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On the cover: At September In-Place Recycling Workshop, Dunn Company cold-in-place recycles bituminous pavement; see pp 30-31.
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When Preservation Becomes ‘Alteration’

By Michael Buckingham
President, FP2 Inc.

Did you ever think that micro surfacing, or cape sealing, or cold milling and thin-lift asphalt overlays constituted an alteration to a pavement, demanding installation of curb ramps—and maybe a lot more—for use by those with mobility issues?

I didn’t, and neither do other stakeholders in the pavement preservation community. That’s why we were so puzzled, despite FP2’s best efforts, when the U.S. Departments of Justice and Transportation announced this summer that a variety of thin, non-structural pavement preservation treatments would require installation of those facilities.

In the last few years FP2 Inc. has worked hard on Capitol Hill to make pavement preservation eligible for funding in the Moving Ahead for Progress in the 21st Century (MAP-21) bill. It was a thrill to see the benefits of pavement preservation become federal public policy. But now we see the public policy of MAP-21 undermined by new public policy, the cost of which to implement could greatly increase the cost of asset management plans, lead to deferred preservation treatments, failed roads, and diminished budgets for road systems.

ALTERATIONS VS. MAINTENANCE

Title II of the Americans with Disabilities Act of 1990 (ADA) requires that state and local governments ensure that persons with disabilities have access to the pedestrian routes in the public right-of-way. An important part of this requirement is the obligation whenever streets, roadways, or highways are altered to provide curb ramps where street level pedestrian walkways cross curbs.

In past years DOT has not treated preservation treatments which do not add structural capacity as alterations. But recently DOJ took another look at preservation treatments and provided new guidance on which treatments constituted pavement maintenance and which were pavement alterations.

Similar treatments, at least from an engineering perspective, were treated differently in the new guidance; some were mysteriously categorized as alterations invoking ADA accommodations, while others were called maintenance treatments and did not invoke ADA accommodations. The net result of this guidance will be to decrease the overall road miles that can be maintained by an estimated 20 percent, and decrease local, state, and federal government decision-making authority with regard to how they should maintain their roads.

Products deemed to be alterations must include curb ramps within the scope of a project. These include micro surfacing, thin lift overlays, open graded surface courses, cape seals, mill-and-overlays, and hot in-place recycling.

Projects deemed to be maintenance, not requiring curb ramps, include crack and joint filling and sealing, chip seals, slurry seals, scrub and fog seals, concrete joint repairs and dowel bar retrofits, spot high-friction treatments, undersealing, diamond grinding, and pavement patching.

POTENTIAL DAMAGE TO PROGRAMS

This new unfunded federal mandate on state and local governments has the ability to severely damage road network life spans by undermining our rule that preservation be The Right Treatment for the Right Pavement at the Right Time.

Because DOJ and DOT have chosen which preservation treatments are acceptable and which aren’t, the ADA rules may lead to the wrong treatment at the wrong time, or even no treatment if it’s perceived that the right treatment would lead to unaffordable capital improvements. This has the potential to be very problematic for our overall road system and appears to fly in the face of MAP-21’s focus on asset management and pavement preservation. Cities, towns and counties that are already strapped for cash will be the most impacted by the ADA rules. This new technical guidance will make it difficult for them to meet the ADA plans they currently have in place.

Additionally it will increase their costs substantially and make it difficult to select the proper pavement preservation treatments for their programs. We know it’s important to provide accessibility, and support that goal, but this guidance does not do that. This new mandate will inhibit local and state authorities from making the types of decisions that will allow them to preserve and maintain their roads, decreasing the road miles they can maintain, resulting in rougher, less-maintained roads which will decrease the safety of all road users.

The DOJ and DOT developed these rules without the input of stakeholders, despite FP2 and other stakeholder efforts to participate in the process. With better understanding of pavement preservation techniques and the engineering behind them, we would hope the government would come up with a more rational approach based on sound facts and engineering. AASHTO was concerned enough to issue a new resolution which says that these issues were never put out for public comment, and that they should be.

So we will continue our work building a coalition that will interface with the U.S. DOT to help moderate the situation. We will advocate engineering principles for these guidelines, and more, down the road helping agencies provide pavement preservation while making sure accessibility is provided for people who need it.
NCPP Marks Decade as Voice of Pavement Preservation

By Tom Kuennen

The National Center for Pavement Preservation is a tremendous resource for public and private sector stakeholders in pavement preservation.

Today—after a decade of service—the National Center for Pavement Preservation at Michigan State University has an ambitious program of technology transfer, reaching state and local road agencies through many channels, with support from AASHTO, FP² Inc., FHWA, and to a lesser degree, the private sector.

The NCPP’s mission is to lead collaborative efforts among government, industry and academia to advance pavement preservation. Founded in July 2003, the NCPP is the embodiment of the collective national vision of pavement practitioners, policymakers and industry.

“Ten years ago, few people had even heard of the term ‘pavement preservation’,” said NCPP executive director Larry Galehouse, P.E. “Today, pavement preservation is a commonly used term among highway officials, and practitioners understand what it is. I would like to think that the national center had a lot to do with that.”

Now—after 10 years of working principally with government road agencies—NCPP sees a great opportunity for growth in the use of NCPP by contractors and private entities.

“The National Center for Pavement Preservation is one of the players in the pavement preservation arena,” said Mike Buckingham, president of FP² Inc. and principal, Buckingham Consulting LLC. “NCPP is the information exchange, the technology transfer source, and via its relationship with the American Association of State Highway & Transportation Officials and FP² Inc., is the main focus of pavement preservation within the government side, the public sector.”

While NCPP has strong exposure to the public sector, it’s utilized less by the contractor, or private sector, Buckingham said. “It may be that some contractors in the private sector feel they are best positioned to relate to pavement preservation techniques,” he said. “It leads to the national center being underutilized by the private sector.”

That’s unfortunate, Buckingham said, as they have common goals and purposes. “As an industry we all support the preservation processes,” he said. “There are proprietary, specialty processes within those categories, but the industry is marketing those, while the National Center for Pavement Preservation is educating about the general concepts of pavement preservation and the standard processes used.”

All stakeholders need to stand together and work together to promote pavement preservation effectively, Buckingham said. “Support for pavement preservation is like a three-legged stool,” he said. “NCPP provides education, FP² provides advocacy, and the third leg, industry—as represented by the FP² founding organizations of International Slurry Surfacing Association, Asphalt Emulsion Manufacturers Association, Asphalt Recycling & Reclaiming Association and other industry partners—delivers quality, innovative products to the buyers. We all need to work together to make sure our limited resources are used to the best advantage.”

STATE/INDUSTRY PARTNERSHIPS

Under the aegis of AASHTO’s Transportation System Preservation Technical Services Program, or TSP•², the NCPP has been very active in creating regional state pavement preservation partnerships, including the Midwest, Northeast, Southeast, and Rocky Mountain West Pavement Preservation Partnerships. They include all 50 states, Puerto Rico, D.C., and four Canadian provinces.

But the “partnership” refers not to the state agencies in cahoots with
each other, but a partnership between federal, state, local agencies, academia, and the private sector.

“It would be great to see more industry involvement with the regional partnerships,” Buckingham said. “They are as much a part of the partnership as the agencies are. The states are there to have a relationship, and have an opportunity to exchange information with industry. Industry is given equal time within the partnerships. But the industry involvement is not near what it should be; private sector members in the regions don’t take advantage of the partnerships as much as they should.”

“I think there is tremendous opportunity for the private sector to get more involved in the partnerships, but for whatever reason, they have not picked it up and run with it,” NCPP’s Galehouse said. “We got a tremendous response to the Nashville conference in 2012, and industry stepped up to the plate for that. We had a full house of exhibitors. But as big as industry is, and for the need that is out there, there always is room for more industry, and some in industry don’t perceive the opportunities that are there.”

Training is one area where the national center excels, as its position as an independent organization lends an air of non-promotional authority to the content, to which agencies respond, Buckingham said. “NCPP can train where an industry effort would not be acceptable. Private industry trainers may be characterized as having a bias about a product or products. But the NCPP provides unbiased education, but with much more authority than a private contractor. The private contractors don’t like to hear that, but it’s sometimes true.”

In addition to public/private sector interaction, the regional partnerships provide an important avenue for technology transfer to the state agencies. They have been so successful with the TSP•2 program that NCPP is developing state-level pavement preservation councils to spread the gospel of pavement preservation to county, township, and municipal agencies. This has begun with the launches of the Florida Pavement Preservation Council and the Georgia Carolina Pavement Preservation Council, each with the mission of unbiased technical outreach to local agencies, and private industry is involved with both councils.

“We have begun the process of setting up local state preservation councils,” Galehouse said. “The councils are designed to work with local agencies to advance pavement preservation. They are an outgrowth of the state partnerships, because the partnerships see a need for greater local agency involvement.” This statewide outreach is critical as many local agencies don’t have the resources for personnel to travel out of state on business.

“The national center has a vision to establish pavement preservation councils wherever they are needed,” Buckingham said. “They realize that many local agencies are unable to participate in the pavement preservation partnerships. At the councils, industry—contractor applicators, suppliers and consulting engineers—gets together with the state county association, and the local public works association. Industry funds the effort and participation is free to local agencies. Industry funding defrays the cost of training if presented by the national center. It’s very important because local agencies have the bulk of the road miles.”

A TREMENDOUS RESOURCE

NCPP’s broad resources are just right for today’s needs in which preservation takes place within the context of asset management. “Today the emphasis is on how we manage our infrastructure investment,” said NCPP’s Galehouse. “The key issue for agencies is to have an asset management plan that is successful and provides predictability. We can have the most sophisticated asset management plan, but if we don’t have success where the rubber meets the road, we will end in dismal failure.”

To help promote that concept, early on NCPP established a strategic plan, and with the help of many individuals, was able to land contracts that would support the center. “We are an independent, self-supporting organization, backstopped by the university, with some assistance from FP,” Galehouse said. “Like a small business, we have to bring in revenue, despite our being a not-for-profit entity.”

A contract from the FHWA was the initial anchor for NCPP, to conduct voluntary pavement preservation technical appraisals or audits for state DOTs. “They were three to five days in length, and involved interviews with central office staff and both urban and rural districts,” Galehouse said. “The material was compiled into a database and we developed a final report for each state surveyed. States have been able to use those reports to advance their pavement preservation programs.” To date, 44 states, plus D.C., Puerto Rico, several counties, and federal agencies with road inventories have been appraised.

NCPP’s movement into the field took a load off of FP’s predecessor organization, as there was a need for a tech transfer entity, and FP was not prepared to fill that need. Today, FP and NCPP continue to work together.

“The relationship between NCPP and FP is better than it ever has
been right now,” said Jim Moulthrop, executive director of FP² Inc. “The work that we all did in putting together the National Pavement Preservation Conference last year in Nashville typifies this,” he said (see National Conference

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5 Year Winner President’s Award International Slurry Surfacing Association
Gives New Momentum to Preservation Movement, Winter 2012, pp. 22-31). “The outdoor demonstration was a great cooperative effort between public and private sectors, and the entire event was a defining moment for the relationship between NCPP and FP2.”

When the center took over technology transfer duties from FP2, it liberated FP2 to pursue other goals, including Capitol Hill lobbying.

“Back then we had very little money,” Moulthrop said. “We were a volunteer organization at the time, and as the center was a real entity, paying people to do things, they were able to take over an activity from FP2 that we were never really very good at.”

In addition to its long-term financial support, FP2 partners with NCPP in other ways, Moulthrop said. “In addition to the 2012 National Pavement Preservation Conference in Nashville, we co-sponsored the 1st International Conference on Pavement Preservation in 2010 in Newport Beach,” he said. “The FP2 executive director is chair of the advisory board to the center. They are facilitating our October strategic planning meeting. And we provide an annual partnership contribution. The relationship is excellent.”

**LAUNCH TRAINING PROGRAMS**

Soon after founding, NCPP launched its first training program, an asset management course in 2004. “With the assistance of the International Slurry Surfacing Association, we developed a micro surfacing and slurry seal training course,” Galehouse said. “This was followed by courses on chip seals, and what we call the ‘top of the curve’, dealing with rejuvenators, fog seals, and crack sealing and filling, treatments that are typically applied to pavements whose conditions are towards the top of the deterioration curve.” Currently, NCPP is developing courses in cold milling and in-place recycling.

A major step forward was an alliance in which AASHTO designated NCPP as the major provider of pavement
preservation technology transfer to state DOTs. One channel for this is the regional state preservation partnerships, which NCPP manages.

“AASHTO has contracted with the NCPP to develop and administer the TSP•2 program, including a help ‘desk’, webpage, library link, and four pavement preservation partnerships,” Galehouse said. “The partnerships facilitate the exchange of information on pavement preservation techniques and provide support to state and industry efforts.”

AASHTO’s involvement with the center was a big boost to NCPP’s capabilities. “When AASHTO joined with the center, it made all the difference in the world,” Moulthrop said. “From the very beginning, the center had very little money to operate with. Although the university provided the facilities, the NCPP had to subsist on a series of small contracts until winning a larger FHWA contract to conduct voluntary pavement preservation appraisals of state highway agencies. The appraisals helped lead to the genesis of the TSP•2 program.”

INFORMATION CLEARINGHOUSE

Today, TSP•2 serves as a clearinghouse for information on preservation measures that enhance highway performance and extend useful life. The TSP•2 program is funded by voluntary contributions from state DOTs, other agencies and private sector stakeholders.

The regional partnerships are key to advancing pavement preservation nationwide and permit members to share technologies and resources in depth with each other. This partnership technology transfer helps states to observe field tests by an agency in the same region, determine whether to test the technology itself, or even specify the technology based on another state’s findings, and this saves time and money.

As part of this tech transfer, NCPP manages a large online technical “library” which can be accessed by any user. It also has compiled streaming video of past conference presentations, containing for example, every presentation at last year’s NPPC in Nashville.

With TSP•2, NCPP’s reach has broadened. “Not only are we providing technology transfer on pavement preservation, but also bridge preservation, and recently, equipment management. We have been selected by AASHTO to lead the charge on all three themes, which represent three of the most vital functions for all state DOTs,” Galehouse said.

NCPP also arranges and manages meetings and workshops for stakeholders in the pavement preservation industry, such as the FHWA/ARRA-sponsored workshop on in-place recycling and demonstration, held in suburban Chicago in September (see article in this issue, pp. 30-31).

While web-based training has value, Galehouse said, NCPP prefers to conduct in-person classes and presentations, and specializes in this classroom format. “We bring the courses to whoever wants the courses, along with an experienced trainer who has actual field experience,” he said. “We believe that face-to-face training is more effective than web-based because it holds the class’s attention better, and allows interaction with a trainer.”

FOLLOW-UP TO NASHVILLE

Presently, NCPP is working with its partners to assemble a follow-up to last year’s National Pavement Preservation Conference in Nashville, tentatively scheduled for September 2016, also in Nashville.

In the meantime, NCPP will increase its efforts to get technology out to the government agencies that need it. “At this point, the states recognize that they must do preservation, with a strong emphasis on asset management,” Galehouse said. “The fact that pavement preservation is now written in federal legislation [MAP-21] really opens up an opportunity for state agencies to implement preservation programs. Now, each state also has a strong political reason to move toward a preservation program.”
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Neither the Washington shutdown, the onset of winter’s dark period, nor the threat of white “termination” dust on the surrounding mountain peaks was going to stop members of the Rocky Mountain West Pavement Preservation Partnership from traveling to the top of the world for their annual meeting the second week of October in Anchorage. There—in the spirit of the 1889 Alaska Gold Stampeders—they filled their pans with a wealth of Alaska-sized nuggets of pavement preservation inspiration, and heralded the meeting as a success.

Two individuals received a rare honor—the Alaskan Gold Pan Award—given for their leadership and tireless work in promoting pavement preservation practice. The Alaska Department of Transportation & Public Facilities prestigious Gold Pan Award is a unique service-based award that is rarely, or never, given to anyone outside the state, but this year was presented to Jim Moulthrop, P.E., executive director, FP2 Inc., for his leadership and resolve in working to have preservation language placed in the MAP-21 transportation program reauthorization bill, and to Larry Galehouse, P.E., executive director of the National Center for Pavement Preservation, for his tireless work in educating and promoting pavement preservation practices over NCPP’s first decade.

As I think about how far pavement preservation has come in the last 10 years, I have a hard time conceiving of the monumental amount of education and outreach performed by Larry and Jim. Each has endeavored to effect pavement sustainability strategies nationwide.

Pavement preservation saves time by helping those orange vests zero-in on the right treatment when it’s needed, and saves their agencies money by eliminating early rehab. Take a little advice from those two pavement doctors with the gold pans on their wall, as a topical dose of preservation at the right time strengthens and protects. It’s much better than dealing with the scalpel’s pain or the hospital’s reconstructive surgery bill later on! If you need help or training, make a call to the NCPP and they’ll get you in to see the doc; no government insurance plan needed.

San Angelo is state materials engineer, Alaska DOT&PF. Photo by Gwen Mayo, AKDOT&PF

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PG70-22TR Chip Seal, Pyramid lake,
This fall marks the first anniversary for the Preservation Group (PG) experiment of the National Center for Asphalt Technology (NCAT) Pavement Test Track 2012 study. The last year has been an eventful one, as a full cycle of seasons and nearly 20,000 truck passes have led to exciting observations and visitors from around the region.

Just over a year ago, 25 sections were placed with over 20 different preservation treatments or combinations of treatments. These sections delineate a half-mile-long section of roadway that leads to a quarry and asphalt plant located at the end of Lee Road 159 in Auburn, Ala., near the NCAT Test Track.

The intent of this study is to develop life-extending benefit curves for each section. The half-mile section of the two-lane roadway was split into 25, 100-ft. test sections to study various preservation treatments. Each section was further subdivided into 40, 5 by 10-ft. subsections with a diverse range of pretreatment conditions to enable the completion of life-extending benefit curves, quantified by the time or traffic until recurrence of pretreatment condition.

Furthermore, changing conditions in each section are being compared with untreated control sections to document the relative improvement in condition due to the various preservation treatments. Early observations are beginning to illustrate the life-extending benefits that we have long known were possible with preservation treatments, but unable to quantify.

**CRACK SEALING MITIGATES MOISTURE**

For instance, it has been observed that the stand-alone crack sealing treatment in section “L5” inhibited the development of much of the interconnected cracking that is evident in the adjacent untreated control section (“L4”).

The cracking at the surface may not be the only thing that is being affected by the crack sealing. Each section has been equipped with a port to enable neutron probe readings of the subgrade moisture. The plot shows the moisture readings relative to the average moisture readings in the control sections over time. The subgrade moisture in the crack sealed section has consistently been lower than that of the two control sections as the placement of the treatments a year ago, indicating that crack sealing may also play a role in mitigating moisture infiltration of the unbound materials.

The bi-annual sponsor meeting for the 2012 NCAT Pavement Test Track was held in June, bringing representatives from the eight sponsoring entities, as well as the agencies and organizations supporting research on the track to Lee Road 159 for a walking tour.

In addition to hosting the sponsor meeting, NCAT also hosted the Alabama DOT division maintenance engineers, as well as the Alabama County Engineers Association meetings. Culminating in a tour of Lee Road 159, these meetings highlight the growing interest at both the state and county levels for implementation of pavement preservation treatments.

Progress of the experiment can be tracked at www.pavetrack.com.

*The authors are affiliated with NCAT*
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Polymers Boost Performance of Conventional Fog Seals

By Steven Muncy

Polymer modification can enhance the performance of fog seals, experience is showing.

As the awareness of the benefits of fog seals has increased and as pavement preservation is more widely embraced, agencies are looking for increased performance, and information about industry best practices. One way to boost fog seal performance is by polymer modification.

WHAT IS A FOG SEAL?

A fog seal is the spray application of a thin layer of asphalt emulsion to the pavement surface, and constitutes an easy first step toward a full pavement preservation program. Fog seals protect the pavement from oxidation and environmental degradation, as they replace the surface layer of asphalt binder lost due to traffic wear, while helping seal minor hairline cracks.

Their application is simple and cost-effective, but must be evenly applied to the full lane. The emulsion cure time can be adjusted to the needs of the project. These applications have been used on surfaces of every type; fog seals may be used on low traffic roads, city streets, parking lots, and even interstate highways.

The asphalt emulsions used in fog seals may be diluted to a lower residue content to allow for better control during application. The penetration of the residue is similar to the asphalt binder used in the same local climate. Some agencies have separate specifications for fog seal emulsions.

Polymer modification of asphalt has been in use for decades and its benefits have been well documented. Today, BASF’s Acronal NX 4627 polymer modifier is being used to provide a more robust fog seal for high-stress pavements. The polymer provides a strong bond with better long-term performance, and can also be used to modify most types of emulsions.

APPLICATION CRITICAL

Fog seals have only one component in the system: application of the emulsion. It is critically important that the application is accurate, and evenly applied. Proper application comes from four factors:

Surface preparation. The surface of the pavement must be dry, free from standing water, mud and dust. Power brooms are employed to clean the surface starting at the center line, and continuing to the edge of the pavement. Some areas may need multiple passes. This will provide an uninterrupted clean surface and best adhesion of the emulsion.

Calibrated distributor. Modern distributors are fully capable of controlling an even coat of emulsion at the small volume needed for spraying good fog seals. But the machine needs to be calibrated and adjusted periodically to function properly. Items such as nozzle angle, bar height, bar pressure, tachometer speed, and forward speed are each important and controllable. AASHTO, ASTM, many DOTs, and the manufacturer will have a procedure for calibrating the distributor. Be sure to check to find the most applicable method for your area.
Proper nozzles. Distributor nozzles must be capable of applying a small volume of emulsion evenly across the pavement. They must provide a full fan of material to atomize the emulsion for proper curing. Consult your distributor manufacturer for the correct size nozzles.

Operator training. The operator must fully understand the capabilities and control methods of the distributor. Starts must be clean with no overlap of the preceding passes. The equipment needs to be inspected daily for proper function.

The best candidates for fog seals are hot mix or warm mix pavements early in their life cycle, when only hairline cracks may exist. Fog seals can fill hairline cracks before they become an issue in themselves. The fog seal places a layer of relatively softer asphalt binder to slow the effects of oxidation and aging common at the surface.

Older asphalt pavements that show no structural problems may also be candidates. Fog seals replace the binder layer at the surface which is worn off by tires, renew the protective layer, and can provide additional bond to newly exposed aggregate.

Surface treatments, such as chip seals, often include fog seals as a step in installation. The fog seal provides excellent contrast for pavement markings. They are also effective in adding extra bonding adhesion to aggregates. This is particularly important in graded-aggregate seals, in order to hold smaller aggregates that have not been adequately seated by the rollers.

Fog seals provide an excellent means to extend the life of asphalt pavements with minimal cost. Fog seals should be included in every pavement preservation program in agencies of all levels, and polymer modifiers can boost their performance.

Muncy is business development manager, BASF Corp.
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A combination of pavement preservation products and best practices, along with a rare double fog seal, resulted in one of the finest roads in Oklahoma, that to Chickasaw Children’s Village.

South Central Oklahoma is Chickasaw country. The mile-long stretch leading to the Chickasaw Children’s Village, a residential and educational campus in Kingston, Okla., that houses Native American children from troubled homes, is a scenic roadway that was constructed over a decade ago.

Surrounded on both sides by open fields and a pristine white rail fence, the road eventually began to deteriorate from cracking and oxidation, causing it to stand in stark contrast to its well-kept surroundings. A two-year drought in Oklahoma only served to quicken the pavement’s deterioration, prompting longitudinal cracks to appear even more frequently.

Working with Ergon Asphalt & Emulsions, Inc., the Chickasaw Nation Roads Department sought to repair these distresses before they got worse and provide a roadway that would once again do justice to the grounds of the Children’s Village.

“Our inspector, Brad Williams, had recently visited the site and saw that the road was significantly cracked and in need of repair,” said Nick Woodward, special projects manager for the Chickasaw Nation Roads Department. Along with Chickasaw Nation Roads director Bo Ellis, and Ergon’s Johnny Roe, Woodward evaluated his options for repairing the pavement, and found the Children’s Village road was a perfect candidate to receive federal funding for preservation.

“We were in a situation where we could spend $140,000 on a one-mile, 1 1/2-in. hot mix asphalt overlay, or use preservation treatments to completely restore the pavement at a drastically lower cost,” said Woodward. “We elected to rehabilitate the pavement and spread the money that we didn’t spend on an overlay to other projects.”

“Responsible stewardship is something the tribes have practiced for years; not only of our financial resources, but also our natural resources,” said Ellis. “For us in the Roads Program, pavement preservation is the most responsible way to extend the service life of the infrastructure we have. That stewardship is what drove our decision making on the Children’s Village road.”

**PROACTIVE MEASURES**

Although Village Road was suffering from a high number of cracks, it was far from beyond repair. One of the most recommended, but often overlooked, steps in preserving a pavement is to seal existing cracks. Doing so locks out moisture, keeps cracks from widening, and prevents the otherwise inevitable decay of the underlying structure.

“Crack sealing a pavement before applying a chip seal is a benefit to the road in several ways,” said

A 3/8-in. limestone was used as the chip seal aggregate, with polymer-modified CRS-2+ emulsion holding it in place.
View past issues of the Pavement Preservation Journal online at www.naylornetwork.com/fpp-nxt

Zach Burkey, sales rep for Paving Maintenance Supply, Inc. (PMSI).

“You’re sealing out the moisture to help protect your base, and you’re filling the voids in between the cracks. That gives the road a smooth surface to apply a chip seal on, which will improve ride quality and prevent reflective cracking in the future. It makes for a better end product that lasts much longer.”

Using a Crafco Super Shot 125 Melter/Applicator purchased from PMSI, an crew from the Chickasaw Nation Roads Department sealed the pavement’s cracks using 2,600 lbs. of Crafco Road Saver 515 crack sealant. Without taking this measure, the cracks would have eventually worked their way back to the surface.

Chip seals are one of the most versatile tools in the pavement preservation toolbox. Woodward chose to chip-seal Village Road using the polymer-modified asphalt emulsion, CRS-2+. The emulsion was chosen based on the amount of traffic the road receives, as well as the Chickasaw Nation’s prior positive experiences with the product. It’s produced at Ergon’s facility in Lawton, Okla., and has become the Chickasaw Nation’s preferred chip sealing emulsion. The selected aggregate was a 3/8-in. limestone from the Doleske Quarry in Coleman, Okla., and PSI Seal Masters, Inc. of Davis, Okla., was the contractor.

DOUBLE FOG SEAL SOLVES MIX-UP

On the front end of the job, a calibration issue with the distributor’s onboard computer caused the binder application rate to be lighter than the expected 0.4 gal./sq. yd. The issue was quickly corrected, but a portion of the pavement received only 3/4 of the material needed to securely hold the aggregate to the surface of the roadway. Woodward and Roe had planned to apply a heavy fog seal at 0.15 gal./sq. yd., which would compensate for the lost binder and improve the overall aesthetics of the surface. But on the day of application, they devised a superior solution.

“We had enough material to apply a double fog seal,” said Roe. “It would provide better coverage. It would last longer and look better. And by applying two layers at one tenth of a gallon per square yard each, we could utilize more material while greatly reducing the risk of runoff.”

The specified fog seal was CQS-1F, an Ergon Asphalt & Emulsions product produced in Catoosa, produced at Ergon’s facility in Lawton, Okla., and has become the Chickasaw Nation’s preferred chip sealing emulsion. The selected aggregate was a 3/8-in. limestone from the Doleske Quarry in Coleman, Okla., and PSI Seal Masters, Inc. of Davis, Okla., was the contractor.

Contribute Your Technical Paper to Pavement Preservation Journal

PROSPECTIVE AUTHORS ARE invited to present articles on original research on any topic relevant to pavement preservation, such as preservation techniques, materials, construction, testing, performance, recycling and pavement management to Pavement Preservation Journal.

Papers discussing best practices for pavement preservation treatments, including asphalt overlays, scrub and fog seals, crack sealing, chip seal, hot in-place recycling, microsurfacing, and slurry seals, would be welcome as well.

Authors must prepare their manuscripts in accordance with the guidelines outlined by the Pavement Preservation Journal. All articles should be submitted as an e-mail attachment to Dr. Yetkin Yildirim, P.E., at yetkin@mail.utexas.edu.

For more information, including style guidelines, please visit the Pavement Preservation Journal’s home page at www.fp2.org.
Okla. CQS-1F provides twice the residual of its regional alternative, SS-1, and gives surfaces a noticeably darker appearance. Perhaps most importantly, CQS-1F cures in under an hour, compared to anywhere from two to four hours with SS-1. These properties made it a desirable pick for the Children’s Village road. The product’s quick curing ability made the possibility of a double fog seal much more tangible.

PSI Seal Masters, Inc. shot the CQS-1F on one side of the mile-long road at 0.10 gal./sq. yd. They then returned to their starting point and applied the fog seal to the other side of the pavement at the same rate. Weather conditions were ideal. Warm temperatures and a strong breeze allowed the fog seal to cure in approximately 20 minutes, far quicker than average. Once the material had cured, crews immediately applied a second coat at 0.10 gal./sq. yd. Dry weather and the engineered fast cure times helped the material break quickly, preventing any runoff. And the results looked astonishing.

Chickasaw Roads Director Bo Ellis firmly believes in the benefits of fog seals. “I’ve seen chip seals that are still losing rock a few weeks after they were applied,” he said. “The fog seal really bonds the whole thing together and locks in your driving surface, giving you more bang for your buck.”

**DOING THE MATH**

Properly crack sealing, chip sealing and fog sealing can add years of service life to a pavement. Given the extra protection afforded by the double fog seal, it’s anticipated that the Children’s Village road will last even longer than originally expected. With timely maintenance, the chip seal should have no trouble achieving a 10-13 year lifespan. And the cost to achieve those extra years is impressively low.

“In Oklahoma, 2,600 lbs. of crack sealant averages about $3,600. The cost of a single CQS-1F fog seal is typically $3,000 per mile on a 24-ft.-wide road, or about 0.20 cents per square yard. A chip seal is approximately $2.00 per square yard,” said Roe. “That’s about $45,000 in total for these preservation treatments in comparison to $40,000 for a mile-long hot mix asphalt overlay, which would typically require an additional $25,000 for milling.”

The combination of pavement preservation best practices and products, as well as the on-hand expertise of Roe and Woodward, produced one of the finest pavements in the state of Oklahoma—for a fraction of the cost of an overlay. And the fruit of the Chickasaw Nation’s pavement preservation efforts has stimulated a high level of interest among other tribes.

“I wouldn’t say that a double fog seal is the right choice for every pavement,” said Roe, “but given the right road, and the right circumstances like we’ve seen on these projects, it can make a very substantial difference in both quality and appearance.”

Heritage is staff writer, Ergon, Inc.
After a hiatus of several decades, Florida DOT once again is employing hot in-place recycling (HIR) with simultaneous hot mix asphalt overlay, this on U.S 41, the Tamiami Trail, a process known as repaving.

There, late last season, about 35 miles west of Miami, four miles of the Tamiami Trail was hot in-place recycled with virgin HMA overlay, from mile posts 0.00 to 3.9, with 12-ft. driving lanes each way. In addition, two 4-ft.-wide shoulders were overlaid monolithic with the pavement. Before this work, both the existing pavement and shoulders were milled of their open-graded friction course 1-in. deep.

For this work Florida DOT applied a “developmental specification,” which permits use of a new or unique process. Dev 325 permits “[Construction of] a repaved asphalt concrete pavement by milling and constructing a binder course layer and friction course layer using a paving machine capable of recycling the existing asphalt using the hot-in-place process and placing plant-produced virgin hot-mix asphalt simultaneously.”

“This was a brand-new spec,” said John S. Fowler, P.E., quality assurance engineer for Florida DOT. “During our previous era of recycling we used one spec for surface recycling, and it did not permit the repaving method used here. After seeing a couple of demonstrations we wanted to open the competition up to other processes, so we wrote a brand-new spec that permitted the HIR repaving process.”

THERMAL ‘INTERLOCK’ ATTAINED

The HIR process used on Tamiami Trail was a unique, one-pass, hot-on-hot repaving process in which the existing, deteriorated pavement is heater-scarified by mobile equipment to a depth of 1 in., and mixed within the equipment with a rejuvenating agent prior to being placed as a leveling course immediately behind the repaver.

This 100 percent-recycled leveling course then is immediately topped by the repaver with 1 in. of virgin hot mix asphalt, which achieves a thermal interlock between the lifts.

This HMA is received by a hopper at the front of the recycler and is conveyed the length of the machine to a screed at the very rear of the repaver. The process is exclusive to the HIR contractor, Cutler Repaving, Inc., Lawrence, Kan.

“The Tamiami Trail surface was worn, but some of the material below the base is undesirable,” Fowler said. “Consequently, every 10 or 12 years we have to work on it. Also, being in the Everglades, the water table is very high in the rainy season, which does not help. The roadway had light surface cracks and raveling of the

As tack coat is applied to shoulder only in advance of overlay, preheater unit begins movement down driving lane of U.S. 41 in advance of repaver
surface, but the distress that got it into our resurfacing program is that its ride quality was deficient by our standards.”

Florida DOT’s experience with HIR dates to the late 1970s, Fowler said. “We had nothing substantive for about 25 years,” he said. “In the early 2000s we did more hot-in-place recycling, to the tune of one project a year. After 10 years of this our executive leadership decided we should develop this process more and bring it into our ‘toolkit’. So for the last three years we’ve been doing more and more HIR projects.”

However, nearly all of those projects had been single-pass surface recycling jobs, and the Tamiami project was the first in memory to include a virgin HMA overlay immediately following the HIR. “The U.S. 41 was the first time we used the Cutler Repaving method in over 20 years,” Fowler said.

Not that Florida DOT was a stranger to asphalt recycling, having used reclaimed asphalt pavement (RAP) in mixes for decades.

DIFFERENT CROSS SLOPES

Typically the repaving process rarely includes a shoulder overlay monolithic with the driving lane recycling and overlay. But on Tamiami Trail, the virgin HMA went down with a 2 percent cross slope on the driving lane, and 6 percent cross slope on the shoulder. Both driving lanes and shoulder were placed at the same time.

Getting two separate cross slopes placed in one pass required some adjustments to Cutler Repaving’s unique HIR equipment.

“In Florida we have never had the challenge of recycling and paving a travel lane at a 2 percent cross slope, while paving the shoulder at a 6 percent cross slope, all in one pass,” said Bob Hall, Cutler area manager. “We had to manufacture a special screed extension that we attached to our machine’s screed, to enable us to achieve the 2 and 6 percent cross slopes simultaneously.”
The result, a “crownable” bolt-on extension, was not unusual for the industry at-large, but atypical for Cutler.

“From our point of view, the most unusual thing about this project was that we had to overlay a shoulder at the same time we were recycling a travel lane,” said John Miles, Cutler vice president-operations. “For this we built a special extension for our screed that was 4 ft. wide, with a separate cross slope. It’s not so difficult using a standard paver, but the fixed-width screed at the rear of our repaver is not hydraulically extendable, needing bolt-on extensions.”

Because the travel lanes and shoulders were cold-milled 1-in. prior to HIR, the cold milling cut the pavement to its required slope. “The intent was that they would mill 2 percent slope at 1-in. to remove the existing open graded friction course [OGFC],” Hall said. “The shoulder was milled 1-in. at a 6 percent slope as well.”

The milling was required by the Florida DOT. “The roadway has an open-graded friction surface, and we don’t allow that surface to be recycled,” Fowler said. “So we milled 1-in. to get to the grade where we could perform the recycling operation, and then Cutler came through, recycling 1 in. of the travel lanes only, and immediately paved a new 1-in. friction course over the new travel lane and paved shoulder.”

**REPAVING AN HIR PROCESS**

The Cutler Repaving process takes place in one pass, in one continuous train, eliminating lane closures and construction traffic. In residential areas drivers may leave home in the morning on a decayed pavement and return from work on an entirely new pavement.

With repaving, the existing pavement is heated to 300 deg F. Once it reaches a softened, plant condition, the pavement is scarified to a depth...
of 1 in., and in the mobile repaving unit, a recycling agent that restores the viscosity of the aged asphalt is mixed into the scarified, reclaimed asphalt. This reclaimed material is reapplied and distributed with a recycling screed as a 1 in. leveling course. While that material remains at a minimum 225 deg F, the main paving screed immediately lays a virgin hot mix asphalt over the recycled leveling course.

Cutler’s repaving machine scarifies, applies recycling agent, places the leveling course, and applies the new overlay simultaneously in one pass. That benefits road users because there is no delay between the time the pavement is recycled and the time a riding or friction course is placed, resulting in a safer work zone for road users and for contractor personnel.

To place a final friction or driving course, other hot in-place processes use a separate paver following the heater/scarification process. But Cutler uses a screed at the rear of the repaver and thus is able to eliminate an entire machine.

“From an engineering point of view, the thermal interlock between layers means there is no delamination between the recycled layer and the new overlay,” said Cutler vice president John Rathbun. “The recycled and virgin courses bond to become a monolithic overlay. The same heat that’s used to take the road apart is used to put it back together, and the two layers are effectively compacted into one lift.”

A core of the new pavement would not reveal an inch of virgin mix on top of reclaimed material, Rathbun said. Instead you would see a consistent, 2-in.-thick layer of HMA. This thermal or hot-on-hot paving adds to the durability of the driving surface and improves the smoothness of the highway. And because it’s done in one pass it saves owner and user delay costs, without the additional traffic control and delays to the public.

In addition to the benefits of recycled material, hot in-place recycling as executed by Cutler provides a smaller energy consumption and emissions profile cumulatively than nearly every other surface reconstruction method. Although this was Florida DOT’s first repaving project in memory, the process has been used routinely in Hillsborough, Orange and Escambia counties in Florida, Hall said.

Thanks to Gregory A. Sholar, P.E., state bituminous engineer, James A. Musselman, P.E., state bituminous materials engineer, Theresa Gunter, materials verification specialist, and Christine McDonald, B.S.J., public information director, Florida DOT, for their assistance with this article, which was contributed by Cutler Repaving, Inc.
ARRA, FHWA Sponsor In-Place Recycling Workshop and Demo

By Tom Kuennen

Nearly 100 stakeholders in the pavement preservation community enjoyed the Midwestern States Regional In-Place Recycling Conference held in suburban Chicago Sept. 10-12. Sponsored by FP2 Inc. founding association the Asphalt Recycling & Reclaiming Association and the Federal Highway Administration, and administered by the National Center for Pavement Preservation, the event tackled cold in-place recycling, full-depth reclamation, and hot in-place recycling processes. A highlight was an in-field demo of those processes, held on a little-used pavement adjacent to O'Hare International Airport. Here are some images from that demonstration, which was underwritten by Dunn Company, Gallagher Asphalt, Rock Solid Stabilization & Reclamation, Ergon Asphalt & Emulsions, BLS Enterprises, Cutler Repaving, Roadtec, and Wirtgen America.

While delegates watch, Gallagher Asphalt demonstrates hot in-place recycling method

Gallagher HIR one-pass hot in-place recycling process incorporates preheater
In one pass, contractor Dunn Company cold in-place recycles pavement using Wirtgen 3800 CR, grinding and mixing with engineered asphalt emulsion from Asphalt Materials, Inc. (tanker at left off image), and placing cold mix in hopper of Vögele Vision 5100-2 paver.

Full-depth recycling using lime slurry is demonstrated by Rock Solid Stabilization & Reclamation with Caterpillar RM 500 stabilizer.

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HIR section gets micro surfacing overlay placed by Rock Solid Stabilization & Reclamation, using Bergkamp mobile equipment.

Terry Haekstra, Illinois DOT District 7 materials engineer, discusses workshop action with ARRA 2013-14 president Pat Faster, national sales director of Gallagher Asphalt’s Recycling Division.
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PRODUCERS OF GOLDEN BEAR PRESERVATION PRODUCTS
Riverview Blvd. in along the Mississippi River in far north St. Louis is a problematic pavement, requiring frequent re-repair.

The Missouri Department of Transportation (MoDOT) maintains this stretch of roadway that connects a long-haul truck terminal area with I-270, linking east-west I-70 and north-south I-55 in the metro area. The resulting heavy traffic has mercilessly punished the pavement.

A particular area of degradation lies at the base of a bluff, from which water seeps, and the pavement is continually wet. In addition to this surface water, the roadway is subjected to water permeating up through the road material due to hydrostatic pressure.

Locally available cold mix and hot mix asphalt had been used previously on this area, with premature failure, and constant re-repairs every 10 days. MoDOT was interested in finding a permanent solution that would alleviate the labor and equipment commitment this single location was eating up.

Having experienced previous success with UPM permanent pavement repair material from Unique Paving Materials Inc., on Nov. 28, 2012 MoDOT personnel from its Bellefontaine and St. Charles maintenance sheds mobilized to repair the site. After setting up a work zone and marking the area, the crew used a milling head mounted to a skid steer loader to remove 1.5 to 2 in. from the road surface.

After removing the millings, sections of existing hot mix asphalt were left in place to use as a control for the performance evaluation. Using a pre-qualified aggregate, UPM was used from a local producer, NB West Contracting of St. Louis. The product was shoveled off the truck, raked to a uniform height and compacted using a commercial vibratory plate compactor. During the compaction process, water from under the road surface was forced out of the repair. The repair was dusted with available road dust and sand to blend the repair into the surrounding road.

This repair was monitored by MoDOT officials, and after three weeks, showed no sign of material loss raveling or pushing. The repair area remains wet, due to the flow of water down the hillside, but no damage to the repair area could be seen.

After 11 weeks, UPM was still performing above the expectations with no sign of raveling, dishing or loss of material, despite the stress of constant water. During the
monitoring period, St. Louis experienced several freeze thaw cycles, as well as 30 days of snow and 30 days of rain as the winter wore on.

“MoDOT considers this area to be the greatest problem pavement in the greater St. Louis area,” said Rich Schneider, maintenance supervisor for the Bellefontaine maintenance shed. “The repair with this product has lasted longer than others used previously in this location.”

UPM was able to outlast the other repair materials due to its high-performance engineering and flexibility, the manufacturer says. It’s designed to outlast the existing surrounding pavement, when properly applied, which the maker states in writing.

Edited by PAVEMENT PRESERVATION JOURNAL from information provided by Unique Paving Materials Corp.
Macrotexture and Microtexture Influence Pavement Safety

By Yetkin Yildirim, P.E.

The Texas Pavement Preservation Center would like to thank the late Mr. Gary Billiard for his years of service to the industry, and hopes to honor his memory in endorsement of his presentation on friction and texture enhancement which is available for viewing online at the TPPC website (see News Briefs, Fall 2013, p 29).

The Pavement Preservation Strategies: Friction Restoration Conference was held at the Center for Transportation Research in Austin. The workshop, which was jointly sponsored by Skidabrader and TPPC, can be accessed on the TPPC webpage under “conferences” (ww.utexas.edu/research/tppc).

These proceedings included presentations from direction of the TPPC Dr. Yetkin Yildirim, Thomas Yager from NASA Langley Research Center, and Mr. Billiard, former president of Skidabrader.

Surface texture and friction are the main factors affecting the safety of pavements. The friction force that develops between the tire and pavement surface is an essential part of the vehicle-pavement interaction; it gives the vehicle the ability to stop safely. The greater the frictional resistance, the quicker the vehicle can be slowed or stopped. Skid resistance is the friction force which develops at the tire-pavement contact area.

Many factors influence the level of skid resistance on a paved road such as: microtexture and macrotexture, age of the road surface, seasonal variation, traffic intensity, aggregate properties, and road geometry. The macrotexture of the pavement surface is related to mixture design, compaction level, as well as aggregate gradation. The microtexture is related to the texture and shape characteristics of aggregates. Pavement texture is defined as a road surface property that describes the interaction between the road surface and vehicles tires.

When in a dry and clean state, roads generally provide insignificant differences in friction levels, regardless the type of pavement and surface configuration. Hence, the operation on dry runway surfaces is mostly satisfactory. Many studies have revealed that 15 to 18 percent of traffic crashes occur on wet pavements. When in this state, the water acts as a lubricant between the pavement surface and the tires, which reduces friction. For this reason, most of the equipment dealing with pavement friction measurement operates in wet conditions.

Microtexture and macrotexture greatly influence the skid resistance of road surfaces. Fig. 1 illustrates the difference between microtexture and macrotexture. Adequate macrotexture provides good drainage of water from the pavement surface. Microtexture, on the other hand, provides the direct contact between the tires and road surface and contributes to the adhesion part of the pavement friction. Pavement with rougher texture provides better skid resistance; however, it may increase noise, vibration, and tire wear.

Aggregate, being part of asphalt mixtures, plays a major role when it comes to skid resistance. The aggregate properties such as gradation, shape, and mineralogy dictate its ability to resist polishing action by traffic. This ability to resist polishing is the most significant characteristic to skid resistance of pavement surfaces.

Hogervorst (1974) explained that skid resistance changes with vehicle speed, and it depends on both microtexture and macrotexture. The results of this study showed that the skid resistance decreased as vehicle speed increased, and pavements with a coarse and rough surface provided better skid resistance compared to those with fine and polished surfaces.

Because of the great importance of pavement surface skid resistance, many pieces of testing equipment are developed and correlated to each other in order to measure friction. The need for improvement of pavement friction performance in existing roads has led to the development of different treatments like shot-abrading, grooving, grinding, and overlays. These topics were presented in more detail at the Pavement Friction workshop which can be accessed on the TPPC webpage.

Yildirim is director, Texas Pavement Preservation Center

Fig. 1: Microtexture and macrotexture greatly influence the skid resistance of road surfaces
The application of a single slurry seal immediately after or one year after construction of the asphalt layer is not effective in terms of both the benefit to the users and the benefit cost ratio for the agency, our research found. For uniformity purposes, we recommend agencies apply slurry seal three years after the construction of the asphalt layer for both new and overlay constructions.

Local agencies and the Regional Transportation Commission in northern Nevada use slurry seal as a main preventive maintenance for their flexible pavements. However, due to the lack of a standard specification, the time of slurry application to asphalt pavements has been according to the project engineer’s standard of practice, which resulted in an inconsistency in the timing of application between and even among the agencies themselves.

Recognizing the significance of optimal time at which a roadway would most benefit from a preventive maintenance treatment, in 2010 RTC sponsored research at University of Nevada-Reno (UNR) to evaluate and assess the optimum time of slurry seal application on asphalt pavements within the RTC region.

We evaluated long-term pavement performance and the cost-effectiveness of slurry seals applied to new and existing flexible pavements with respect to the time of slurry seal application.

A total of 2,700 pavement sections from minor arterials, collectors and residential streets were evaluated in this study, with the latter having by far the highest number of pavement sections. Only pavement sections that were slurry-sealed once during their intended performance lives were evaluated and were grouped as follows:
- Do-nothing: a slurry seal was not applied to the pavement
- Slurry seal applied immediately after construction, and
- Slurry seal applied at: 1, 3, 5, 7 and 9 years after construction.

Fig. 1 illustrates the effect of slurry seal on the performance of a newly constructed pavement when applied at three or seven years after construction.

The slurry seal performance life was defined as the number of years for the slurry seal performance curve to reach the PCI of the existing pavement before treatment application.

The extension in pavement service life was defined as the number of additional years the pavement will have at the end of its service life (i.e., PCI = 40; threshold value for reconstruction) due to the application of the slurry seal. In other words, the extension in pavement service life is the number of years a pavement reconstruction is delayed. In this study, the slurry seal performance life ranged from 2.0 to 4.0 years, except when applied at years 0 and 1 (ranged from 0.0 to 1.0 years). The pavement service life was only extended in few cases by 0.5 to 2.0 years.

Based on the relative benefit and benefit cost ratio observations, user satisfaction and agency cost effectiveness were maximized when slurry seals were applied as follows:
- Year 3 for newly constructed arterials and newly constructed residential streets
- Years 3 and 5 for newly constructed collectors
- Years 3 and 5 for arterials, collectors and residential streets with overlays.

Edited by PAVEMENT PRESERVATION JOURNAL from original submittal. The authors are affiliated with the Western Regional Superpave Center, University of Nevada-Reno

Fig. 1: Effect of slurry seal on the performance of a newly constructed pavement when applied at three or seven years after construction
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