



# RPA NEWS

Vol. 3, No. 2

Dedicated to encouraging greater usage of high quality, cost effective asphalt pavements containing recycled tire rubber.

Summer, 1999

## Rubber roads rising in the east

### New England states join the growing number of Asphalt-Rubber users

All States Asphalt of Sunderland, Massachusetts, the lone RPA member on the eastern seaboard, is spreading the word and the rubber throughout the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York thanks to the tireless efforts of Paul Montenegro, special projects manager.

Montenegro said the primary use has been Asphalt-Rubber stress absorbing membranes and interlayers (SAM and SAMI) at the municipal level. However, several state DOTs are beginning to use the material in hot mixes as well as spray applied membranes.

He said the Asphalt-Rubber market has been growing steadily but has basically gone unnoticed as most of the industry's attention is focused on the large states, such as Texas, and the southwestern states of Arizona and California.

All States Asphalt, which has plants in three states and three affiliate companies, started its Asphalt-Rubber division in 1994. Since then, it has gained a reputation as an innovative contractor, willing to tackle unusual projects.

This includes the placement of an Asphalt-Rubber chip seal (SAM) on a bike path on the narrow bank of the historic Windsor Locks Canal in Connecticut last year.

The project, which was featured in *New England Construction*, consisted of resurfacing the narrow tree-lined bike path running between the canal and the Connecticut River with a durable material which would discourage skateboarders and skaters.

An Asphalt-Rubber chip seal was



*No room to spare - Resurfacing the bike path along the Windsor Locks Canal in Connecticut required careful planning by All States Asphalt and New England Emulsions. The contractors are leading the way to increased use of Asphalt-Rubber in the east. Photo courtesy of New England Construction editor Paul Fournier*

chosen for the job. But getting equipment to the site presented a "logistical nightmare," according to Steven Francois, manager of the firm's Northeast Pavement Division.

Originally a horse tow path for the canal built in 1828, it was used as a bridle path before becoming a bike path in 1976.

New England Emulsions, an All States Asphalt affiliate, produced the Asphalt-Rubber binder for the spray applied chip seal. Since a distributor truck was too large for the pathway, the Asphalt-Rubber membrane was spray applied with a Crafc

wand normally used for crack sealants.

A pickup truck had to back up the narrow path to discharge stone into a 10-ft wide spreader. The truck had only inches to spare on either side of the steep embankments that led to the canal on one side or the river on the other.

Thanks to Yankee ingenuity, All States Asphalt and New England Emulsions provided a solution. For information on other Asphalt-Rubber solutions for all pavements, call Montenegro at 800-343-9620.



# RPA

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## Members on the move

**Ross Kashiwagi**, RPA secretary, has been named plant supervisor for Granite Construction's Palmdale operation. His new address is P.O.Box 902500, Palmdale, CA 93590-2500. The phone is 661-533-0145 and the e-mail address is rkashiwagi.granite@mci.com.

**Mark Chalfa** has been appointed to replace Jay McQuillen as the RPA board representative for Granite Construction. He recently moved from Granite's San Diego office to Palm Springs where he is Asphalt-Rubber manager. His address is 38000 Monroe St., Indio, CA 92203 or by e-mail at mchalfa@granite-socal.com.

**Murray Quance** has joined BAS Recycling as senior vice president. He replaces Mike Harrington on the RPA board. His address is 1400 North H St., San Bernardino, CA 92405-4316. The phone is 909-383-7050 or e-mail at CMQBAS@aol.com.

**Michael Riley** has replaced Dick Miller on the RPA board from All States Asphalt. His address is P.O.Box 91, Sunderland, MA 01375 or e-mail at asphalt@allstatesasphalt.com.

**Jeffrey Smith**, RPA past president, has formed a consulting company, Modified Asphalt Technologies, Inc. He serves a variety of clients in both the tire recycling and Asphalt-Rubber industries. His address is PMB 185, 1106 N. Gilbert Rd. #2, Mesa, AZ 85203. His phone is 480-962-4401, mobile phone is 602-768-4420, fax is 480-890-8385 or e-mail at jsmith@consultant.com. His Internet site is www.modified-asphalt.com.

**Randall England**, formerly of CEI Enterprises in Albuquerque, has joined the marketing and sales department of PolyTek Rubber and Recycling. He will work with Fred McWenie to develop the asphalt market. You can reach him at 6245 N. 24th Parkway #202, Phoenix, AZ 85016. Phone is 602-840-2266.

**Wayne Silvia** is the new RPA treasurer. He is president of Silvia Construction, Rancho Cucamonga, Ca.

## New RPA Members

### DackRec AB

DackRecAB, a tire shredder in Malmo, Sweden, has joined the RPA as an associate member.

The company was started in 1993. It has just opened a new plant for crumb rubber production.

The company representative is Pehr Malmstrom, managing director. You can contact him at Ljusterogatan, Malmo, 21124, Sweden. He can be reached by phone at 011-464-093-7630, or by fax at 011-464-093-7637. His e-mail address is pehr@malipp.se

### Unix Rubber, Inc.

Unix Rubber, Inc., a manufacturer of Asphalt-Rubber binder in Seoul, Korea, has joined the RPA as an associate member.

The company was founded in 1997 to make Asphalt-Rubber binder under the Unix ARC name. It is working to promote tire recycling and crumb rubber production.

The company representative is Choong Hee Won, president. You can contact him at 506 Samyeon Bldg 315-1, Seongsuska-3 dong., Seongdong-ku, Seoul, 133-120, Korea. He can be reached by phone at 011-82-2-461-5333 or by fax at 011-82-2-461-7723. His e-mail address is rubber@unixrubber.com.

## RPA phones get new area code

The RPA office will be in Arizona's new 480 area code. Currently the former 602 area code or the new 480 area code will both work in reaching the RPA office.

The new area code becomes mandatory after September 1. Please change your records.

Voice: 480-517-9944. Fax: 480-517-9959.



# Gene Morris, McDonald's mentor

As the story of Asphalt-Rubber unfolded in the 1960's, many referred to its inventor, Charles McDonald, as the *father of Asphalt-Rubber*. But McDonald, a City of Phoenix engineering supervisor, may never have moved his material beyond the city limits and the *Band-aid* patch stages of 1964 and 1965 had he not had a powerful mentor at the state DOT level.

That mentor was Gene Morris, described by some of his former employees, like George Way, as the *idea man*. Way, the ADOT pavement section engineer, worked for Morris when he started with the department 30 years ago. He is now considered to be an international Asphalt-Rubber authority because of the vast knowledge gained from working with Morris.

"Gene always challenged you to investigate new things and Asphalt-Rubber was one of the new things he challenged me to investigate," said Way.

When McDonald was trying to make his patch concept work for an entire pavement, Morris was the senior resident engineer for the state DOT. Because Morris is the type of engineer who is always ready to try a new idea, he and McDonald soon teamed up to work on developing this promising sticky, rubberized asphalt binder into a full fledged paving product. Not only did they improve the product, they worked with equipment manufacturers to build the blending units and distributor trucks that would handle the viscous material.

Using scrap tires was not their goal. The addition of crumb rubber from scrap tires was to improve the properties of the asphalt by making it more flexible and resistant to aging.

With Morris, who became director of the Arizona Transportation Research Center in 1978, as his mentor, McDonald had an opportunity to quickly share his ideas with the rest of the country. Working through municipal engineering organizations would have taken far too long and probably failed because most material research is done at the state and federal levels.

By having a nationally known engineer from a state agency share his experiences and research with other states, the material was brought to national attention very quickly. In fact, it led to the \$1.1 million FHWA Demonstration Project #37 *Discarded Tires in Highway Construction* in the mid 1970's in which 35 states were contacted and contracts



were let for 43 projects around the country.

The projects included 16 Asphalt-Rubber chip seals, 23 interlayers, three bridge deck seals, and one embankment stabilization.

Long after McDonald retired from public service, Morris kept up his work with Asphalt-Rubber. Even after his retirement from ADOT in 1983, he shared his expertise with a variety of private companies, including Western Technologies and International Surfacing. To this day, Morris serves as a key member of the RPA Technical Advisory Committee and keeps abreast of the latest advances in the industry, traveling throughout the world.

On a recent trip, he gave a 90-minute presentation to DOT officials in Nova Scotia, then traveled by air and rail to Kingston, Ontario where he conducted the workshop summarized on page three the following day.

Morris received his engineering degree at the University of Arizona and has pursued graduate studies in mathematics, geotechnical engineering, pavement design, and statistical methods at Arizona State University. He has authored nearly 100 papers and has served on numerous panels for national associations including TRB, AASHTO, NCHRP, and the FHWA.

Morris was recently awarded a lifetime membership in the Association of Asphalt Paving Technologies (AAPT) and is a fellow in the American Society of Civil Engineers. He is also a member of ASTM, the American Concrete Institute, and the National Society of Professional Engineers.

In 1972, Morris was named *Engineer of the Year* by the Arizona Society of Professional Engineers and in 1982, he received the esteemed W. J. Emmons Award from AAPT.

# Morris' Presentation

in Kingston, Ontario, Canada  
an historical timeline

**1963-1964** The development of mixtures of asphalt and rubber to achieve an elastomeric material.

**1964-1965** The development, testing and patents of the "Band-aid" patch.

**1966-1967** Slurry seal applications. Two major faults. First, the limited time for the reaction of the asphalt and the rubber required asphalt temperatures of 450° F plus. Second, the system worked for flat pavements, like airfields, but was not practical for highway structures where some rutting is nearly always present. The first contract by the Arizona DOT was awarded at this time, a short section of U.S. 80 in Phoenix.

**1967** The Arizona DOT placed a seal coat application on freeway interchange ramps in Phoenix. Although these pavements were in an advanced condition of failure and scheduled to be reconstructed, some portions of this project were still in use 20 years later.

**1968** The first Asphalt-Rubber system placed as a interlayer was included in a project on Interstate 40 east of Winslow, Arizona. The project was sponsored by the National Cooperative Highway Research Program to study reflective cracking in overlays. Eighteen other types of treatment were included in the project. The performance of the Asphalt-Rubber interlayer was far superior to all other treatments. The term "stress absorbing membrane interlayer (SAMI)" was introduced to describe the system.

**1973** Arizona DOT recognized that cracked pavements on high-speed highways also required improvements in ride quality. Its research sections included open-graded asphalt surface courses (plant mix seals) with crumb rubber added dry in the pug mill. These sections were not effective in controlling reflective cracking. Another section consisted of placing an under-asphalted open-graded mix, half-inch thick, then flushing in an Asphalt-Rubber binder. The quantities of the spray application was .30, .40, and .50 G/SY.

This system was placed over an old PCCP and served for over 15 years before the pavement was rebuilt in conjunction with a major redevelopment. Of special interest

(continued on page 5)



# Forecast 99

From the January issue of *Scrap Tire News*:

**“Keep your eye on the Rubber Pavements Association in 1999 as this revamped industry group continues its educational blitz to get the word out about better performance, quieter ride and longer life of Asphalt-Rubber paved roads. And don't be surprised if this comeback technology gets a nod from the Clinton administration.”**

**RPA News editor's note: Mr. President: nod yes. Mandate: no**

## 26 in 17 months

# RPA workshops

Starting in April, 1998, the RPA kicked off an intensive Asphalt-Rubber workshop program for public agencies that has taken its crew of directors, advisors, and staff from the California coast to the shores of South Carolina with stops in Arizona, Nevada, Tennessee, and Texas.

RPA also sent technical advisors to presentations in Georgia, Kentucky, Oklahoma, Canada, and Belgium.

The California program began with four training seminars for Caltrans personnel and included three regional workshops for local agencies funded by the Los Angeles County Rubberized Asphalt Concrete Technology Center and the California Integrated Waste Management Board.

In the fall, RPA made its first foray into Texas with a workshop for TxDOT personnel in the Austin area.

This year started with a 17-country International Symposium in Arizona. It was followed by two more local agency workshops in California and three programs in Arizona, involving Phoenix, Tucson, and Flagstaff. The Flagstaff session required traveling in a rare spring storm that dropped 30 inches of snow in the state's high country.

In spring, RPA focused again on Texas with workshops in Houston and San Antonio. The association also sent speakers to Nova Scotia and Ontario in Canada and to the annual meeting of the Nevada APWA.

By May, the RPA was in Columbia, South Carolina where it cosponsored a day-long seminar for DOT and state contractors.

*(continued on page 6)*



South Carolina - Workshop speakers included (l-r): Mark Belshe, FNF Construction; Ross Kashiwagi, Granite Construction; Larry Smith, Florida; Donna Carlson, RPA; K. C. Evans, TxDOT; George Way, AzDOT; and Robert Erdman, Maricopa County (Az) DOT.



Above, Mike Eubank, Eubank Asphalt Paving & Sealing, describes the thickness of the Asphalt-Rubber on a section of U.S. 70 near Nashville. The completed project is seen below.



Above, Ted Campbell, South Carolina Department of Commerce, left, talks with Larry Smith, RPA technical advisor, at the South Carolina program. Below, Gary Hildebrand, Caltrans Maintenance, addresses a California workshop.





## Winters gets “Pioneer Award”

Bob Winters, president of Atlos Rubber, Inc. and first vice president of the RPA, has received the Pioneer Award from the International Tire and Rubber Association (ITRA) at its annual dinner in June.

Winters founded Overflex Corp., which developed the commercial application of the “McDonald Process” for Asphalt-Rubber. He is the second generation leader of Atlos Rubber, a leading producer of high quality rubber products founded by his father in 1939.



Winters was also a founding member of the Asphalt Rubber Producers Group and served as ARPG president for four years. He has been a leader of RPA since its formation and serves on the Board of Directors and the Executive Committee.

Winters is also a member of the Rubber Division of the American Chemical Society, the Los Angeles Rubber Group, and several other organizations.

## Gene Morris historical timeline

(continued from page 3)

was the improved performance with the higher rates of application.

**1975** Two important projects were placed this year. The first was to rehabilitate four miles of badly cracked PCCP on I-40 west of Flagstaff, Arizona. Flagstaff is at an elevation of 7,000 feet, receives an average of 100 inches of snow annually, and has temperatures as low as -30° F. The system consisted of a half-inch leveling course, an Asphalt-Rubber interlayer, and a half-inch open-graded surface course.

This project served for over 12 years. More importantly, it attracted the attention of Carl Monismith and his graduate student, Nick Coetzee, who conducted an analysis of the system to determine why it performed so well. This was the first rational analysis that demonstrated the behavior of low modulus, elastic materials.

The analysis concluded that overlay thickness over low modulus interlayers was not a significant factor in the magnitude of stress at the bottom of the overlay. This behavior has since been confirmed by others.

The other major development was the first use of reacted Asphalt-Rubber as the binder in a plant mix. The project was on U.S. 87 north of Phoenix. The system used as an open-graded half-inch plant mix surface course with binded contents of over 8%. Once again the system performed beyond expectations.

**1989** One other system was developed independently by the City of Phoenix and the Arizona DOT. This is similar to the stone mastic system that has been successfully used in Europe. The mix is designed for rock-to-rock contact, a high VMA, and binder contents in the 8 to 9% range. Final voids are in the 3 to 5% range.

The systems developed over the past 30 years plus consist of:

*Asphalt-Rubber seal coat (SAM)*

*Asphalt-Rubber interlayer (SAMI)*

*The three-layer system (a SAMI modification)*

*The open-graded Asphalt-Rubber hot mix with 9 to 10% binder*

*The gap-graded Asphalt-Rubber hot mix (3 to 5% final voids and 8 to 9% binder)*

Using these developments, thousands of miles of successful highway projects have been constructed in California, Arizona, and Texas. In the 1980's, California placed 32 evaluation projects to determine design methods, performance, and costs. As a result, Caltrans has officially adopted design procedures that basically result in a 50% reduction of overlay thickness.

Recent tests by the heavy vehicle simulator has not only verified the adequacy of this design, but has suggested that a reduction of overlay thickness to one-third is justified.

In Arizona, over 1800 miles of thin overlays have been constructed in the last five years. Many of these projects are on urban freeways in Phoenix and Tucson. A large number of projects have been constructed in the colder climate areas of the state.

The important development from this work, and one that has been overlooked, is that pavements incorporating low modulus, highly elastic binders behave differently than the normal asphalt concrete. Present design methods do not recognize the elastic factor in mixture analysis or structural evaluation.

With consideration of this vital material characteristic, major economic benefits are possible, both in terms of costs and long-term performance.

Gene can be reached at 520-772-3055.



ITRA panel - At the ITRA in Tennessee (l-r): George Way, pavement section engineer, AzDOT; Dennis Cook, director of operations, TnDOT; Mark Belshe, FNF Construction and RPA president; Donna Carlson, RPA executive director.



# President's message to members

by Mark Belshe

## It's time to give back

Frequently, in our daily progress of work, we forget how far we have come. Today's Asphalt-Rubber industry barely resembles the collection of dedicated individuals who never gave up believing that this product had a bright future.

It was through the determined leadership and vision of men like Bob Winters and Charles McDonald that the diversified industry we enjoy today has become possible. Having just returned from the ITRA Expo in Nashville, we were very gratified to see Bob recognized by that organization with its prestigious *Pioneer of the Industry* award.

Bob, in typical fashion, delivered a very touching, heartfelt acceptance speech that made all of us proud to be associated with him. The excitement and interest in Asphalt-Rubber we saw there has truly become global and it drove home the point with me that we need to foster the next generation of leadership. The question that comes to mind then is where will this industry find its next leaders?

As a President's Initiative, I am very proud to announce a new RPA program designed to foster in the future the kind of leadership we have enjoyed in the past. The new program, FLARE, stands for Future Leaders in Asphalt-Rubber Engineering.

Under FLARE, RPA members will be encouraged to contact the local universities and engineering schools in their immediate service area. The RPA staff is preparing a 30-minute PowerPoint presentation designed to introduce engineering students to the uses and benefits of Asphalt-Rubber.

It is hoped that individual members will take time from their busy schedules to drop by the school and make this introductory presentation. We expect a receptive audience in student chapters of ASCE and other student organizations.

The centerpiece of the FLARE program, however, will be the establishment of the Charles McDonald Memorial Scholarship Fund. Although we expect it may take nearly a year to adequately fund this, we hope to start awarding scholarships as early as next spring.

Administered through the existing

scholarship offices of the various universities, this fund would grant scholarships in amounts of \$1,000 to eligible juniors and seniors in civil engineering or related fields. Any RPA member interested in becoming involved in the administration of this fund should contact me.

The payback to the industry for FLARE will be immediate and substantial. We will have the opportunity to introduce future members of our industry to Asphalt-Rubber, giving them a background in the product before they ever show up for that first job.

That student sitting in the front row while you are making the presentation may be next year's prospective employee or the new inspector on your job next summer. We have all found a satisfying and rewarding career associated with Asphalt-Rubber. It's time we started to give back something so that the future remains bright. It's time to do it with FLARE.

And Bob, thanks.

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## RPA Workshops

(continued from page 4)

Other sponsors were the state DOT, Department of Commerce, and Department of Health and Environmental Control. The next day a workshop was held for counties and cities in the state.

In June, RPA returned to Tennessee to conduct a workshop at the International Tire and Rubber Association's annual meeting and a bus tour of an Asphalt-Rubber project just outside of Nashville.

That is being followed by a four-day tour of Asphalt-Rubber projects in Southern and Northern California the week of July 19 sponsored by RPA and Caltrans.

RPA workshops are typically a six hour format with two breaks and lunch. They can be tailored to fit an agency's specific needs.

For a sample agenda and speakers list, contact the RPA.

## Sacramento County, CA ready to take lead

The Sacramento County Transportation Division has been aggressively developing an Asphalt-Rubber (RAC) program for a decade. It began with a 1989 test section, launched with rubberized overlays on arterial and thoroughfare roadways.

The average annual tonnage has been about 14,700 since 1991, said Theron Roschen, senior civil engineer. This year, the county is diverging from its traditional treatment of a chip seal with a slurry on residential streets to a 0.1 ft. thick rubberized overlay.

It will also place 1.3 million square feet of rubberized chip seal on rural roads. The combined programs now total 79,600 tons of RAC.

The county has sponsored sound comparison studies between Asphalt-Rubber and conventional overlays. It has compared noise reduction from pre-construction to post-construction and to 16 months later. Generally, a sustained reduction of 5 to 7 dB was found for RAC, while conventional overlays recorded a reduction of only 2 dB. The results have eliminated the need for a sound wall for RAC pavements.

Another study comparing noise after three years is being conducted by Bollard & Brennan, Inc. (ph 916-660-0191). Results should be available soon.

The county is also working with the California Integrated Waste Management Board (CIWMB) to become the Northern California RAC Technology Center. This involves development of a co-op RAC program that can be shared with neighboring counties and cities.

If certain tonnage targets are met, the CIWMB could provide a bonus for distribution to participating agencies to offset the cost of using recycled tire rubber. The agencies would also get RAC marketing assistance.

The county has reached an agreement with the CIWMB and Lewis Homes, a subsidiary of Kaufman & Broad, to pave the streets of the former Mather Field military base with Asphalt-Rubber. This presents a real win-win situation for the redevelopment of the closed base, opening it up to residential and commercial use and removing tires from the waste stream. Now that's real integrated waste management.



## Research 99

Following an aggressive agenda laid out in its second strategic planning session, the RPA board of directors has approved three research projects and a \$5,000 grant to NCAT for graduate student research in FY 1999. The total appropriated for the projects represents nearly 43 percent of the association's 1999 budget.

The research approved includes a "Quality Control Plan" that will be developed by Drs. Gary Hicks and Jon Epps in cooperation with the RPA Asphalt-Rubber contractors. The "Development of a Mechanistic Overlay Design Method" for Asphalt-Rubber hot mixes includes the "Influence of Aging on Fatigue Behavior" on Asphalt-Rubber hot mix gap-graded (type II binder) and California dense-graded asphalt concrete mix.

The mechanistic design research, which is a two-year study, will be conducted by Consulpav International principals Dr. Jorge Sousa and Dick Stubstad with assistance from Professor Jorge Pais and Dr. Manual Bronstein, University of Minho.

Cooperative support will be provided by George Way, AzDOT, and Dr. Shakir Shatnawi, Caltrans.

The RPA Technical Advisory Committee will monitor the results and has advised RPA to submit them to the NCHRP 1-37A for inclusion in their 2002 Pavement Design Guidelines.

The University of Alaska will study the fatigue life comparison with samples from the same materials used in a 1990 study conducted by Dr. Lufti Raad, director of the Transportation Research Center at the University of Alaska in Fairbanks.

The original study consisted of flexural fatigue tests on ARHM GG and DGAC to consider the number of repetitions to the failure of each material. It concluded that ARHM GG demonstrated superior performance over the conventional mix.

The follow-up research will see what results will be obtained from 10-year-old samples.

*A report on the original study, A Comparison Between Conventional Asphalt Concrete Dense-Graded (CAC DG) and Asphalt-Rubber Hot Mix Gap-Graded (ARHM GG) by Lufti Raad, Stephan Sabaoudjian, University of Alaska, and John Corcoran, Manhole Adjusting, Inc., is available from the RPA library.*



Arizona Governor Jane Dee Hull and George Way, pavement services engineer for the Arizona Department of Transportation.

## Governor supports A-R, Arizona DOT wins "Pride" award for its use

The Arizona Department of Transportation (ADOT) has won a *Governor's Pride in Arizona* award from Arizona Clean & Beautiful for its pioneering role in the use of Asphalt-Rubber and its use of recycled tires.

The agency was recognized in the Environmental Technology category during the group's annual awards program. The award read "In the past five years ADOT has used an average of 1.5 million tires per year on resurfacing projects, involving more than 30 percent of all tires discarded throughout the state. In 1998, ADOT launched a record construction program using nearly 2.5 million tires to finish about 700 miles of resurfacing."

Gov. Hull earlier said that the state is very proud of ADOT for its work in the development of Asphalt-Rubber.

**"The benefits to our taxpayers are many. First, our roadways are lasting longer, our maintenance costs are reduced, and the roads are smoother and quieter. Secondly, Arizona is currently recycling nearly 75 percent of its discarded tires each year and 85 percent of the crumb rubber that is being produced is going into our pavements. We are truly a leader in pavement engineering innovations as well as recycling a very serious solid waste."**



# RPA News

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*Bite the Dust - Phoenix Mayor Skip Rimsza is flanked by council members Cody Williams and Peggy Bilsten as he announces the city's program to cover its remaining dirt roads.*



*BST treatment - An ISS paving crew covers a dirt road in a rural Phoenix neighborhood.*

## ISS helps Phoenix clean the air with A-R

The City of Phoenix contracted RPA member International Surfacing Systems (ISS) to cover dirt roads in the city with a Bituminous Surface Treatment (BST) to meet federal air quality standards.

The process consisted of Asphalt-Rubber binder sprayed directly on a graded or swept dirt road surface followed by pre-

coated chips and sealed with a slurry coat. The work was employed to reduce particulate contamination of the air and provide a long-term cost-effective solution to maintaining rural roads.

The EPA had only required the paving of heavily traveled dirt roads, but Phoenix paved them all and finished almost a year

ahead of schedule. The 65 miles of BST treatment not only improved air quality, but provided cost effective pavement while using 65,000 tires. For more information contact Jeff Van Skike, city engineering supervisor, at 602-256-4335 or by e-mail at [jvanskik@ci.phoenix.az.us](mailto:jvanskik@ci.phoenix.az.us). Contact ISS at 800-829-4548.