



CP2 CENTER NEWS

Newsletter of the California Pavement Preservation Center

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Investing for the future

By Steve Takigawa, Deputy Director, Caltrans



Steve Takigawa

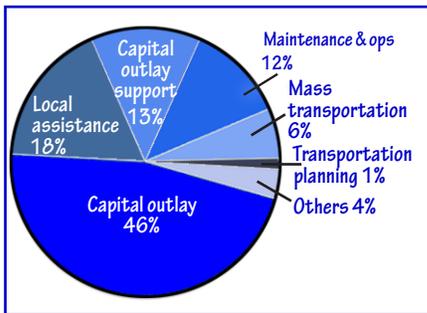
The future of our highway system is uncertain, but one thing we do know is we must manage our infrastructure smarter. In this article, I try to address the problems and challenges we and other agencies face as well as potential solutions for dealing with the problems.

The problem

The state and local agencies are facing challenging times. We all have too many roads (Caltrans has 50,000 lane miles of roads) with limited or reduced funds to maintain them. State highways account for about 10% of the over 150,000 total miles, but carry over 50% of the vehicle miles travelled.

Last year, Caltrans delivered \$1.5 billion in pavement projects on over 6,000 lane miles. This year we plan to deliver \$2 billion in pavement projects on over 4,000 lane miles of roads. This is due in large part to ARRA and bond funds that are coming to a close. Going forward, we will not have access to these funds and will need to leverage our dollars to do more with less. Figure 1 shows how we use our funds for transportation.

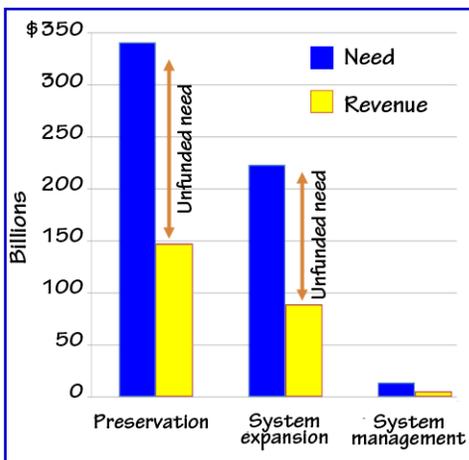
Figure 1. Use of Caltrans resources – \$13 billion



The reality

A major challenge is how to balance the needs between preservation, system expansion and system management and continue to meet required mandates (Figure 2).

Figure 2. Ten year cost and revenue



We have to communicate the problem and the plan with all stakeholders to demonstrate we are doing more with less and we have to commit to preservation of our assets for our future. We have great technical abilities, but need to promote strategic thinking so we can invest in the future with more than just dollars.

Potential solutions

Our aim now is to slow the rate of deterioration of our existing highway network using pavement preservation treatments. We must use the "right treatment at the right time." The development of a new management system for our pavements (PaveM) is a smart step in the right direction. This new tool will help determine the most cost effective treatments to apply on a given pavement at a given time. It is expected to be ready to help drive the pavement programs priorities in 2013/14.

It is also time we communicate with our customers and stakeholders. With real data, we will be able to communicate our needs and the consequences of the current funding and the effects on our assets. We must also include the effects of projects on jobs

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and the economy. All this data will make us better stewards of the system.

This state is a leader in the use of green technologies and Caltrans supports using green technologies to save on energy and reduce emissions and to use available resources more effectively. For example, we are using warm mix technologies to allow us to do better work at night using conventional and asphalt rubber mixes. We have expanded our program in this area from about 50,000 tons in 2010 to over 500,000 this year. Warm mix asphalt reduces fuel usage and greenhouse gases and improves worker safety by reducing odor and fumes.

We need to be more creative in using other recycling techniques such as full depth reclamation to strengthen and improve existing roads. Next year we will be expanding our use of recycled asphalt pavements (RAP) and begin using recycled asphalt shingles (RAS) in our pavements which is not only cost effective, but conserves aggregate use and reduces greenhouse gases by reducing carbon emission.

In summary, we are investing now for our future by working smarter. The development of improved management systems and the use of more cost effective treatments is a big step in the right direction.



Concrete grinding residue: NDSU sheds new light on age-old question

By John Roberts, IGGA

Nearly every concrete road repair project raises the question of how to handle the resulting concrete residue generated during sawing and diamond grinding operations. Also known as sawing slurry or concrete grinding residue (CGR), it is the byproduct generated when a diamond blade's cooling water mixes with the concrete fines created by the sawing of a concrete pavement or the removal of a thin layer of the existing pavement surface during a diamond grinding operation.



Slurry is the by-product generated by the combination of the blade cooling water and the residue created by the removing of a thin layer of the existing pavement surface during the grinding operation. (Colorado Highway 285)

How CGR is handled varies greatly across the country. In many rural areas it is spread along the adjacent roadway slopes as the saw cutting or grinding operation moves down the roadway. In some rural areas and all areas with closed drainage systems, the CGR is collected and hauled to other locations for processing and disposal.

In the past there has been some debate regarding the contents, classification, beneficial uses and proper handling procedures for CGR.

In an attempt to clarify these issues, in 2009, the International Grooving and Grinding Association (IGGA) entered into a research project with North Dakota State University (NDSU). This research studied five CGR samples from different areas across the country. The samples were obtained from California Interstate highway 10 (10/CA); Michigan Interstate 69 (69/MI); Nebraska highway 75 (75/NE); Washington Interstate highway 82 (82/WA); and Minnesota Interstate highway 94 (94/MN). The research contained three phases: (1) determine chemical composition and characteristics of CGR; (2) determine

what effect CGR has on the mechanical properties of the soil; and (3) determine what effect CGR has on plant growth.

What is in CGR?

Chemical composition of the five CGR samples was analyzed with EPA methods 7470A, 6020A/6010B, 9038, 7196 and others. These tests were performed by a commercial laboratory. The CGR samples had a high pH, near 12. Otherwise the solution phase levels reported were within toxicity limits outlined within the Environmental Protection Agency's Code of Federal regulations, Title 40, Part 261. In the solid phase, mercury (Hg) levels were below the reporting limit in four of the five samples, but in one was elevated above what is expected in surface soils. Chemical oxygen demands ranged up to 2210 mg/kg. Other solid phase values were below those generally found in surface soils. None of the semi-volatile compounds analyzed were found in the samples. (Go to <http://igga.net/ConcreteGrindingResidueFactSheet.pdf> to see the complete article with the accompanying tables. Included there is

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In many rural areas slurry is spread along the adjacent roadway slopes as the grinding operation moves down the roadway. (I-88, Oct 4, 2004)



CGR is not harmful to the mechanical properties of the soil, increases the shoot biomass of smooth brome, and has a negligible effect on the trace metals in both the soil and smooth brome.

Table 1 on the physical and chemical parameters of the solution phase of concrete grinding slurry from U.S. roadways and Table 2 on the physical and chemical parameters of the solid phase of concrete grinding slurry from U.S. roadways).

How does CGR affect the soil?

The influence of CGR additions from two of the CGR sources on two different soil types was evaluated by infiltration experiments. One of the experiments involved spreading a 2.5 mm layer of CGR, which is equivalent to 14 tons of dry CGR per acre, on the soil surface prior to infiltration. Two other experiments consisted of mixing CGR with soil in the top three centimeters of the infiltration columns at rates of 8 and 25 percent, which is equivalent to 14 and 43 dry CGR tons per acre.

NDSU Researchers determined that, overall, the results of this study do not point to degradation of soil hydraulic properties as a result of CGR application. This presumes that longer filtration times are detrimental and speeding of infiltration is not. In most instances this is probably the case, but exceptions are possible. There was an indication that the changes in infiltration due to CGR may moderate with time. Most importantly, the results of this work do not point to any reason, in terms of soil, chemical, physical, or hydraulic properties, for restricting the application of CGR directly to soil when the application rates are less than those used in the experiments cited above.

Does CGR affect plant health?

This phase of the research initiative involved a greenhouse study looking at soil and plant health as a result of adding CGR. Samples 10/CA and 94/MN were air-dried and ground and mixed with two soils at rates of 8 and 25 percent by mass, which equated to 39 and 122 tons of dry CGR per acre, respectively. The two soils were a silty clay (fine, smectitic, frigid typic epiaquerts) and fine sandy loam (course-loamy, mixed, superactive, frigid aericalciaquolls). Smooth brome (a common grass used for hay, pasture or silage) was planted into each treatment from seed and was used as the indicator of plant health. At the termination of the experiment, a soil sample was taken and plant and root biomasses were quantified. The soil and plant samples were sent to a private laboratory and analyzed for a number of parameters. (Visit <http://igga.net/ConcreteGrindingResidueFactSheet.pdf> to see the complete article with the accompanying tables. Included there is Table 3 on the physical and chemical parameters of smooth brome (*bromus inermis* Leyss) biomass grown in two different soil (Wyndmere and Fargo) treated with two different

concrete grinding residues (94/MN and 10/CA) at three rates of application (0, 8, and 25%) and Table 4 on soil chemical parameters resulting from the application of two concrete grinding residues (94/MN and 10/CA) at three rates of application (0, 8, and 25%) to two soils).

Research results

NDSU Researchers were able to draw several conclusions from the CGR research initiative:

- Soil pH and electrical conductivity will likely increase after CGR application due to the liming potential and total dissolved salts present in CGR, respectively;
- Smooth brome growth will be a function of soil type, CGR, rate of application of this byproduct, and thus CGR additions to soil will variably impact this plant species;
- Uptake of Calcium (Ca), an essential plant nutrient, by smooth brome will likely be accentuated by the application of CGR;
- Trace metal uptake by smooth brome is variable and will depend on CGR and many soil chemical properties;
- Soil application rates of CGR will likely not increase trace metal levels in either soils or smooth brome above those found in uncontaminated soils; and
- Application of CGR at the 8 percent rate or (39 ton/acre), was beneficial for smooth brome growth, but application rates greater than eight percent should be justified and are not recommended since the actual rate that smooth brome responded negatively was not determined here.

What does this mean?

This research indicates that CGR applied at less than 40 tons/acre, which is far more than is applied during normal grinding operations, is not harmful to the mechanical properties of the soil, increases the shoot biomass of smooth brome, and has a negligible effect on the trace metals in both the soil and smooth brome. The addition of CGR does have a liming potential, which could be either good or bad based on soil type. It is recommended that good pH control measures should be a part of any CGR handling plan.

There is a lot of variation in how CGR is handled across the country. Burdensome regulations add cost to the grinding and sawing processes. The elimination of these unnecessary regulations in areas with site conditions that allow for the discharge of CGR directly to the road's shoulder would benefit roadway owners and taxpayers alike by the reduction in construction costs. To read the full report with the tables and references, visit <http://igga.net/ConcreteGrindingResidueFactSheet.pdf>.



Update on dowel bar retrofit systems utilizing polyester polymer concrete used on US Route 50

By Ding Cheng, CP² Center

Dowel bar retrofit (DBR) is a cost-effective preservation strategy for Jointed Plain Concrete Pavements (JPCP) originally built without dowel bars. The technique is used to restore load transfer efficiency across the joint and extend pavement life. A major dowel bar retrofit project consisting of 61,200 dowels was completed in the summer of 2010 on the US 50 freeway between Sunrise Avenue and Watt Avenue in Sacramento County, California utilizing Kwik Bond polyester polymer concrete as the backfill grout material (Figure 1). This article provides a brief update on the project and a proposed study by the Center and Caltrans to evaluate the effectiveness of the project with emphasis on the benefits of using Polyester Polymer Concrete (PPC) used as the backfill material.

As a first application of its kind in California, the summer of 2010 experienced the installation of retrofit dowel bars using Kwik Bond polyester polymer concrete as the backfill grout material in the outermost two lanes in the westbound and eastbound directions of Route 50 in Sacramento, California. This project is located in Sacramento County in and near Rancho Cordova from the Watt Avenue overcrossing to Sunrise Boulevard. This project was encouraged by the numerous laboratory tests on polymer concrete that demonstrated the strong bond characteristics of polyester polymer concrete with conventional portland cement concrete, in addition to a cascade of other desirable features mainly related to workability and strength of the product. Also, polyester concrete has been used in California for nearly 30 years with good success as thin overlays on bridge decks subjected to heavy traffic and as a patching material for concrete pavement repairs.

Figure 1. Location of Dowel Bar Retrofit Project on US 50 near Rancho Cordova.



Preliminary results from the California Test 550 have shown about 40 grams of material loss for the conventional cement concrete and only 2-4 grams for polyester polymer concrete, indicating that there will be less erosion and abrasion due to bearing of

dowels on the backfill material when polyester concrete is used. Laboratory testing using the bending beam test (California Test 551) showed promising results with the use of polyester polymer concrete

grout. Testing was conducted by applying a load directly on the surface of the grout-pavement interface. The test results showed the failure occurring at the interface when various cementitious grouts were used, whereas failure occurred in the concrete when the polymer grout was used and not at the interface as exhibited by the various cementitious grouts (Figure 2). These results indicate the superior adhesion characteristics of the polymer grout, and that it would be less sensitive to construction variability. Additionally, cores taken from the project showed improved consolidation. Figure 3 shows a typical core extracted from a completed dowel bar retrofit slot backfilled with polyester polymer concrete completely surrounding the dowel with intimate bond with the existing concrete.

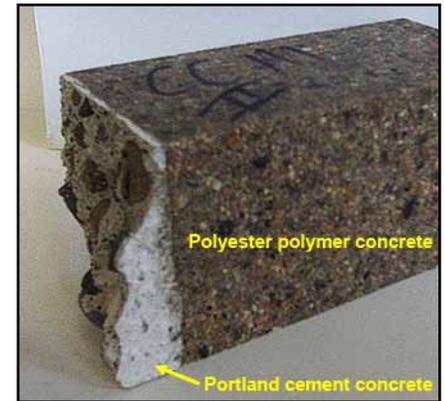


Figure 2. Beam failure in the cement concrete not in the polyester concrete or at the bond. California Test 551 (Shatnawi 2011).



Figure 3. Core showing improved consolidation with the Polyester Polymer grout (Shatnawi 2011).

The current condition of the project indicates the backfill material is still intact since DBR installation, with no signs of wear, debonding, cracking, or spalling. Future monitoring is planned by Caltrans to evaluate the following:

- Condition of the polyester fill over at least five year period
- Effectiveness of the DBR to provide load transfer using falling weight deflectometer
- Presence of voids and the bond strength between the fill and the concrete using both non-destructive and destructive tests

Caltrans continues to use DBR as a preservation treatment throughout the state with other backfill materials. This project will provide a good opportunity to evaluate these materials in the field and in the laboratory.

Update on fog and rejuvenating seal study

By John Fox, Caltrans District 9
and Gary Hicks and Ding Cheng, CP² Center

Fog seals are emulsions consisting of asphalt, water, and surfactant. Rejuvenator seals are emulsions consisting of petroleum rejuvenating base oils (maltenes, saturates, acidifins). Some contain additional asphalt. Both fog and rejuvenating seals are spray applied to an existing AC pavement surface with the intent of preserving the pavement. Fog and rejuvenating surface seals have been used by agencies over the last several decades. These spray applied seals are used to:

- seal the surface to prevent water and air movement through the asphalt concrete (AC) layers,
- soften (rejuvenate) the upper few millimeters of oxidized AC surface, and
- improve the appearance of the driving surface.

The benefits of surface seals include reducing raveling of the AC surface and slow cracking by reducing the stiffness of the surface layer (Caltrans MTAG 2007).

Spray seals are usually applied to roadways with an open texture so that the emulsion can penetrate into the upper layer of AC. Caltrans has placed four test projects in recent years to evaluate the performance of various fog and rejuvenating seal products.

2007 project

On June 18 and 19, 2007, Caltrans District 9 (D9) placed six rejuvenator seal test sections and preserved a control section in the eastbound number two lane, the

right lane often used by trucks, of Highway 58 between PM 123.3 and 125.1 east of Mojave, Calif. in Kern County (Figure 1). This roadway is a four-lane divided expressway with a 65 MPH speed limit. The weather during the application was dry with light winds. The traffic levels were about 17,000 AADT. The test sections began at PM 123.3. There was 500 feet of transition spacing between the sections, with the exception of Sections 1 and 2.

A number of the products for evaluation in this study were selected because they are commonly used in California and members from their companies were involved in the PPTG sub-task group dealing with fog and rejuvenating seals. Similar products were also used in a larger Federal Highway Administration (FHWA) project detailed in the report titled "Spray Applied Polymer Sealers Study – Preliminary Report" (King, 2007). These were the CQS-1h, CRF, Pass-QB, and Reclamite. However,

TOPEIN C and Styraflex were added to the Caltrans study because of their prior use in California. A brief summary of the different products can be found in this section.

- CQS-1h is a standard non-proprietary emulsified asphalt product which is commonly used by a number of agencies across the country. This product meets the requirements for cationic emulsions in the AASHTO M-208 specification. Information on this product can be found at www.pplca.com.
- CRF is a proprietary asphalt and rejuvenator blend produced by TRICOR Refining, formerly Golden Bear Oil Company. Information on this product can be found at www.tricorrefining.com. This product is sanded, per manufacturer's recommendation, immediately after application.
- TOPEIN®C is a homogenous emulsion of TOPEIN® and selected asphaltene resins. This emulsified rejuvenator is produced by Paramount-Alon and it has been formulated for extending the life of asphalt pavements. Information on this product can be found at www.ppcla.com.
- PASS-QB is a proprietary product produced by Western Emulsions; the QB indicates this is a quick breaking product. The emulsion is designed to penetrate small pores in the existing HMA surface to soften the aged asphalt cement. The emulsion soap consists of asphalt, rejuvenator oil, and polychloroprene latex polymer. For more information on this product you can visit their website at www.westernemulsions.com.
- Styraflex ERA is a proprietary product produced by Valley Slurry Seal (VSS). It is a high polymer modified rejuvenating emulsion (VSS 2008). Information on this product can be found at www.slurry.com.
- Reclamite is a proprietary product supplied by TRICOR Refining, LLC. This product is a cationic emulsion which was developed to penetrate the HMA surface and rejuvenate (soften) the old asphalt cement. The emulsion has a residue content of 62% before being diluted. This product is sanded immediately after application, per manufacturer's recommendations. More information on this product can be found at www.tricorrefining.com.

For each of the products, cores were taken from all test sections immediately before the treatments were placed, and again 60 days after the treatments. The top 6 to 12 mm of surface mix was removed for testing using the bending beam rheometer (BBR) and dynamic shear rheometer (DSR) to determine the influence of the various treatments on the stiffness and flexibility of the aged pavement. Samples were also taken at various intervals after construction to determine the changes



Figure 1. General project location.

in the asphalt properties, including penetration and viscosity in years 2 and 4.

The primary objective of this effort was to develop a generic specification that uses performance based properties by conducting pilot studies using the various products available in the market in California and elsewhere and to quantify the necessary material properties needed for a performance based specification. Specific objectives are to:

- Assess the effectiveness of the various seals in reducing surface stiffness and long term aging
- Determine the engineering properties that relate to the effectiveness of the rejuvenation treatment
- Assess the penetration abilities of the rejuvenation seals into the pavement surface
- Ensure the friction requirement in the new specification can be met within a reasonable time
- Evaluate the effect of sanding in increasing pavement friction

All of these products are used to extend service life by reducing surface permeability, rejuvenating the aged asphalt, delaying aggregate loss, and preserving ride quality. The products can be applied to dense graded mix, gap graded mix, open graded mix, and to chip seals.

2009 projects

Three additional sets of fog and rejuvenating seal test sections were placed during the summer of 2009. Figure 2 shows the locations of the 2009 projects.

The Boonville test sections were the first to be placed on June 7 and 8, 2009. They were applied on Highway 128 in Mendocino County between post mile markers 25.0 to 28.0. The rural roadway is a slightly rolling two lane with no shoulders with AADT levels below 3,500. The existing surface was open graded hot mix asphalt. Boonville is located in a cool coastal California climate in Caltrans District 1.

The Alturas sections were the second set to be placed on June 16, 2009. Alturas is located in the upper northeast portion of California near both the Oregon and Nevada state lines. This area has a cool, mountainous climate. The project is located on Highway 395 in Modoc County between post miles 23.3 to 25.0. The existing surface was 1/2 inch rubberized gap graded hot mix asphalt with high void content (greater than 10%) and a low binder



This section of pavement from the Bishop project shows darker pavement color compared with adjacent control section after two years.

content (about 7%) by weight of the mix. The highway is two lanes without shoulders.

The Bishop project was located on Highway 395 in Inyo County between post miles 118.47 to 120.58. The seals were applied on July 10, 2009. The existing surface was a new 3/4 inch dense graded hot mix asphalt pavement which was constructed with a PG 64-28 binder. The pavement had been placed approximately 30 days prior to the application of the seal coat test sections. The climate in the area is a high mountain desert climate with snowfall in the winter.

Results to date

The 2007 study report indicated that the BBR test was the better of the two Superpave type tests to determine the softening of the existing pavement. As a result, the follow-up studies made use of the BBR test only on the 2007 project and relied more heavily on recovered asphalt properties (pen and viscosity) for the other 3 projects. All the binder tests have been completed and skid tests were performed on all four projects before and after construction of the sections. Final skid testing is underway on all the projects.

In addition, permeability tests were performed on all the test sections and these tests clearly showed that the fog and rejuvenating seals lowered the permeability of the test sections. In addition, Hamburg tests were performed on some of the test sections to determine if this test might reveal any benefits of the seals. The testing using the Hamburg testing has just been completed.

Draft reports were submitted to the PPTG surface seal group in October 2011. The PPTG surface seal group is now using the results of these two reports to develop improved specifications for fog seals, Polymer Modified Rejuvenating seals (PMRE), and rejuvenating seals including Reclamite and CRF. It is expected that the new and improved specifications will be drafted by the end of 2011.

Figure 2. General locations of fog and rejuvenating seal test sections in 2009.



A finished project on Highway 395 near Alturas, Calif.



Rubber modified slurry project placed on I-5 using terminal blended tire rubber

By Peter Vacura, Caltrans, and Jim Ryan, PPTG co-chair

Valley Slurry Seal of West Sacramento California was awarded and performed the first tire rubber modified slurry seal project for Caltrans in Central California. Project 06-0J4904 was done in Caltrans District 6 on Interstate 5, in Kern and King Counties. The project limits were approximately 6 miles south of the Kettleman City interchange of State Route 41 and I-5, south 24 miles to roughly 10 miles north of the I-5 and State Route 46 interchange at Lost Hills in Kern County.



Figure 1. Placement of the slurry seal.

The entire project encompassed nearly 96 lane miles of roadway including on and off ramps. The scope of work consisted of removing all thermoplastic striping and pavement markings, placement of 4500 ton of hot mix asphalt, placement of 10,900 ton of Type 3 rubberized slurry seal CQS1h-TR, fog sealing shoulders, and placement of new thermoplastic striping and markings.



Figure 2. Project partially complete.

Rick Cross, Operations Manager for Valley Slurry Seal, oversaw the entire project from the time it was awarded through its completion. "It was great being a part of such a high profile project, on Interstate 5, placing one of the first tire rubber modified slurry treatments in California and by far the largest at 96 lane miles." The project had its challenges, ranging from high speed traffic on the main north-south artery on the West Coast, the remedial preparatory asphalt work which doubled in quantity over the project as the job proceeded, and the placement of the preliminary CQS1h-TR test strips totaling four lane miles in length to insure proper

placement of the tire rubber modified slurry when the slurry aspect of the job got underway.

Victoria Wightman was Project Manager on site for the CQS1h-TR portion of work and her efforts aided in the successful and the safe placement of the slurry seal product. Victoria was quick to point out how well the project turned out. "The tire rubber combined with the black aggregate used, left the finished mat jet black." Valley Slurry Seal utilized the newest computerized 12B Model Macropaver for placement of the tire rubber modified slurry material.

Other key individuals on the project were the Construction Engineer Albert Lopez, Resident Engineer Oscar Sherrill and Inspector Sikander Garcha, all of whom who helped monitor the safe placement of the tire rubber modified slurry seal.

The material suppliers for the project included Paramount Petroleum's Bakersfield, Calif., terminal, the manufacturer of the terminally blended tire rubber modified slurry seal emulsion. Jim Ryan, Marketing Director for the Bakersfield Paramount facility observes, "The final results and the ease with which this project was accomplished, once begun, speaks well of the people involved, the quality of the materials used and the coordination between the agency the contractor and the materials suppliers".

VSS Emultech supplied the additives such as sulfate and cement. George Reed manufactured and produced the type 3 black aggregate used in the slurry seal.

Sub-contractors and vendors working for Valley Slurry Seal on the project included Black Diamond Trucking, Safety Striping, Titan DVBE, and Perez Asphalt.

With the successful placement and performance verification, these newer tire rubber modified emulsion products will add another "green and recycled" tool in the State and local agencies' tool box. Industry's ability and agencies' willingness to bring these innovative technologies into the market place lead to a very bright future in the State of California and beyond. The California Pavement Preservation Center is expected to monitor the performance of the project over the next several years.



Figure 3. Project completed.

Lessons learned with asphalt rubber chip seals used in hot climates

By Gary Hicks and Lerose Lane, CP2 Center

Projects evaluated

Figure 1. Soft binder area showing wheel tracks in finished seal coat.

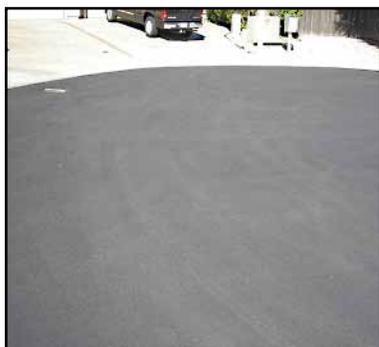


Figure 2. Westover Court after slurry seal repair.

Two California cities experienced some problems with double chip seals this past summer. The City of Roseville placed a double chip seal using a warm mix Polymer modified asphalt rubber (PMAR) $\frac{3}{8}$ -inch chip followed by a terminal blend rubberized $\frac{1}{8}$ -inch chip in the fall of 2010. Soft spots developed during the early summer mainly in the cul-de-sacs likely due to the excess asphalt from overlapping spray patterns. The contractor, Intermountain Slurry Seal, worked with the City to repair the problems. The solution was a two step process in which they first placed portland cement as a blotting material, followed by the placement of a slurry seal in the cul-de-sacs. Figure 1 shows a problem area on the one of the cul-de-sacs in the City of Roseville and Figures 2 and 3 show typical cul-de-sacs conditions after corrective work was completed.

The second project was placed in the City of Davis, also in the fall of 2010. The first course was also a polymer modified asphalt rubber (PMAR) without a warm mix additive using a $\frac{3}{8}$ -inch chip followed by a rubberized asphalt binder (RAB) using a $\frac{1}{8}$ inch chip. Like the Roseville project, the surface developed soft spots during the warm summer months in many of the cul-de-sacs. The contractor, International Surfacing Systems, has placed a microsurfacing on the

cul-de-sacs to correct the problems. The problems are shown in Figures 4 and 5. Photos of the finished surface are not yet available.

Lessons learned

These two projects were the first placed in the Sacramento Valley where pavement temperatures easily reach 140°F or higher. Until industry has a solution for uniform binder application in the cul-de-sacs, it is recommended a cape seal be used in place of the double chip seals for these areas with the hot summer temperatures.

Asphalt rubber (AR) products are excellent treatments for city streets as they have been used extensively in the past in cape seals. These projects did not use the standard AR specifications.



Figure 3. Scott Mills Court after slurry seal repair.

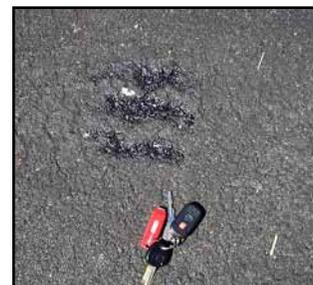


Figure 4. Soft spots in cul-de-sacs.



Figure 5. Tearing in the mat. cul-de-sacs.

Agencies continue to use warm mix asphalt rubber chip seals

By Sean Swanson, Brandon Fraser and Lerose Lane, CP2 Center

Several agencies used warm mix asphalt rubber chip seals or cape seals since our last newsletter. All of the projects are being monitored as a part of a CalRecycle project.

Caltrans placed a single conventional and warm mix asphalt rubber chip seal on State Route 150 near Ojai. The contractor was Intermountain Slurry Seal Inc. Both products were placed at night and both products are performing well. The warm mix asphalt rubber chip seal was placed at 340°F



Figure 1. Finished product near Ojai after receiving warm mix asphalt rubber chip seal.

Continued, next page



Figure 2. Close-up of pavement in Ojai after seal and sanding.

compared with the conventional asphalt rubber chip seal which was placed at 390°F. The placement at cooler temperature results in savings in both energy consumption and emissions. Figures 1 and 2 show the road and pavement close-up after treatment.

The City of Fort Bragg placed a Cape Seal using warm mix asphalt rubber chip seal for the first application followed by a Type 2 slurry seal in August-September 2011. Again, Intermountain Slurry Seal was the contractor. A number of streets in the City were treated using this technique and the results appear to be very good. The

pavements were all pre-treated with a microsurfacing leveling course prior to the placement of the Cape Seal. Photos of the completed project are shown in Figures 3 and 4.

The City of Lodi completed a cape seal in the summer of 2011. The cape seal consisted of a of a warm mix asphalt rubber chip seal followed by a Type 2 slurry. Several streets were treated and the initial performance looks very good. The

City has a history of preventative maintenance using asphalt rubber seal coats as part of their cape seals. Figure 5 shows the recently finished cape seal project done by Intermountain Slurry Seal, Inc. Figure 6 shows a close up of the 2011 cape seal coat. The City has used this type of



Figure 3. Cape Seal placed using warm mix technology in Fort Bragg, Calif.



Figure 4. Finished product of Fort Bragg, Calif.

product for a number of years, but without the warm mix chip seal. The City's Department of Public Works is satisfied with the performance of their cape seals and is planning to continue using this preventative

maintenance strategy on their streets. The CP² Center will continue to monitor and compare the warm mix cape seal to the corresponding non-warm mix product.

Summary

Agencies continue to expand their use of warm mix asphalt rubber chip seal either as a single seal coat application or in cape seals. The reduction in spray temperature lowers the emissions and saves on energy usage. The long term performance is still being evaluated.



Figure 5. Recent cape seal with warm mix seal coat and type II slurry seal.

Figure 6. Finished mat of recent warm mix cape seal.



Seeking new solutions for bridge deck repair

By Bryan Graves, Butte County, Superintendent of Maintenance Operations

Methacrylate is often recommended for bridge deck maintenance, but it is not always the most affordable or environmentally benign material for these projects. After attending a recent bridge conference and investigating many alternatives, I accepted an invitation from Tensar International Corporation to trial a safer and more efficient alternative for sealing one of our bridge decks.

The company's polymer cement surfacing product,

Endurablend™ Systems, is a formulated surface preservation system that offers superior bond strength over concrete and asphalt pavements. The product literature suggested it would deliver a skid- and UV-resistant surface with a low permeability rating. In the Northern California climate, anything that can protect a structure from moisture intrusion while resisting chemical, oil and gas contamination is a plus.

Continued, next page



Figure 1. Bridge deck before surfacing with Endurablend.



Figure 6. Completed project in August 2011

coating is looking good and performing well, with a tight bonding seal of the bridge deck. The results are promising, suggesting that finally an alternative for bridge deck sealing and preservation is available. Figure 6 shows the



Figure 2: Close-up of bridge deck condition.

Endurablend Systems is packaged as a fully blended dry mix available in 80-pound bags or 3,000-pound super sacks. It is mixed with water at the jobsite and applied at ambient temperatures in a one-step process that cures in as little as one hour. The product consists of non-asphaltic flexible formulations, so it won't break down when exposed to fuel while delivering high compression strength. These properties mean that it should last 10 years before needing additional maintenance.

It was decided to install the Endurablend Deckset™ on a 39-year-old Butte County bridge deck that needed resurfacing. As with any product, proper installation is essential for optimal results. To ensure good adhesion,

the deck surface was cleaned and prepared the day before and traffic control provided by a County crew.

On June 9, 2011, Tensor's installer, Intermountain Slurry Seal, Inc., applied a layer of Endurablend Deckset to the entire bridge deck. The product is water based and contains no harmful ingredients, so the installers did not require special safety gear or environmental precautions.

The installation was quick and efficient. The entire bridge was opened to vehicular traffic in approximately three hours. So far the 1/8-inch-thick



Figure 3. Polymer cement surfacing should be applied before deterioration becomes advanced.



Figure 4. Endurablend can be applied with conventional equipment.



Figure 5. Standard colors for Endurablend Deckset are light gray and black. The gray surface provides good reflectivity that improves nighttime visibility.



Figure 7. Bridge deck condition in November 2011.

completed project in August 2011 while Figure 7 shows it again in November 2011. Butte County plans to continue to use this decking material to help preserve their bridges.

Acknowledgements

I appreciate the support of the entire team that helped Butte County with this project. The Butte County Bridge Crew included Richard Partain, Tracy Henson, Gary Jenkins, Pete Rasmussen, Jim Durant, Roger Fuentes and Keith Atkinson. Tensor International is the manufacturing team that provided material and support from the local rep., Dennis Rogers, Nicholas Reck, the technology leader from Atlanta, as well as Keith Brooks out of the Northwest and Joe Schmidlin from Southern California. The contracting team was Intermountain Slurry Seal Inc. Doug Olsen and his team provided the equipment and labor for the installation. We also appreciate the support from Dr. Gary Hicks from the CP2 Center as well as Dr. Shakir Shatnawi of Shatec Engineering Consultants. 

CIR use in the Bay Area is increasing

Cold in-place recycling (CIR) using the “foamed process” was recently used to repair the pavement on Monterey Road in San Jose, Calif., from Blossom Hill Road to Bernal Road. The roadway is a busy, crack-riddled street that has come to represent the condition of the pavement in the region. For this project alone, the CIR technique is expected to save more than 1,400 truck trips and 10,000 tons

of material. The CIR treatment will be overlaid with an asphalt rubber pavement surface which is estimated to recycle 17,000 tires. The overall cost of the project is estimated to be \$2.4 million for a 23% cost saving over more conventional treatments. The contractor for this project was Fonseca McElroy Grinding Co., Inc. (FMG) of San Jose who has already

completed six Bay Area projects. The City of Gilroy, Santa Clara County, Campbell School District, Redwood City and Foster City also have tried this process.

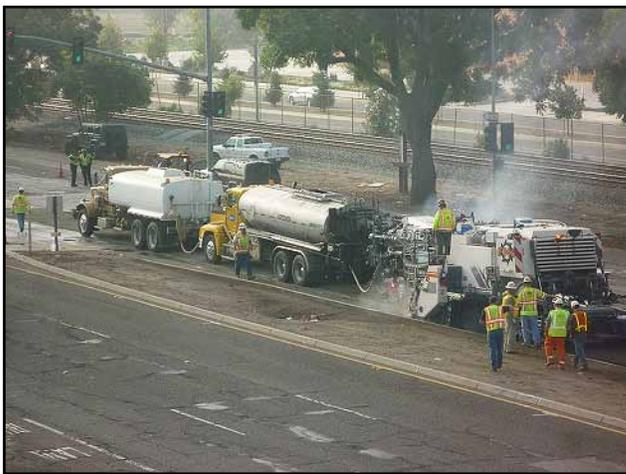
Cold in-place recycling was also used on the recently completed project on Adobe Road near

Penngrove in Sonoma County using an “emulsion process.” The project design section of two inches of RHMA over three inches of CIR saved over \$500,000 or about \$118,000 a lane mile over traditional HMA methods. Projecting that same level of savings over the other 1,000 lane

miles of candidate roads with similar pavement condition could provide over \$118,000,000 in cost savings if CIR becomes the preferred treatment method in Sonoma County. In addition to the significant cost savings, every lane mile that Sonoma County uses CIR on can remove approximately 144,000 pounds of GHG emissions over traditional



Foaming process in the City of San Jose, in 2011.



Another view of the milling operation in which the foamed asphalt is added.



Milled material being laid down and compacted

paving approaches. The recycling contractor for this project was Pavement Recycling Inc. from Southern California.

The CIR emulsion process has been used since the early 80s with the advent of recycling trains. Oregon and New Mexico were early pioneers. Dr. Gary Hicks of the CP² Center along with Dale Allen of Oregon DOT and Charlie Valentine of Valentine Construction developed mix design and QC/QA processes for CIR during this period.

The State of California has been using these processes for a number of years and its use is growing. Caltrans alone placed 24 projects during the summer of 2011 using the emulsion process throughout the State. The foaming process has also been used extensively in California. Caltrans placed its first project using this process in District 3 in the 1990s. The City of Chico, Calif., used this process on more than three projects in the mid 2000s. Both processes are very useful, but different.

The Metropolitan Transportation Commission (MTC) is promoting this concept for the Bay Area local agencies. The MTC estimates that the Bay Area will have \$350 million a year to spend over the next 25 years. That is far less than the \$975 million needed. The use of innovative techniques such as pavement preservation including in-place recycling can help stretch the limited funding available.

For more information on recycling projects in the Bay Area, contact Sui Tan at stan@mtc.ca.gov, Jack Wu at jack@fmgcoinc.com or Steve Urbanek at steve.urbanek@sonoma-county.org.



Compaction of CIR using a pneumatic tire roller.

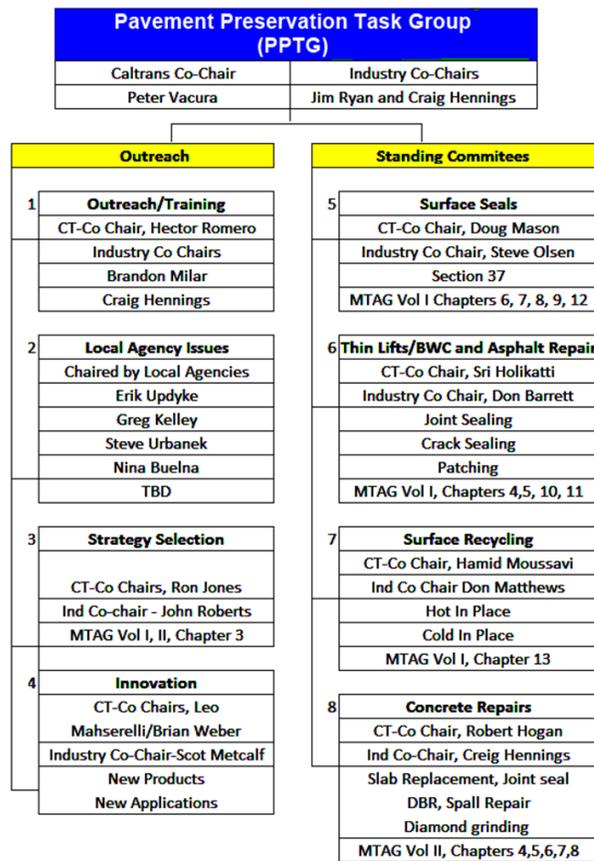
PPTG general meeting held in Alhambra, L.A. County

By Ding Cheng and Lerose Lane, CP² Center



Peter Vacura at the November 2011 PPTG meeting.

PPTG organization chart, Nov. 14, 2011



The annual pavement preservation task group (PPTG) meeting was held in the L.A. County Public Works Building in Alhambra, California on November 14, 2011. Caltrans PPTG co-chair Peter Vacura, along with industry co-chairs Hans Ho and Craig Hennings, opened the meeting with a warm welcome and self-introductions. They mentioned it has been a good year for preservation in the state and that Caltrans initiated a lot of projects in preservation including REAS, asphalt rubber chip seals, modified binder chip seals, warm mix asphalt, and over 20 cold in-place recycling (CIR) projects.

The new PPTG industry leaders were elected during the meeting. Jim Ryan was elected as the new PPTG flexible pavement industry co-chair while Craig Hennings of ACPA southwest remained as the concrete pavement co-chair. Steve Olsen was elected as the new Surface seals group co-chair. Others elected are shown in the new PPTG organization chart.

Those at the meeting acknowledged the achievements by the past PPTG co-chairs, especially Hans Ho who is stepping down from his post as industry co-chair. Hans said that he will remain actively involved with PPTG as a member. Figure 1 provides the new organization chart for the PPTG.

Caltrans co-chairs, including Peter Vacura, Leo Mahserelli, Doug Mason, Hamid Moussavi, and Robert Hogan discussed with new industry co-chairs, members, and local agencies for the future work plans. Lerose Lane and Ding Cheng attended the meeting for the Center.

Ding gave a presentation on the CP² Center research and activities while Steve Cross of the PRRC reported on their activities. Caltrans would like continue to utilize the PPTG to support the innovation and specifications of pavement preservation activities. The minutes from the meeting and the presentations can be found on the PPTG website www.cp2info.org/taskgroup.



Update on the Recycling Center at Cal Poly Pomona

Steve Cross, Executive Director of the Pavement Recycling and Reclaiming Center at Cal Poly Pomona gave an update on Center Activities at the recent PPTG meeting in Los Angeles. The Center is sponsored by Caltrans, the Asphalt Recycling and Reclaiming Association (ARRA) and individual contributions from ARRA members or Founders Circle members.

Steve Cross reported on the major initiatives of the Center including:

- Innovation and Research
- Education and Outreach
- Sustainable Pavements Toolbox

For Caltrans, they are involved in two tasks including a study of high percentage RAP and a comprehensive study of CIR projects placed in California. The high RAP study included a literature review and a survey and the final report is near completion. More than 22 CIR projects alone were placed by Caltrans during the 2011 construction season and many others placed by local agencies. The CIR study includes a performance review of eight previously completed CIR projects, construction monitoring of five CIR projects and a detailed investigation of two existing projects. This study is expected to be completed in spring 2012.

In the education and outreach initiative, the Center is involved with an update of the Basic Asphalt Recycling Manual (BARM) and the development of a virtual BARM. They are also planning on developing recycling courses covering CIR, HIR and FDR for the winter of 2012. They also produce a quarterly newsletter which can be found at www.prrcenter.org.

The final initiative, the Sustainability Toolbox, involves a help desk, a sustainability database, a technical library and much more. Essentially, it is a one-stop shop for all you need to know on pavement recycling.

For more information on these activities and the classes and more, please contact Steve Cross at steve.cross@okstate.edu or Dragos Andrei at dandrei@prrcercenter.org.





Update on Federal legislation

by Steve Healow, FHWA California Division

At long last our lawmakers are showing results, albeit mixed, on Surface Transportation Reauthorization (STR). Thanks to concerted efforts of industry groups, AASHTO and state DOTs, STR has finally advanced among Congressional committees. Activity in the Senate has taken off like a rocket while the House of Representatives remains on the launch pad. The White House is pushing 'infrastructure investment' while steering clear of STR.

The White House strategy for infrastructure investment was summarized in the president's Sept. 8 nationally televised speech to a joint session of Congress in which he asked Congress to support his \$60 billion Rebuild America Act. The proposed act is a component of the administration's \$447 billion American Jobs Act package and directs \$50 billion in transportation spending and \$10 billion in seed money for a national infrastructure bank. On October 11 the bill was voted on in the Senate where it failed to garner the necessary sixty votes to proceed. The president vowed to break the bill into several smaller derivative bills.

Committees within the Senate and House of Representatives are moving on surface transportation reauthorization although movement within the Senate is more robust. On Nov. 9 the Senate Environment and Public Works Committee (EPW) unanimously approved and forwarded a two-year STR bill "Moving Ahead for Progress in the 21st Century" (MAP-21). The bill is now awaiting action by three related Senate committees and the full Senate.

Until late September, House Transportation and Infrastructure Committee Chairman John Mica's proposed Surface Transportation bill included a 30% cut in spending below current levels to match revenue trickling into the highway trust fund. Industry groups resoundingly criticized the proposed cuts and House leadership responded by directing Mica to seek additional revenue. As this article goes to print the Committee is preparing a six year bill that would spend at or above current levels.

On Nov. 3, House Speaker John Boehner (R-OH) announced that prior to Thanksgiving he will introduce a long-term STR bill that draws upon revenues from broader offshore gas and oil exploration ventures. Rep. Boehner indicated he'd like to have the legislation passed by the end of the year.

Noteworthy progress in the Senate

On Nov. 9 the Senate Environment and Public Works (EPW) Committee unanimously approved a two-year \$86 billion STR proposal, S.1813, "Moving Ahead for Progress in the 21st Century" (MAP-21). This is the most significant bill yet proposed in the 112th Congress for STR because it has bi-partisan

support, maintains funding at current levels, consolidates existing programs and provides additional flexibility for spending.

EPW Chair Barbara Boxer (D-CA) and Ranking Member Sen. James Inhofe (R-OK) have underscored their bipartisan effort to prepare MAP-21. When the draft bill was announced in May, Boxer, Inhofe, Subcommittee Chairman Max Baucus (D-MT) and Ranking Member David Vitter (R-LA) issued a joint statement that said, in part:

"...It is no secret that the four of us represent very different political views, but we have found common ground in the belief that building highways, bridges, and transportation systems is an important responsibility of the federal government, in cooperation with state and local governments and the private sector..."

Those who wish to read MAP-21 will be relieved to learn the full draft is only six hundred pages and is available at the EPW web page. In summary, the bill:

- Reauthorizes the Federal-aid highway program at current funding levels plus inflation for two fiscal years;
- Consolidates existing programs, focuses resources on key national goals;
- Eliminates earmarks;
- Implements Performance Management wherein State DOTs and Metropolitan Planning Organizations will be held accountable for improving the condition and performance of their transportation assets;
- Expedites project delivery while protecting the environment;
- Strengthens the Transportation Infrastructure Finance and Innovation Act (TIFIA) to leverage federal dollars;
- Consolidates certain programs into a focused freight program to improve the movement of goods.
- Establishes National Goal Areas: Safety, Infrastructure Condition, System Reliability, Freight Movement, Environmental Sustainability, and Livability.

In spite of progress to date there is a larger issue which overshadows MAP-21 and most other matters before our lawmakers - deficit reduction. To refresh your memory, the July budget deal between the White House and Congress identified \$900 billion in spending cuts and established the Joint Select Committee on Deficit Reduction (a.k.a. super committee) to identify by Nov. 23 an additional \$1.2 trillion in deficit reductions over the next decade. These cuts are needed to offset the \$2.4 trillion increase in the debt ceiling. The super committee considered cuts to subsidies, discretionary programs, entitlements and closing tax loopholes

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but could not reach consensus. On Nov. 21 the committee co-chairs announced they were wrapping up their deliberations. To put this into perspective the Federal government plans to spend \$44 trillion over the next decade and the super committee couldn't agree on how to cut \$1.2 trillion or less than 3%. Consequently, \$1.2 trillion in automatic reductions, or sequestration, will occur over the next decade. Half of the cuts will be absorbed by the Department of Defense beginning in January 2013. The cuts aren't as serious as it might appear because Federal spending, including DoD, will continue to increase, just not as quickly. See Figure 1 below. Speaking against sequestration the president threatened to veto any proposed cuts to national defense or domestic spending.

Conclusions

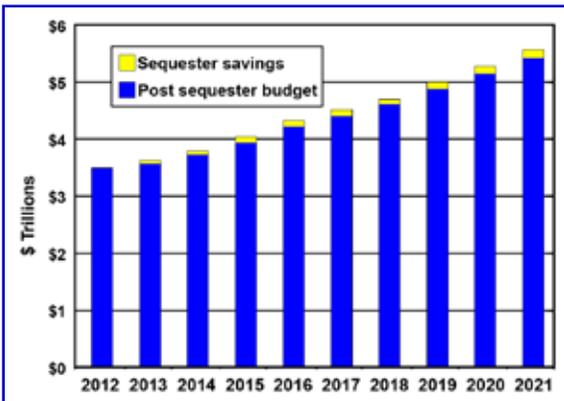
Look for the House T&I Committee to forward their version of STR to the full House soon. If both houses pass their respective bills a conference committee will seek to combine the two.

Approaching Dec. 16, look for another continuing resolution to extend SAFETEA-LU for the tenth time in twenty-six months. Congressional appropriations do not extend beyond Dec. 16, although the Federal Highway Administration has contract authority

and Highway Trust Fund expenditure authority through March 2012.

On Dec. 23 the \$1.2 trillion sequestration becomes law. With encouragement from the White House, Congress will continue the work of the super committee and try to find a way to avoid sequestration.

Figure 1. Even with sequestration the Federal budget expands nearly \$2 trillion over the next decade.



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FP² Inc Update

By Jim Moulthrop, Executive Director

News from DC

Please refer to the preceding story for a full account of what has been happening with highway legislation in Washington DC. FP² feels good about what has transpired since we have been in close communication with the EPW committee staff for some time now; but as Yogi said, "It ain't over 'til it's over." We hope to see a bill by the end of the year.

National Conference in August 2012

We continue to plan along with the National Center for the 2012 National Pavement Preservation

Conference to be held in Nashville, Tenn., the last week of August. The organizing committee is in the process of finalizing brochures announcing the meeting and completing arrangements with the hotel, the Renaissance, in downtown Nashville. The demonstration committee, co-chaired by Gene Arnold, Pierre Peltier, and Colin Durante, has planned for the demonstration of several preservation treatments and a ribbon cutting.



The technical committee, co-chaired by Roger Olson and Ding Cheng of the CP² Center, has identified seven technical tracks that run the gamut of preservation activities. Concurrent sessions will be held and

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invited speakers have been contacted to prepare and deliver presentations. The final program is expected to be completed by Feb. 1, 2012. Plans are also underway for all of the Pavement Preservation Partnerships to attend and participate in the meeting.

We are looking forward to an exciting and productive conference. Mark your calendars now and plan to attend. More information on the conference can be found at www.pavementpreservation.org.

Pavement Preservation Partnerships

The Pavement Preservation Partnership meetings held around the country this spring and fall were an excellent opportunity for practitioners to network and hear the latest innovations in the preservation industry. Plan to attend and engage in the meetings next year. Information on all the partnerships and their activities can be found at www.tsp2.org.



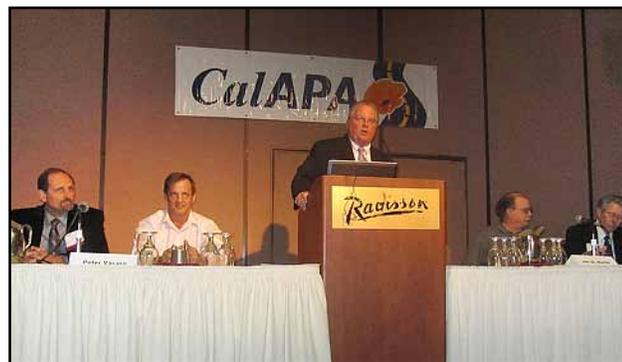
Asphalt Paving Association conferences held in Northern and Southern California

The two asphalt paving associations have held their last individual conferences as they are combining at the beginning of 2012. The first combined Board of Directors meeting is scheduled for Jan. 12, 2012. For more information on the merger, please contact Russell Snyder at 916-791-5044 or check out the story at www.californiapavements.org/unification11.pdf. Following is a brief summary of their recent conferences.

Northern California

A one day California Asphalt Pavement (CalAPA) conference was held at the Radisson Hotel in Sacramento on Oct. 27, 2011. There were about 150 people in attendance at the meeting which feature Steve Takigawa, Caltrans Deputy Director for Maintenance and Operations. He emphasized the importance of innovative strategies such as preservation, recycling, warm mix, and rubberized asphalt. Another keynote speaker, Assembly Speaker Pro Tem Fiona Ma, spoke about the importance of using more RAP in highway paving projects. Attendees from industry, Caltrans, local agencies, and academia listened to a series of presentations on pavement research, national asphalt pavement trends, asphalt rubber practice, warm mix asphalt specifications and pilot projects of Caltrans.

Dave Jones of UCPRC, Joe Peterson of Caltrans, Ding Cheng of CP2 Center, and Tom Carter of Twinning Labs formed the first interactive panel discussion on new testing methods, including Superpave



CalAPA Interactive Panel (left to right): Jack Van Kirk, Peter Vacura, Russ Snyder, Chuck Suszko, and Jim St. Martin.

Gyratory Compactor and Hamburg testing. Ding Cheng introduced the experience of the CP2 Center in using the Gyratory Compactor and Hamburg tests on a number of projects. The second panel (see photo above) answered questions from the audience on permeable asphalt, recycling rubberized asphalt and other technical questions. All of the presentations can be found at www.californiapavements.org.

Southern California

The APA of California's Asphalt Pavement Conference was held on Nov. 2, 2011 at the Ontario Airport - Doubletree Hotel. A crowd of over 180 participants enjoyed a session-opening address by Caltrans Deputy Director Steve Takigawa; the Keynote Speaker, Heritage Construction CEO Charles Potts; an update on transportation funding by Transportation California Executive Director Bert Sandman and a host of presentations by technical experts from up and down the State of California.

The one day conference also featured a small exhibition area of 24 companies that were sharing their expertise and information with the conference attendees. Copies of the conference presentations are available on the APA of California website (www.apaca.org).



Jim St. Martin, Executive Director, APACA.

Advanced surface preparation and preservation treatments for concrete pavements

By Tanya Komar, CIM California State University, Chico

The Chico State Concrete Industry Management (CIM) program has been working with industry partners to develop ideas, strategies, and field tests to evaluate the effectiveness of lithium and other treatment solutions for extending the service life of concrete pavements. The vision is to define, implement, and monitor research and develop trial projects to gain statistical data for predicting performance and life-cycle cost of concrete pavements and help fast-track these new technologies into agency practice.

Given the success of two projects in 2009, and the success of the Concrete Industry Management program at Chico State, involved companies are interested in focusing a great deal of their future testing efforts with Chico State. The first of the 2009 projects was in Chico on a private road at the A&A Concrete Supply plant and focused on older concrete pavement; the second was done in cooperation with Caltrans and Teichert Construction on new concrete pavement on Interstate 80 in the Donner Pass/Lake Tahoe area. Figures 1 and 2 show the shot blasting surface preparation and application of silicon modified lithium sealing material, respectively.

The I80 test was of high interest due to the harsh service and exposure conditions endured by pavements including heavy truck traffic, snow plows, deicing treatments, and tire snow chains. Although unpredictable weather and logistical difficulties have delayed collection of adequate data for a full technical report, the I80 test section has none-the-less

provided significant initial results from skid and surface profile tests as well as striking visual confirmation of the differences in performance between the untreated control and treated test sections through on-site evaluations by Chico State, industry, and Caltrans individuals together with 2D and 3D imaging (figures 3-6, on the next page).

At the center of the Chico State work in concrete pavement preservation are overall strategies that serve the life of concrete pavements. The Caltrans Interstate 80 pavement rehabilitation effort that extends from 11 miles east of Colfax near Alta to the Nevada State line, including 60 center-line miles (260 lane miles), began in 1995 will have cost over \$600 million once it is completed. The last phase of the rehabilitation effort covers the distance of 10



Figure 1. Shot blasting for the 2009 I80 test section.

miles from Nyack to Rainbow and is scheduled for completion in 2013. Rex Herve, a pavement engineer for Caltrans District 3, who has worked cooperatively with the research team led by Chico State, has said emphatically that “we need to find new ways to protect this investment.” Concrete pavement projects for Caltrans are typically designed for 20-40 year service lives and can be enhanced by timely and appropriate protection strategies that delay or work in conjunction with traditional surface grinding and other rehabilitation approaches that may be needed sooner in harsh environments such as Donner Pass.

The Chico team plans to work with industry to further develop a comprehensive long-term testing platform for new trial sections that will add to the information gained from the Chico and I80 tests, similar tests in Oklahoma, and related field and laboratory tests. Chico State will participate in this collaborative effort with Advanced Concrete Technologies (ADVAN), Dow Corning, FMC, Premier Construction Products, Convergent Concrete Technologies, Blastrac, TCG Consulting Group, and Iowa State University to introduce the innovation test trials and technical assessment studies for 2012 /2013 that will also include anti-scale and wear resistant treatments, micro- and macro-texturing, anti-icing and deicing chemicals, ASR mitigation, chloride ion screening, rapid patch/repair materials, and silicon joint technologies.

At the heart of the current collaborative research effort are new technologically advanced silicon modified lithium materials that offer improved performance in concrete formulations for anti-scaling, freeze-thaw protection, wear-resistance, chloride ion screening and moisture curing for new construction applications. ADVAN in collaboration with Dow Corning is pioneering the development with assistance from Convergent and Blastrac. The strength of this combined concrete pavement protection/preservation effort lies in the combination of mechanical profiling machinery to restore



Figure 2. Application of silicon modified lithium material for the I80 test section (hand-applied in test case, mechanically applied in commercial situations).

Continued, next page



Figure 3: Untreated control section of I&O test after 1 year showing surface wear (resulting in loss of skid resistance) and numerous pop-outs.



Figure 4: Photo of treated section of I&O test after 1 year showing approximately 50% improved wear and few pop-outs.

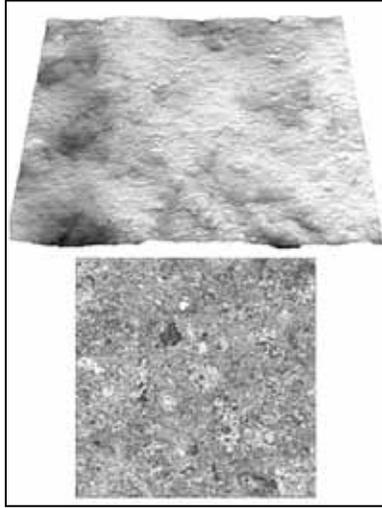


Figure 5: Untreated control section of I&O test after 1 year showing polishing and pop-outs (Top: Laser Profile 3D image, bottom: Laser Video Image)

friction levels together with the fact that lithium compounds form insoluble bonds with the free calcium in Portland cement leading to more durable pavements. Add to this the possibility of incorporating more extensive repair processes as may be needed for older pavements approaching the end of service life by many traditional standards, and this tool-box approach is an exciting advancement in sustainable concrete paving practices. As the next phase of the partnership grows, Chico State is looking forward to incorporating other synergistic technologies such as lithium acetate anti-icing and deicing technology that was developed with the South Dakota DOT.

The continuing research will be led by Dr. Tanya Komar at Chico State. Jeff Koebrick, President, Convergent Concrete Technologies, will act as project

manager for the sponsoring industry companies and work with Dr. Doug Gransberg of Iowa State to

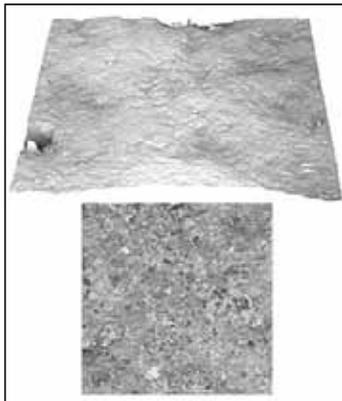


Figure 6: Treated section of I&O test after 1 year showing retention of surface friction for skid resistance (Top: Laser Profile 3D image, bottom: Laser Video Image)

define and develop the full-scale testing procedures and parameters. Specific tasks are structured as project deliverables for each respective sponsoring company, showing the percentage of the total project involvement of each partner. Each company offers specific resources (project leadership, specialized people, capabilities and resources) and relationships in place with State DOTs and other

agencies across the nation. In addition to those mentioned above, each partner company or entity has identified project leaders: Dal Hills, President, ADVAN; John Mantel, Business Market Leader for the Construction Industry, Dow Corning; Claudio Manissero, President, Premier Construction Products; Kent Barrus, Director of Research, Convergent Concrete Technologies; and Mark Hayworth, Global Vice President, Blastrac. The plan for the future includes Chico State leading the implementation of additional test sections, beginning to develop appropriate testing procedures to evaluate success of the applications, and participate in life cycle cost studies.

Overall objectives include:

- Define a series of research and development trials to gain statistical data for predicting lifecycle cost of concrete pavements for sponsored industry testing
- Determine ways academia/industry/agencies can work together to define larger concrete pavement preservation initiatives
- Examine ways to fast track and utilize the relationships between industry, academia and agencies incorporating results from Donner Pass into a full-scale pavement test with pooled resources from sponsoring companies
- Identify possible federal and association funded programs to piggy back on existing initiatives as well as share resources
- Outline next steps reviewing short-term immediate needs regarding test data from Donner Pass and long-term joint efforts with Caltrans and other agencies

Specific goals include:

- Developing a methodology for determining the optimal timing for the application of treatments and combined approaches with synergistic technologies:
 - o Shot blast treatment post new-construction and at various stages of wear
 - o Treatment over diamond grinding to restore and improve pavement surface
 - o New construction (at-time-of-placement) as an all-in-one combined moisture film-forming membrane and anti-scale, wear resistant protective treatment
- Presenting the methodology in the form of a guide specification and prediction model to facilitate the use of a variety on pavement maintenance situations encountered by agencies in extreme weather climates such as Donner Pass
- Developing a plan for use by agencies to collect the data needed to support the proposed treatment methodology
- Explore other uses such as bridge decks

Center staff participates in outreach at conferences

Center staff was very active this past quarter. They were invited to participate in a number of conferences. Some of the events they participated in are discussed below.

Rocky Mountain West Pavement Preservation Partnership (RMWPPP)

The annual meeting of RMWPPP was held on Oct. 4-6, 2011 in Reno, Nev. Gary Hicks of the Center was invited to talk of the CP² Center activities and how they might relate to this group. The session was opened by Lloyd Neeley of Utah DOT and followed by national updates from FHWA, the National Center on Pavement Preservation, and FP² Inc. One of the more interesting presentations was on the National Media campaign to promote pavement preservation that is in its beginning stages.

The opening session was followed by states reports from Alaska, Arizona, Colorado, Hawaii, Idaho, Montana, Nevada, Utah, and Wyoming. The states of California, Oregon, and Washington were not represented at the meeting.

Task force reports on specifications seals, communications, and promotion were presented on activities undertaken since the last meeting. Two additional task forces were added including one on research and one on cost effectiveness of pavement preservation treatments.

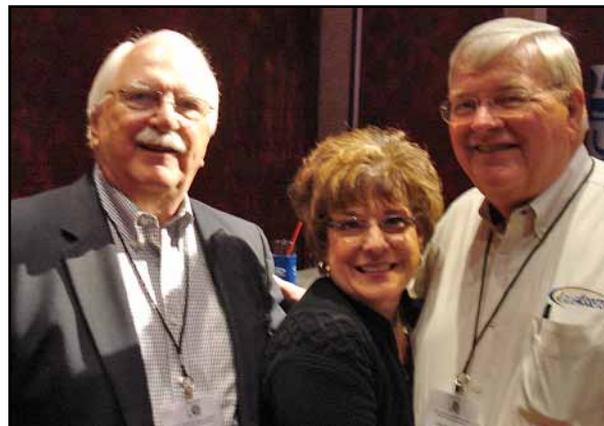
Another highlight of the meeting was a Panel Discussion of State Executives (Oregon, Nevada, and Utah) who discussed challenges facing the DOTs, types of preservation treatments used in their states, implementation challenges of introducing pavement preservation, and funding issues.

Technical presentations were provided on the following topics:



Anita Bush, Nevada DOT

Sui Tan (MTC, Oakland, Calif.) and Scott Gibson (RTC, Reno, Nev.)



Jim Moulthrop (Fugro) and Jim and Ann Edgerton (Agile Assets). Both companies are contractors of Caltrans with their Pavement Management System.

- CP² Center update – Gary Hicks
- Cost effectiveness – David Peshkin, APTEch
- Pavement preservation for Concrete pavements – Craig Hennings, ACPA-Southwest
- Pavement Preservation for Local Agencies, George Johnson, Riverside County
- Microsurfacing – Rusty Price, Intermountain Slurry Systems
- Emulsions 101 – Jack Dougherty, Paramount Oil
- HMA and WMA – Kent Hansen, NAPA
- NCAT research – Buzz Powell, NCAT Asphalt
- Fog seals – Stu Zick, Ergon
- LTAP and Pavement preservation – Pat Kennedy, City of Denver

Detailed meeting notes and all the presentations can be found on the partnership website at www.tsp2.org.

International Warm Mix Conference in St. Louis

The Second International Warm-Mix Conference was held in St. Louis, Mo., on Oct. 11-13, 2011. This conference was well attended with more than 550 people from 45 states and provinces and 24 foreign countries. FHWA Deputy Administrator Greg Nadeau and NIOSH Director Dr. John Howard kicked off the proceedings. NAPA Chairman Kim Snyder of Eastern Industries Inc., Pennsylvania, welcomed the attendees. Forty-five papers were presented in breakout sessions, covering topics from Health, Environment, and Performance to RAP and WMA. There were also 35 exhibitors with extensive information about their products for attendees to learn about many of the warm-mix products, processes, and technologies.

Continued, next page

California was well represented in the Conference by industry, agencies, and academia including the following:

- The conference was attended by Leros Lane, from the CP² Center, who presented a paper entitled "Using Warm Mix Technology to Improve Application of Asphalt Rubber in California". This paper was the result of a study funded by CalRecycle.
- Cathrina Barros, Caltrans, Office of Roadway Materials Testing, also attended the conference. She has worked extensively on warm-mix technologies for Caltrans and presented a paper entitled "Improving Pavement Preservation Life Using Warm Mix Asphalt".
- David Jones, University of California Pavement Research Center, presented a paper entitled "Key Results from a Comprehensive Accelerated Loading, Laboratory and Field Testing Study on WMA in California".
- Rongzong Wu, University of California Pavement Research Center, presented "Analyses of Laboratory and Accelerated Pavement Testing Data for WMA Using California Mechanistic Empirical Design Method".
- Adam Hand, Granite Construction Company, presented the "Contractor's Experience."

In listening to the many world wide experiences, it is clear that California is in the lead with RHMA warm-mix usage. California seems to be the only geographical area that is using warm-mix with the rubberized asphalt mixes. The NAPA website notes key takeaways from the conference: "warm-mix is the future of asphalt,

providing both construction benefits and enhanced working conditions." Conference papers are available through NAPA at their website: www.asphalt-pavement.org/index.php?option=com_content&task=view&id=613&Itemid=1228.

Pacific NW Pavement Management Conference

The 2011 conference was held in Portland, Ore. on Oct. 18-21, 2011. More than 200 people attended the meeting which was held at the Doubletree in Janzen Beach. The conference featured one day of workshops on Oct. 18, followed by presentations including a variety of pavement related topics such as:

- Pavement recycling
- Warm mix asphalts
- Designing long life pavements
- Pavement preservation
- Asset management
- Pavement management

Gary Hicks of the CP² Center was invited to give two keynote talks. One dealt with a "look into the future" on some of the technologies that should be considered by agencies in tough economic times. The second dealt with: "bringing back some older technologies" such as bituminous surface treatments and soil stabilization to maintain our roads. All of the presentations can be found on the conference website www.nwvpmma-online.org. Companies from California that were gold sponsors included Intermountain Slurry Seal, Street Saver, and Valley Slurry Seal.

Pacific Coast Conference on Asphalt Specifications (PCCAS)

The Pacific Coast Conference on Asphalt Specifications (PCCAS) held its committee meetings on Oct. 25-26 in Reno, Nev. Roger Smith represented the Center at the meeting. The PCCAS (aka the User-Producer meeting) provides an opportunity for representatives from the state DOT's and asphalt material producers to work towards unified regional asphalt specifications. There topics of the two committees are noted below.

The **paving asphalt committee** heard updates on the following:

- Adapting Superpave tests for use with asphalt rubber binders
- Results of accelerated rut testing (via HVS) on rubberized WMA by the Pavement Research Center at U.C Davis
- Round robin testing of Superpave binders involving 11 labs throughout the Pacific Coast region
- State DOT reports on their use of warm mix asphalt (WMA). Caltrans appears to be taking the lead role.

The **recycling committee** heard reports from the state DOTs . The primary discussions centered on the percentage of RAP allowed in new HMA. As in California, Washington contractors are requesting that higher percentages (e.g. 40%) of RAP be allowed. Cold in-place (CIR) recycling is being used more and more. Caltrans did 24 CIR jobs in 2011. Nevada DOT continues to use CIR as a pavement maintenance tool.

Alaska Asphalt Summit

The 2011 Alaska Asphalt Summit was held in Anchorage, Alaska on Oct. 31 and Nov. 1, 2011. More than 200 attendees from industry, agencies and academia attended the event. The summit offers a chance for professional, technical, and research related presentations and discussions on current issues and new techniques in asphalt pavements. Dr. Gary Hicks was invited as a keynote speaker on the topic of pavement preservations. Other topics covered included:



- Pavement/materials research
- Pavement preservation
- Warm mix asphalt
- Base Course Stabilization and Full-depth Reclamation
- Foamed asphalt base using 100% reclaimed asphalt pavement
- Pavement surface texturing
- Continuous thermal imaging during paving
- Construction practices including placement, longitudinal joints and intelligent compaction

The summit is sponsored by AUTC, the Alaska Department of Transportation and Public Facilities (ADOT&PF), and various private industry partners. All of the presentations can be found on the conference website. www.dot.state.ak.us/stwddes/research/pavement_summit.shtml.

Fifth Rubber Modified Asphalt Conference

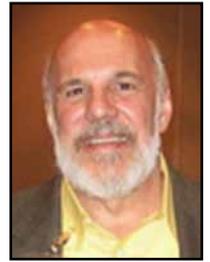
The Fifth Rubber Modified Asphalt Conference was held in Austin, Texas, on Nov. 3-4, 2011. There were about 100 people attending the conference. FHWA expressed its support to the usage of recycled waste tires in pavement. There is a Sustainable Highways Self-Evaluation Tool, INVEST, which has recently been developed by FHWA and the trial version is on their website, www.sustainablehighways.org/. During the meeting, people exchanged knowledge on the different types of rubber modified asphalts including field blend, terminal blend, and dry process.

Dr. Ding Cheng of the CP² Center was invited to give a presentation on the life cycle cost analysis based on the California experience. This work is being done under a CalRecycle project. Based on the LCCA results using the Caltrans' RealCost software, rubberized asphalt concrete pavements were more cost effective than the conventional asphalt concrete for most cases. However, projects in different locations and/or districts showed different percentages of savings compared with conventional asphalt. It is recommended to use the LCCA as a tool to plan asphalt rubber projects.

Other presentations showed that asphalt rubber projects were effective in different States and Countries. Cold region practices were shared at the conference from agencies including Sweden, Alaska, and Canada.

John D'Angelo gave some preliminary results of

using a Cup and Bob instead of parallel plate to conduct PG grading of asphalt rubber binder using Dynamic Shear Rheometer. Generally, the asphalt rubber increases the viscosity of base asphalt. Therefore it can increase the high temperature grade of the asphalt binder. The Center will also be doing some work using this equipment in the new future now that they have received the necessary equipment.



John D'Angelo

2011 Arizona Pavement/Materials Conference

The 2011 Arizona Pavement/Materials Conference was held in the Memorial Union of Arizona State University in Tempe, Ariz. on Nov. 15-16. There were more than 300 attendees from State and Local Agencies, Industry, and Academia. Presentations covered a wide range of topics including Mechanistic-Empirical Design, AASHTO performance testing, FHWA warm mix asphalt perspectives, and research results from California UCPRC, Texas TTI, pavement rehabilitation and preservation.

Ding Cheng was invited to give a presentation on the civil engineering applications of Tire Derived Aggregates (TDA) based on a CalRecycle study. The

presentation generated a lot of interests from the conference attendees. Nationwide, there are about 300 million waste tire generated each year. TDA has unique properties such as light weight, high permeability, durable, low thermal conductivity, which can have a variety of civil engineering applications including light-weight fills, retaining wall back fills, vibration damping, and landfill applications.

California is the leading state to use the TDA in civil engineering applications. Civil engineering has a high potential to recycle and reuse a lot of waste tires. Conference presentations can be found at <http://pavement.engineering.asu.edu/>

International Conference on Managing Pavement Assets (ICMPA)

The eighth international conference on managing pavement assets was held in Santiago, Chile on Nov. 15 –19, 2011. Sui Tan of the Metropolitan Transportation attended this conference to present a paper co-authored with Ding Cheng and Gary Hicks.

Continued, next page



Conference organizers Ali Zareh, George Way, Krishna Biligiri, and Ding Cheng at the 2011 Arizona Pavement/Materials conference.



Overview of poster sessions at the ICMPA

Poster sessions at the ICMPA

The conference was sponsored by the Pontificia Universidad Católica de Chile and the Transportation Research Board along with many other industry sponsors. The main topics of the ICMPA 2011 included:

- Performance Based Private Public Partnership (PPP) Projects
- Sustainable Design, Construction and Operation of Pavement Assets
- Tools to Improve the Decision-making Process in Pavement Assets
- Preservation and Maintenance of Pavement Assets
- Management Practices and Applications
- Pavement Performance Modeling, Key Performance Indicators and Implementation
- Special Requirements/Situations

More information on the conference can be found at their website www.icmpa2011.cl.

Fifth International Pavement Maintenance Technology Congress



More than 600 participants attended the Pavement Maintenance Technology Congress meeting in China.

Ding Cheng was invited to participate in this meeting held Dec. 1-3 in Xiamen, China. He gave a presentation on pavement preservation for asphalt pavement as practiced in California. More than 600 attendees participated in this meeting to hear

international speakers discuss a variety of issues related to pavement maintenance. Sponsors known in the USA included Mead Westvaco, Crafcro, Wirtgen, Shell Bitumen, Akzo Nobel, and Dow. ISSA and ARRA assisted with organizing the meeting. More on the meeting as well as the conference presentations can be found at www.emulsionchina.com/welcome_en.html.

Plan to attend the 25th Anniversary Meeting of the CCSA

Next year will be 25th Anniversary of the California Chip Seal Association. We take this time to recognize the dedication of all the Industry Member Organizations, their volunteer employee participants and the myriad government agency and academic institution contributors who have made this first 25 year effort an invaluable tool for everyone connected to the cause of Pavement Preservation.

With that in mind, we embark on the next 25 years with a clear vision and a dedication to helping promote the use of and increase the informational resources available to the Road Building/Pavement Preservation segment of Industry, Academia and Public Agencies.

We invite you all to attend our annual Pavement Preservation Work Shop/Conference on Feb. 8 and 9, 2012 in Sacramento, Calif. at the J Street Holiday Inn. With an exciting, entirely new format, this event will begin our next 25 years of planned, renewed dedication to our stakeholders.

Kicking off the next quarter century of the CCSA will be our Keynote Speaker, Larry Galehouse, a renowned expert on the advancement of Pavement Preservation and the Founder of the National Center for Pavement Preservation. He will share with us his insight gained from years of experience at the Michigan DOT and as a Chairman and leading member of many of the Federal and national boards and committees on pavement preservation.

This workshop will encompass many new, and what we are sure will be information-packed sessions and round table discussions. An afternoon will be dedicated to breakout sessions with hands on demonstrations of materials testing, test equipment, test result analysis, and correct sampling procedures for materials (liquids/aggregates) used everyday in the treatments that we all depend and rely on to keep our roads in good shape.

Academics from the University of Nevada, Reno Superpave Center, Cal State University, Chico CP² Center, and the Lawrence Livermore Lab will present analysis of surface treatments, new innovative processes being used here and around the world and Cool Pavements. There will be Round Table discussions by leading Industry and Agency representatives on the treatments we use every day. For more information on the conference and registration, please refer to the CCSA website www.chipseal.org.





CP² Center's Ding Cheng was joined by Professor Huang Songchang at the Fifth International Pavement Maintenance Technology Congress in Xiamen, China this month (see story on the previous page).



The Center is requesting your input

We always appreciate input from our readers. Please provide your input on the following to Ding Cheng, Director of the CP² Center at dxcheng@csuchico.edu.

Let us know if you have any articles you would like to include in future newsletters. We are always interested in articles, success stories, lessons learned, or innovations related to pavement preservation.

- What kinds of training would you like the Center to provide?
- Would you like to see other pavement preservation topics covered in the future issues of our newsletter?
- Letters to the editor on articles that have appeared or on pavement preservation in general are welcome.

Upcoming events

January 2012

- 22 – 26, Transportation Research Board Meeting, Washington, DC www.trb.org
- 23 – 27, World of Concrete, Las Vegas, Nev., www.worldofconcrete.com.
- 24 – 27, ISSA Slurry System Workshop, Las Vegas, Nev. www.issa.org.
- 25, Joint Sealing Workshop, Las Vegas, Nev. www.sealnoseal.org.

February 2012

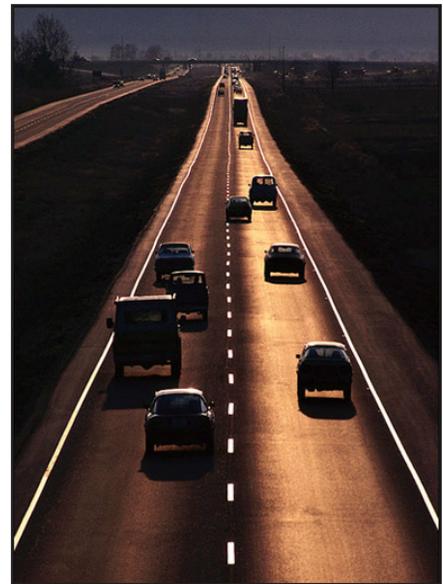
- 8 – 9, California Chip Seal Annual Meeting, Sacramento, Calif. www.chipseal.org.
- 21 – 25, AEMA, ISSA-ARRA annual meeting, Bonita Springs, Fla. <http://www.arrya.org/>.

March 2012

- 1 – 5, NACE annual Conference, Lexington, Ky. www.nace.org.
- 13 – 15, World of Asphalt 2012, Charlotte, N.C. www.worldofasphalt.com.
- 16 – 18, Ninth National Conference on Transportation Asset Management, San Diego, Calif. www.trb.org/conferences/assetmanagement2012.

April 2012

- 1 – 4, AAPT Annual Meeting, Austin, Texas www.asphalttechnology.org.



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