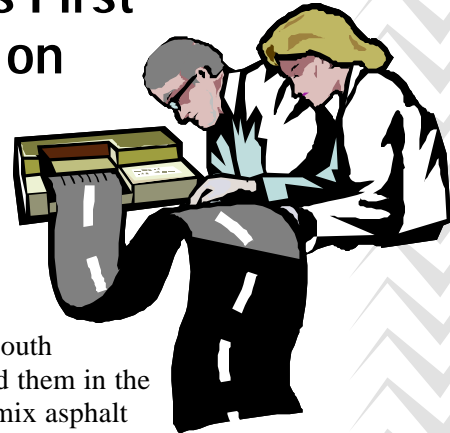


ARTS Quarterly

ARTS Initiates SC's First Research Projects on Rubberized Asphalt Binder



During the last year, the Asphalt Rubber Technology Service has successfully sparked the interest of South Carolina cities and counties and aided them in the introduction of rubber-modified hot mix asphalt (HMA) to their paving programs. ARTS is continuing to make progress by further educating city, county, and state paving officials. Recently, ARTS initiated dialogue with SCDOT to implement several field projects. Initial reactions have been positive and we hope to begin work within this paving season. These projects would have several advantages. SCDOT's involvement and expertise would enhance the outcome of each project and provide the opportunity for test sections to be paved on state-maintained highways and interstates. These research projects could lead to an even more durable asphalt product than the rubber-modified HMA that currently exists. ARTS will complete the four projects throughout the remainder of our grant.

4 Projects Will Be Implemented

1. Particle Size

One research project will examine the particle size of rubber used in modified binder. Several different particle sizes are being used by different states. This project will modify several different binders with a range of different particle sizes. The performance of these binders will be tested in mixes using various aggregate sources from around the state.

2. Reaction Time

Another project will examine the effect of reaction time for rubber-modified binders. Various reaction times will be observed

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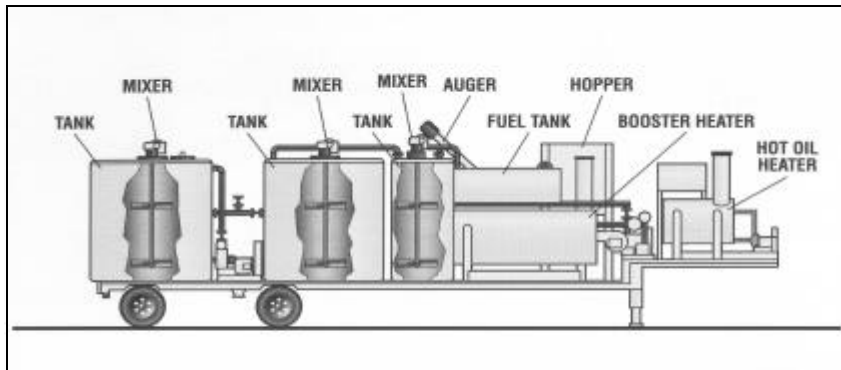
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South Carolina Trivia

- Myrtle Beach, SC, has the most mini-golf courses per area in the United States. At last count, there were 47 in a 60-mile radius.
- The Vietnam scenes of *Forrest Gump* were shot on what is now the Ocean Point Golf Course on Fripp Island, SC.
- Only 20,000 years ago during the Ice Age, walrus lay on the beaches of SC.

ARTS To Buy Blending Equipment

Throughout the successful completion of several rubber-modified hot mix asphalt (HMA) projects, a need surfaced for the increased availability of the binder blending equipment. At this time, on-site blending is less expensive than the other available methods. In the current state of affairs, on-site blending also poses fewer risks to the contractor during production of the rubber-modified HMA. This is due to the long haul distance from the closest currently available terminal combined with the physical requirements of the modified binder like heat and agitation. Although the on-site blending equipment was leased from a contractor in Florida for some of the projects, a scheduling conflict prevented its use in one of the projects.

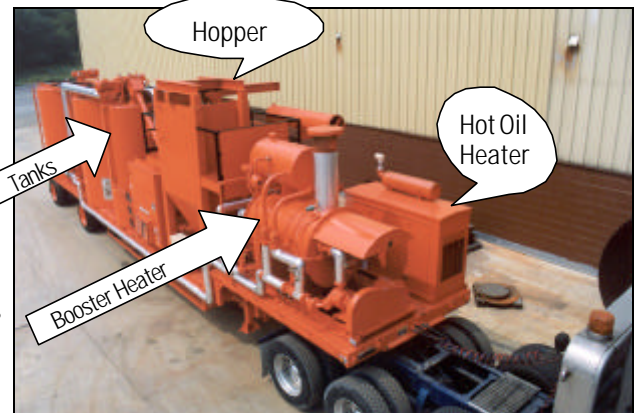


Components of a Batch System for Blending Ground Tire Rubber (GTR)

This problem will be alleviated in the future because the equipment will be available for every rubberized paving project in South Carolina. ARTS is in the process of purchasing a full set of the portable blending equipment and will be leasing it to contractors on a per-project basis. ARTS

will be responsible for assisting with connecting the equipment to the plant and assisting in the operation of the equipment for a set fee per day. The contractor will be responsible for transporting the equipment to and from the plant, supplying any energy requirements of the equipment, and performing standard maintenance on the equipment (e.g., cleaning) at the end of the leasing agreement before the equipment is removed from the plant.

Now that ARTS can supply the blending equipment for the projects, scheduling conflicts will be minimized, and hopes are that it will increase the number of contractors willing to bid on rubberized projects, thus broadening the exposure of this product across the state.?



ARTS' unit will resemble this unit.



Lease agreements will include training from the manufacturer for each contractor. ARTS will also provide and assist contractors with connecting the equipment to their plant, as well as in the operation of the unit.

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Rubber-Modified Asphalt Research is Underway

(Continued from page 1)
to determine their effects on the viscosity of rubber-modified binders.

3. Rubber Content

A third research project will examine the effect of varying rubber contents in rubber-modified binders. Although some research has been done in this area, further investigation of various binders used in this state along with a wider range of particle sizes could lead to more conclusive results.



Aggregate is sieved to separate into various sizes.

Creating a Mix Design



Then it is measured into the bowls by weight to be later combined with modified rubber binder.



4. Rubber-Modified Binder Grading

The last project deals exclusively with binder properties. This project will attempt to “grade” rubber-modified binders by comparing them to standard PG-graded binders. It will involve extensive binder tests in the virgin state as well as at different stages of reaction time and various particle sizes.

Each of the aforementioned projects will involve research on various binders and aggregate sources from around the state, and will examine both the properties of the modified binders and the properties of mixes made with these binders, while evaluating workability as well as performance. In the research projects for rubber-modified binder, properties such as viscosity, resistance to deformation, amounts of recoverable deformation, resistance to creep, and ductility will be examined. The rubber-modified HMA projects will explore tendencies towards rutting, fatigue cracking, and moisture susceptibility.?



Once the ingredients are mixed at the proper temperature and cured in the oven, the sample is compacted using the gyratory compactor.



Incentives Offered to Grant Recipients and Contractors

ARTS is still offering incentives to both grant recipients and the contractors who will be conducting the work on their projects. Incentive amounts for the grant recipients are based on the amount of the grant and range from 15% of the asphalt portion of the project to a maximum of \$30,000. These incentives will be in effect on new proposals received by August 13, 2002. Contractor incentives are 10% of the grant total, to a maximum of \$5,000. These contractor incentives will expire in August 2003. Please see our web site or call the ARTS office for more details.?

Summer Paving Projects

Preparations have begun for the 2002 ARTS projects. Mary Corley is actively preparing mix designs for the projects that will be paved during the summer months this year.

Projects include:

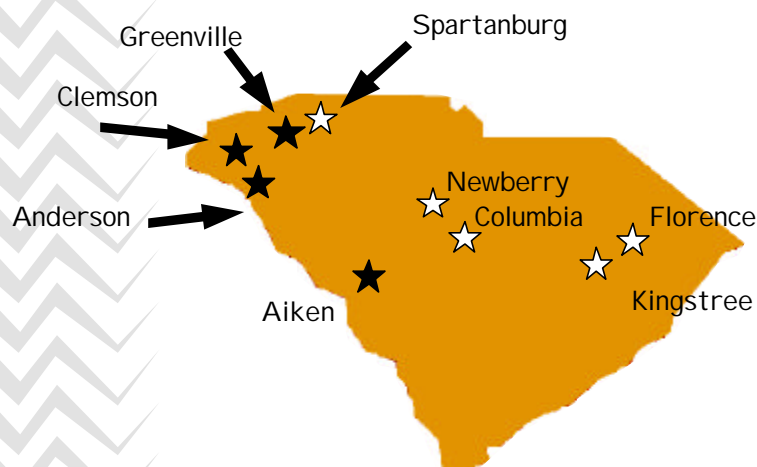
New paving and resurfacing of roads and parking areas in the SC Botanical Garden in Clemson, SC: The liquid will be terminally-blended and transported from the rubber-modified binder supplier. This project includes approximately 2 miles of roads and 2,500 square yards of parking lots.

Driveways and parking areas for the ARTS Research Facility: This project will also utilize the terminal blending process and will be completed immediately following the Botanical Garden project. Paving will include the intermediate and surface courses.

The surface course for Anderson County's Michelin Boulevard, Phase 4: ARTS completed Phases 1-3 last year. This is a secondary, 4-lane road approximately 1.5 miles long.

Resurfacing of roads in the City of Aiken: The roads included here are primarily 2-lane residential roads and will total approximately 3 miles.

(Continued on page 5)



★ Project locations throughout the state

ARTS Has Been on the Road



Mary Corley and Serji Amirkhonian have been traveling around the world spreading the word about ARTS and encouraging many SC agencies to participate in our grant program.

One of the goals of ARTS is to provide technology transfer about the use of scrap tires in civil engineering applications. Requests have come in locally and from around the world for information on rubberized asphalt and how ARTS can provide funding and technical assistance for projects in SC. Mary has made presentations to Spartanburg County, the City of Greenville, Pee Dee Regional COG in Florence, Newberry School System, Richland County, and others. See the white stars on the map below for parties who are currently filling out grant applications. ARTS also had a display at the Carolina Recycling Association Conference in Asheville, NC, and plans to participate in the SC American Public Works Association Conference in Myrtle Beach in July and LTAP's Southeast Local Roads Conference in Myrtle Beach in September.

Some of the presentations Serji has made include: the Recycled Materials Resource Center's Annual Conference in Washington DC; the 10th Annual Tire Industry Conference hosted by Clemson's Continuing Education Department in Hilton Head; and the European Tyre Recycling Association's (ETRA) 9th Conference on Tyre Recycling in Brussels, Belgium. This spring, he has also presented in Tokyo, Japan, which resulted from a visit the Japanese Scrap Tire Association made to Clemson last fall. Another delegation to visit Clemson to hear about ARTS was from China, and hosted by Wilbur Smith Associates.

What do all these presentations mean? ARTS is spreading the word about

(Continued on page 5)

ARTS Presentations, cont.

(Continued from page 4)

rubberized asphalt and how it can be successfully used to get rid of the scrap tire problem the US and the rest of the world is facing.

We would like to come to your location and discuss how ARTS can help you utilize scrap tire rubber in civil engineering applications. Contact us today! We may call you to arrange just such a visit!?

Summer Paving, cont.

(Continued from page 4)

Resurfacing of roads in the County of Greenville using a rubberized surface course: The contractor will utilize an on-site blending method, blending the rubber with the liquid at the asphalt plant. This project includes secondary and residential roads at various locations around the county and will total 4 miles.?



Playground Projects Now Eligible for Grants

ARTS is working with Ford Motor Company to fund the construction of high-quality rubber playground surfaces

in South Carolina for publicly-funded, publicly-utilized playground areas. As part of its commitment to recycle the 13 million Firestone tires recalled from its vehicles, Ford is willing to partially fund the cost of crumb rubber material to be used in the construction of pour-in-place rubber playground surfacing.

With this assistance from Ford, ARTS will contribute between 60% and 90% of the cost of the rubber playground surfacing. Projects will receive the following set contributions according to their county's classification of economic development as ranked by the SC Department of Revenue. The county rankings are based on overall unemployment rates and the average per capita income. The categories are as follows:

SC Classification	Grant Contribution
Least Developed	90 %
Under Developed	80 %
Moderately Developed	70 %
Developed	60 %

There are two types of applicants that are eligible for assistance. The first type is any

publicly funded organization within a county that falls within the "Least Developed" category, as defined by the State of South Carolina.

The second type of eligible candidate is any applicant that applies for and receives an ARTS grant for a rubberized asphalt paving project. In this type, the playground grant must be applied for in conjunction with the rubberized asphalt grant.

The maximum size of the surface cannot exceed 4,000 square feet.

A maximum of two (2) grants can be awarded within each county.?



The pour-in-place rubber surface provides a resilient, durable and water permeable play surface for playgrounds. The recycled tire crumb rubber is mixed with a polyurethane binder and meets the requirements set by ASTM F-1292 for both Head Injury Criteria (HIC) and Gmax.



ARTS accepts Ford's recalled Firestone tires to assist with building public playgrounds in SC. Grants are available for 60-90% of the cost of the pour-in-place surfaces.

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ARTS Research Facility is Approaching Completion



We expect to be moving into our new laboratory and office space in early June. Arrangements are underway to have the building ready to accommodate training classes and the laboratory research that the newly awarded grants require. Our summer issue will reveal a completed building and thank a number of those who have made this construction possible. ARTS is grateful to all the contractors involved for the efficiency and professionalism they have shown in getting this building completed on schedule.