While there is some overlap, and certainly common concerns, between Pavement Maintenance and Pavement Preservation, the committees are differentiated by pavement preservation being a pro-active program of work and maintenance being reactive work to keep the road in safe condition. Pavement Preservation extends pavement service life while reactive maintenance is not meant to. The committee is made up of agency practitioners, FHWA, industry representatives, and academicians and includes a complement of international members and young members. Because pavement preservation practice is not fully adopted, much of the committee’s focus has been on providing training and education via webinars and workshops. Recent webinars have included: Results of Research in Concrete Pavement Preservation, Results of Research in Flexible Pavement Preservation, and Consideration of Pavement Preservation in the Design Process. The committee held a webinar in April 2019 on Building Better Micro-

Surfacing. Another webinar is under development on Performance Curves for Pavement Preservation Treatments, and will include a presentation by the PI from NCHRP Report 858 “Quantifying the Effects of Pavement Preservation on Pavement Performance.”

Two recent workshops addressed “Including Pavement Preservation in Academic Settings” and “Building Better Chip Seals.” The workshop on Including Pavement Preservation in Academic Settings had speakers addressing inclusion of classroom material on preservation, a class project on preservation, laboratory studies, and field projects as part of sponsored research. All stressed the value to the students in learning preservation concepts. The workshop on Building Better Chip Seals included results of recent research on Performance Based Specifications for preservation treatments, issues in achieving uniformity in emulsion and aggregate application rates, and best practices to achieve quality.

One of the strengths of the committee is the willingness of our members and friends to participate in committee activities. An example of this is their involvement in the upcoming webinar on Building Better Micro-Surfacing. The introduction, including a description of the process of micro-surfacing, will be presented by Dr. Andrew Braham, an academic member. Construction tips and best practices will be presented by Mr. Tim Harrawood, a contractor and friend of the committee. An agency’s experience in improving their micro-surfacing quality following a project failure will be presented by Greg Garner, Pavement Preservation Engineer from the Kentucky Transportation Cabinet and a friend of the committee.

The committee has active discussions on research needs and ideas at every committee meeting. The Research Coordinator works with several volunteers to develop at least one research idea into a research needs statement annually. The statement is then shared with the Pavement Technical Working Group of the AASHTO Committee on Maintenance. All research ideas submitted to the Committee on Maintenance are prioritized by the committee as a whole, and ideas include those from Bridge Maintenance, Snow and Ice, Equipment Management, Operations, and Pavement. AHD18 will also be seeking endorsement from the AASHTO Committee on Materials and Pavements. In addition, AHD18 will be identifying research needs and seeking support from the state members to submit the ideas to NCHRP.

In 2018, FHWA funded an effort called “Update the Pavement Preservation Research Roadmap.” This work is being accomplished through a series of conference calls on umbrella topics that include:

- Asset Management, Pavement Management and Pavement Preservation
- Treatment Design
- Materials
- Treatment Application and Contracting
- Performance
- Benefits.

The conference calls included invitees from the AASHTO TSP2 partnerships, industry, TRB Committee on Pavement Preservation, consultants, FHWA, and the FHWA Pavement Preservation Expert Task Group. The result of each conference call was a list of identified needs and information on on-going work that fits in the topic area. All of the conference calls have been completed and the next step will be to organize the topics, draft abbreviated research needs statements, prioritize the needs, and compile the updated roadmap. The Updated Roadmap is scheduled to be completed by June 30, 2019. It is anticipated that the updated roadmap will provide useful research ideas for not only AHD18, but also for the AASHTO Committee on Maintenance-Pavement Technical Working Group, the AASHTO Committee on Materials and

Pavements, FHWA, and the Transportation System Preservation Technical Services Program (TSP2) partnerships.

Current Issues

While many state agencies report use of preservation treatments, those treatments are frequently applied to roads in poor condition. This results in shortened performance of the treatment and reduces the willingness of the agency to use the treatment. This is an issue in treatment design (project selection) as well as in asset management (planning). Training is needed in this area.

Another issue in the practice of pavement preservation is the time lag between the visual evaluation of the pavement and the treatment placement. If an agency conducts annual distress surveys, by the time the data is analyzed, the distress is identified, a program of treatments is set up, contracts are developed and projects are let, one or two years after the distress met the trigger criterion may elapse. During this lag time, distress becomes worse and the treatment based on the distress may not be suitable. This issue combines the pavement management system, with treatment design, and contracting.

Preservation treatments are thin treatments that can be sensitive to weather conditions during placement. Failures of treatments have occurred when work proceeds in weather conditions do not meet the specifications. This issue is related to treatment application and contracting and requires that both contractor personnel and inspectors understand the importance of following the weather limitations.

In the past, the vast majority of preservation treatments, especially chip seals, were self-performed by state agencies. With the reduction in field forces, much of the preservation work is now contracted. As a result of this and due to turnover, there has been a significant reduction in expertise within agencies. Inspectors within agencies are frequently trained and certified for asphalt and concrete, but not for preservation. Out-sourcing has led many contractors to enter the field of preservation, often without experienced field crews. Training and certification is one approach to assure that contractor crews and inspectors have the knowledge needed to produce high quality, successful projects.

More than half of the paved road network in the United States is owned and maintained by local governments, counties, or municipalities. Many of these organizations have significant funding challenges, and must maintain their networks on a shoestring budget. Rarely can a local agency afford to send staff to training on preservation alone. In addition, they often depend on consultants to provide their engineering designs. These consultants may be more knowledgeable about providing an asphalt overlay, than in providing a chip seal, cape seal, slurry seal, or other preservation treatment. This is an educational challenge, requiring more outreach to local agencies and consultants, and more training in preservation techniques.

The challenge of providing preservation in urban environments includes issues with heavy traffic, utilities, use of curb and gutter that limits paving choices, presence of storm drains, and issues in traffic control to allow the contractor to build the job without adversely affecting businesses. These challenges impact not only pavement preservation treatments, but also rehabilitation or reconstruction projects. Some preservation treatments, including chip seals and scrub seals face challenges in the urban environment, while crack treatments and micro-surfacing are an easier fit. Treatments that allow easy pavement marking, or that allow existing pavement markings to remain in place, are desirable. This is a topic area where research may provide some options and opportunities.

Public education remains one of the biggest challenges for pavement preservation. Everyone involved in preservation has heard (many times), “Why are you treating that good road, when my road is much worse?” We make all the right analogies: you don’t wait until there is a hole in your roof to put on new shingles; you change the oil in your car at 5000 miles so you don’t have to replace your engine, etc. The public may hear the analogies, but still may complain about the choices made by the agency if they don’t meet the citizen’s personal expectations. This challenge falls in the benefits topic area.

Relationships

As mentioned in discussing the current activities of the Standing Committee on Pavement Preservation, AHD18, our work benefits from the collaborative effort and input of industry, agencies of all sizes, FHWA, academia, and consultants. We also benefit from interaction with other TRB committees. AHD18 has shared co-sponsorship with the Standing Committee on Pavement Maintenance, AHD20, for workshops. Many of our members are also involved in the Standing Committee on Pavement Management Systems, AFD10, and that committee will co-sponsor the webinar on performance curves. We also have worked with the Standing Committee on Sealants and Fillers in Joints and Cracks, AHD25, because crack filling and sealing is one of the most effective early treatments for flexible pavements. For concrete pavements it is important to clean and seal the joints in a timely manner; we have learned that a bad seal is worse than no seal for rigid pavements because the bad seal can hold water in the pavement.

At our committee meeting, the National Center for Asphalt Technology (NCAT) and the Minnesota Department of Transportation provide updates. Their field test sections with a variety of preservation treatments have been constructed and are monitored for performance in both southern and northern climates.

Industry updates include a legislative update from FP2, and reports from the International Slurry Seal Association (ISSA), the American Recycling and Reclaiming Association (ARRA), and the American Emulsion Manufacturers Association (AEMA). ARRA, AEMA and ISSA also update the group on the Pavement Preservation and Recycling Alliance (PPRA) outreach efforts.

FHWA provides an annual report to the committee. In 2017-2019, those reports have focused on the “Every Day Counts-4” (EDC-4) pavement preservation activities. Those activities, which are winding down in 2019, have included development and promotion of best practice guides for treatment selection and design and checklists with mobile applications for inspection. The update to the Pavement Preservation Research Roadmap is also funded from EDC-4. FHWA also briefs the group on the importance of the Transportation Asset Management Plans (TAMPs) and on pavement performance measures resulting from Moving Ahead for Progress in the 21st Century (MAP-21).

An update is also provided by the Pavement Preservation Expert Task Group (PPETG) and the Emulsion Task Force (ETF). A list of regional partnership meetings for the AASHTO TSP2 partnerships is provided to all attendees.

AASHTO updates are provided for the Committee on Maintenance and the Committee on Materials and Pavements.

We often get announcements of upcoming events and conferences, both in the United States and internationally.

TOMORROW

Trends

Trends suggest increased travel and freight movement on the national road system into the next several decades. Given the already limited budgets, expansion of the road network is not likely to be sufficient for the growth in traffic; congestion and travel reliability will be significant problems. It will be imperative that agencies at all levels adopt and properly practice pavement preservation in order to delay time-consuming and costly rehabilitation and reconstruction.

Currently, many vehicles are equipped with cameras and detection technology to minimize backing accidents, adjust speed to match other vehicles in the same lane and reduce accidents caused by drifting into another lane when a vehicle is present. Some of these technologies depend on lane markings for the baseline of vehicle travel. Paint striping can be damaged or removed by snow plows, normal wear and tear, and when covered by a pavement layer. Some of the safety technology in vehicles will not operate if the paint striping is not present. As more and more vehicles are equipped with this technology, the public will depend on its use, making restoration of striping an important component of preservation treatments.

Automated vehicles will operate with little or no intervention from the driver. The exact mechanism for vehicle alignment and spacing is not known at this point but could use marking sensors embedded in the pavement materials or paint striping or direct global positioning. Whatever mechanism is implemented; pavement preservation construction will have to assure the operability of the method as part of construction.

Platooning of long distance trucks is expected as part of the transition to automated vehicles. In platooning, trucks would form chains of closely spaced vehicles, increasing the capacity of the existing road network insofar as freight delivery is concerned. Platooning is not without consequences. With trucks closely spaced, there is no relaxation of the stresses in the pavement following each load. Damage rates will be greater than the current rate per truck. This means that pavements that are structurally adequate for today's traffic loadings may need additional structure to carry future loadings. These pavements can no doubt be expected to need preservation to extend their service life.

Technology is also impacting pavement distress determination. Almost one-third of state agencies are using automated distress data collection. 3-dimensional imaging with high resolution cameras is making crack detection and quantification possible, even common. It may be possible in the future to use 3-D imaging to determine the pavement surface texture and estimate frictional characteristics.

Mobile communications are already changing work in the field. The checklist mobile applications for EDC-4 will update hand-held technology for inspectors, which have been available, but not widely used for four years. With a laptop, tablet, or smart cellular phone, construction documents can be available on the job site. New cellular telephones take high-quality pictures that can be uploaded into project files and transmitted via text message, email, or construction inspection applications to designers or decision-makers when needed. Skype, Face Time and other meeting formats will enable real-time virtual meetings.

Funding will continue to be an issue. The Highway Trust Fund is almost empty, and no method of restoring it has gained national political traction. Given the trend toward higher efficiency and more environmentally friendly vehicles, and alternative fuel vehicles, a user tax on vehicle miles travelled is one approach being considered. In this approach, the vehicle

odometer reading could be reported as part of annual vehicle registration and a road-use fee could be collected at that time.

Funding will be even more problematic for local agencies and municipalities. Their budgets for infrastructure (roads and bridges) is significantly underfunded. Citizens need to be made aware of the cost of various pavement treatments, including the total cost for whatever system is being considered and the cost savings associated with a program of pavement preservation. Users of roadways need to accept and embrace preservation treatments, and maintain funding for it.

Goals

In some ways, the committee's goals are not likely to change. AHD18 will continue to provide training and outreach to practitioners at all levels and assist them in improving the quality and consistency of their preservation treatments. Current mechanisms, like workshops at the annual meeting or webinars are anticipated to continue. It is hoped that workshops at the TRB Annual Meeting could be "live-streamed," as many of the workers involved in pavement preservation would not attend a TRB Annual Meeting. We reach a broad audience with webinars but would like free participation broadened. Academic budgets do not usually include funding for webinars, nor do budgets of local agencies or many consulting companies.

We are seeking a new generation of champions for preservation. The initial deployment of preservation demonstrated that successful agencies had a champion; a person that would stand up for preservation in the face of efforts to divert funds to other needs. Once a champion retires, or is moved to another position in the agency, a new champion is needed. We are currently near the end of a generational shift in state agencies with the retirement of the baby-boomers. Their replacements need to be both empowered and encouraged until pavement preservation is part of the agency culture. Newer generations of Millennials and Gen X'ers typically embrace sustainability and need to be educated and energized to continue preservation efforts.

Bringing new blood into TRB committees is always a struggle. From a committee chairs point of view, you want to hold on to people who do all the good things: develop research needs statements, review papers, volunteer to moderate sessions, and help with webinars and workshops. At the same time, it is the perfect time to look at some of the next generation leaders.

Asset management will expand its application in transportation agencies. Pavement management began with development of a road inventory and then expanded to include pavement condition monitoring, pavement deterioration modelling, decision trees, and other analyses. Asset management will assist agencies in managing pavement, bridges, lighting, facilities, retaining walls, pipes, and other infrastructure. Once tied to the financial planning and programming parts of agency decision making, asset management will become part of the agency structure. Pavement preservation allows agencies to maintain their road system at a lower cost, which assists the overall asset management need. Pavement preservation should be integrated into the Pavement Management System.

We will also be seeking continued cooperation and collaboration with all of our partners; industry teaches us much about new and existing products and processes, academia will feed the future preservation engineers and consultants, agencies will be balancing the needs of all their infrastructure as they struggle to maintain a state of good repair, and FHWA will provide a national focus and manage federal funding by whatever mechanism is developed. We have already learned that our outreach efforts are most effective when we include the perspectives of

agencies, industry and academia. The MAP-21 measures and TAMP almost necessitate that agencies deploy pavement preservation practices to meet the agency's performance targets.

We will seek ways to improve implementation of new techniques, processes and products. We have heard from industry that they currently have to take a new product to each state department of transportation. Each has a "new products" process that the vendor must satisfy. It frequently involves building one or more "trials" in each state. That is 50 (52 if you count Washington D.C. and Puerto Rico) implementations! It is not hard to see that this cumbersome process is both costly and inefficient. If we want to encourage development and implementation of new materials, we must discuss this issue openly and be open to alternatives. Could regional trials replace the current approach? AHD18 will be one venue for having these discussions.

Sustainability will become a "front and center" topic in the future and may cause a change in committee scope. It is difficult, if not impossible, to open new aggregate quarries in many locations. Liquid asphalt is a product of petroleum distillation. More and more of the petroleum is being converted into gasoline, resulting in less, and lower quality, asphalt. Most preservation treatments use reduced raw materials, both aggregate and asphalt, and are increasingly using recycled materials. New materials, like bio-based binders, will enter the material stream. Approaches to quantify the sustainability of preservation will provide an additional benefit to agencies.

AHD18 will continue to provide a forum for improving practice in the United States and abroad. The members are dedicated to the work and look forward to an exciting future.

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