THE UNIVERSITY OF TEXAS AT AUSTIN ✦ COLLEGE OF ENGINEERING

TEXAS PAVEMENT PRESERVATION CENTER Newsletter

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Our Mission

The mission of TPPC, in joint collaboration with the Center for Transportation Research (CTR) of the University of Texas at Austin and the Texas Transportation Institute (TTI) of Texas A&M University is to promote the use of pavement preservation strategies to provide the highest level of service to the traveling public at the lowest cost.

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Issue Highlights

2006 TxAPA Seal Coat Conference

The Texas Asphalt Pavement Association (TxAPA) held their Seal Coat Conference on April 26-27, 2006 at the Waco Convention Center. The conference attracted approximately 300 attendees. The Association serves the needs of hot mix asphalt producers, contractors, liquid asphalt suppliers, and firms interested in improving and growing the hot mix asphalt industry. TxAPA consistently provides services and information to keep the industry on the competitive edge. A major goal of the organization is to provide training for design, testing, and management of hot mix asphalt materials.

For more information visit www.txhotmix.org.

Mark Your Calendar:

2006 Pavement Preservation Seminar

The Pavement Preservation Seminar, scheduled for October 3, 2006 in Austin, Texas, will present a thorough overview of the latest concepts, techniques, and materials related to pavement preservation.

Visit www.utexas.edu/research/tppc for continuing updates.

Seal Coat Aggregates by Peyton Chatham, Vulcan Materials Company

Chatham presented on how midway shale lightweight aggregate and LRA are produced. At a sample quarry, three separate benches are mined; the top layer is overburden, which is dirt over shale. The shale is mined beneath the overburden, where lightweight aggregate is found. A typical mining bench is approximately 25-30 feet high, since Texas will not allow a rock face to be taller than 40'. Raw shale then gets broken down to 1.5" in a primary crusher. The crushed raw shale then goes through a secondary crusher, which has a 250' rotary kiln that heats the 1.5" raw shale feed up to 2000°F. The coal fired kiln in the secondary crusher expands and vitrifies the raw shale inside the rotary kiln, forming a ceramic lightweight clinker. The clinker then goes through a cooling process, after which it is conveyed into a screening tower, where it gets separated into different-sized aggregates. Conveyors deliver graded clinker to individually graded stockpiles. A calibrated underground conveyor system delivers a designated percentage of certain gradations to loadout. A final gradation is delivered into loadout, and a sample is taken to verify unit weight and proper gradation. At this time the material can be loaded directly into the delivery vehicle (if it is uncoated) or stockpiled for verification testing or to be precoated. A pugmill is used for precoating (CSS-1H emulsion is used with AC-20 as the base). Precoating is monitored by automated metering devices and weigh-in motion scales.

The first stage of the LRA process is similar to that of shale. LRA is produced via conventional mining methods, which are used to produce a blend of lean and rich rock for performance and TxDOT specifications. Rich rock, which is a limestone rock with asphalt actually embedded within the rock, and white rock, which is a limestone without embedded asphalt, are blended together to meet state specifications for the LRA precoat. A primary crusher, typically a gyratory or jaw crusher, breaks down the rock into 3x5" size. The crushed rock then travels to a secondary crusher, where it gets broken down into smaller sizes and pit fines get removed. Crushed rock then goes through a third crushing process and is screened for sizing to produce LRA. Single-sized aggregate gets placed into stockpiles. Stockpiled material then gets re-screened, blended, and mixed with Flux Oil. This process is operated by an automated control center located in the mixing plant. Pre-mix and precoat is produced simultaneously.

Chatham then presented the classification criteria for the Tex-499-A Aggregate Quality Monitoring Program (AQMP). Criteria I is Class A rock, a low carbonate source with 70% or greater acid insoluble residue and 25% or less magnesium sulfate soundness. Criteria II is Class B, C or D rock that must have Magnesium Sulfate soundness and polish value. Class A and B are normally required for surface treatment. Class A may be blended with HMA only and is not permitted to be blended with seal coat aggregate. In 2003, Texas had a total of 115 local sources for sandstone, limestone/dolomite, gravel, igneous rock, and synthetic aggregate. An aggregate's mineral type will determine its resistance to polishing, affinity to asphalt, and skid resistance. Particle size will affect the asphalt content and lift thickness. Particle shape will affect the asphalt content, skid resistance, and resistance to degradation. Cleanliness will affect the adhesion between asphalt and aggregate and durability, and toughness will affect resistance to degradation and weathering. Texas specifications require uniform-size aggregates; angular (crushed) particles at a minimum of 85% with two or more crushed faces, cubical shape, and minimal flat/elongated particles for better skid resistance; and a cleanliness rating of 2% maximum soft particles/ deleterious material. New specifications (Tex-406-A) require a 1/5% maximum decant. Also, toughness and soundness of aggregate in Texas must have an LA Abrasion below 35% loss and 5-cycle $MgSO_4$ soundness of less than 25% loss. LA Abrasion stands for the "Los Angeles Abrasion Test" (AASHTO T96, ASTM C131), which represents the resistance of coarse aggregate to abrasion, where the aggregate is subjected to damage from rolling with steel balls in a drum (value is expressed as percentage loss). For example, extremely hard igneous rock has approximately 10% loss, and soft limestone and sandstone has approximately 60% loss. The Magnesium Sulfate Soundness test estimates resistance to weathering, simulates freezing and thawing action, and results in a total percentage loss.

Chip Seal Asphalt Providers by Chuck Dannheim, Sem Materials

Dannheim gave a thorough presentation on asphalt chip seal binders, beginning with a presentation on the origin of asphalt. All sorts of petroleum products come out of an oil well. Oil product goes through a refinery and then a distillation process. Light-end product is typically gasoline, heavier products may include kerosene and diesel, and the heaviest "bottom of the barrel" product is asphalt. There are three types of asphalt chip seal binders: hot asphalt cement (AC) applied at +/-350°F, cut-back that is diluted with a solvent like fuel oil or diesel at +/- 250°F and emulsified applied at +/-160°F. AC is a hot-applied asphalt binder that is generally graded according to viscosity and typically modified with polymer or tire rubber to improve quality. To be kept in suspension, an asphalt emulsion is basically an asphalt molecule that is surrounded by soap (emulsifier or surfactant), which in turn, is surrounded by water. Because they are suspended, asphalt emulsion can be used without the aid of heat or solvents and can be pumped, stored, and applied at much cooler temperatures than other asphalt. An emulsifying agent (surfactant) such as soap is soluble in water and oil.

Emulsifiers have a surface charge; the hydrophilic head is typically either positive or negative, and like charges of the emulsifier repel one another, keeping the asphalt droplets in suspension. An emulsion is made by introducing molten asphalt and treated water under pressure into a colloid mill, which is a high-shear mixing device specially designed for this purpose. The colloid mill divides the asphalt into very small droplets of about 0.001 to 0.005 inches, and the type of asphalt and emulsifying agent used is specific to the grade of emulsion being produced. Emulsion must be stored at between 50°F and 185°F, depending on the intended use and specific product. It must not be heated above 185°F nor allowed to freeze. The temperature of the heating surface must not exceed 212°F, nor can forced air be used to agitate the emulsion. When heating the emulsion, agitate it gently and not too often to eliminate or reduce skin formation. If possible, use warm water for diluting, and add water to the emulsion (not emulsion to the water). Avoid repeated pumping and recirculation, and pump from the bottom of the tank. What is often observed in the industry is the overheating of emulsion and burning off the water right around the heating unit, which causes the material to break inside the tank. Many times, a skin cap will form at the top of the tank, and that is why it is important to pump from the bottom, and if using the same tank repeatedly for the same product, it is best to never allow the tank to get completely empty so that the top layer skin cap never gets penetrated. It is important to always remember that anionic (negative-charged) and cationic (positive-charged) emulsions repel each other and do not mix (example: SS-1H and CRS-2H will not mix); mixing the two will create a very expensive mess. Also, do not mix different classes, types, and grades of emulsified asphalt, and do not dilute rapid setting emulsions. Medium and slow setting grades may be diluted, but water must be added very slowly.

One of the simplest tests is the viscosity test, which determines how thin or thick a material is. (It needs to be thin enough to spray through a distributor but thick enough to stay on a road surface.) TxDOT specifications (TxDOT T 202) require an absolute viscosity of 140°F and 275°F, which is typically the AC product. The TxDOT T 59 test determines the demulsibility of a seal coat emulsion to test how quickly a seal coat emulsion will break. Demulsibility is highly variable and may be affected by ambient temperature. The penetration test is conducted at 77°F with a sharp-pointed pin penetrated into asphalt for five seconds. Ductility is tested at 39.2°F to determine how much asphalt will stretch. The ductility test basically determines how much resistance an asphalt can withstand and still hold onto the rock. The elastic recovery test determines how asphalt is able to pull back into place. Fast-driving cars will pull rock out of the asphalt; it is important for asphalt to be able to pull the rock back into place. The softening point test determines the temperatures asphalt can withstand since Texas roadways commonly have 120°F to 130°F surface temperatures.

The qualities needed in a chip seal binder are even distribution without streaks or flowing. It must be able to retain aggregate the first day, the first winter, and beyond. It should serve as a long-term sealing for a roadway surface while being cost-effective. Lab tests are designed to determine how products perform in the real world, and help to promote quality.

Fog Seals by Steve Douglas, Ergon Western Emulsions, Inc.

Douglas presented fog seals as a viable, cost-effective option to extend pavement life a few years. Fog seals are an application of diluted asphalt emulsion that protect and extend pavement life by lowering its permeability, inhibiting raveling, treating minor surface defects, coating and improving binder flexibility, enhancing aggregate retention, and providing a uniform surface appearance. Fog seals are primarily used on roads that been applied with a chip seal or seal coat, HMA, or microsurfacing or slurry seal. The materials used in fog seals are slow- or medium-setting emulsions diluted with water to produce a low viscosity that will not "break" before penetrating pavement voids. (The more penetration that is allowed by an emulsion into deeper voids, the better it will enforce a pavement.) Standard emulsions are cationic CSS-1 or CSS-1H or an anionic SS-1, SS-1H, or MS-2 (though MS is slowly being replaced by better products). For these materials, a polymer is usually not needed. Another fog seal material that is widely used is a rejuvenating emulsion such as the cationic CMS-1P. The rejuvenating emulsion is modified with a polymer, making it more expensive than a CSS-1; therefore, the polymer-modified emulsion should only be used in areas where it is absolutely needed (primarily older, more aged roadways). The emulsion will be diluted with water; potable water is suitable most of the time but the PH must be within an acceptable range (city water may sometimes fall slightly out of range). The water must be free from any detectable solids or incompatible salts (treated water should be fine). Dilution rates should be either 50/50 water to emulsion or 60/40 water to emulsion. Rates beyond these are generally not acceptable. Equipment for making fog seals include a broom or sweeper to brush off dust, a distributor with a proper sized nozzle to shoot lower rates with a good fan, a traffic control crew, and a sand truck as a precautionary measure.

If a roadway is prone to shelling and existing damage is relatively minor, then fog seals with a CSS or SS binder are a good, inexpensive option for enhancing aggregate retention and preserving pavement life for a few years. When extending the life of an older seal coat road, it is a good and inexpensive practice to fog seal to extend its life a couple years before paying more money for an asphalt seal coat. With fog seals, hot-applied and emulsion asphalt binders are the same once they have cooled down and water has drained away. Aggregate will have an impact on a fog seal because it will either be pre-coat or bare, natural or manufactured, and will be of varying size gradation and air voids. Proper application rates will depend on the size of air voids, size of aggregate, and porosity. A Grade 5 aggregate is typically shot at 0.08-.10 gals/yd^2, Grade 4 at 0.10-0.12 gals/yd^2, and Grade 3 at 0.12-0.14 gals/yd^2. It may be cost-efficient to fog seal atop a micro/slurry seal to extend pavement life for a few years since costs for microsurfacing are also increasing. Before placing a fog seal atop a micro/slurry seal, let the roadway age for at least 3 years and use an application rate of 0.08-0.10 gals/yd^2. Finally, when using a 60/40 emulsion shoot a little more material than when using a 50/50.

When is it appropriate to fog seal HMA? The answer depends on many different variables. HMA materials include asphalt binder (modified or unmodified), aggregate (natural or manufactured), and modifiers such as tire rubber and ash. HMA is either semi-permeable or permeable. Semi-permeable types include dense-graded mixes and stone matrix asphalt (SMA), and on these, application rates should be 0.06-0.10 gals/yd^2. Permeable HMA includes OGFC and PEM, and these need an application rate of 0.10> gals/yd^2. Dense graded mixes are of fine or coarse grades, well-graded aggregate asphalt binder with or without modifiers, and of a mix design such as Hveem, Marshall, or Superpave. SMA materials include a gap-graded aggregate and modified asphalt binder. Mix designs for SMA include Superpave and Marshall. Open-graded mixes are more conducive to fog seals. Materials for open-graded mixes include aggregate (crushed stone with manufactured sands) and modified asphalt binder. The mix design for open-graded mixes is NCAT 99-3. HMA mixes, including Superpave, tend to age faster, at variable rates between 1-5 years. Applying a fog seal atop OGFC or Porous European Mix (PEM) seems contrary to their design, which is intended to be open graded. However, air voids in open graded courses eventually become clogged. Placing just enough material to produce minimal clogging on a worn-out HMA roadway is an effective means to keeping a pavement in good condition. It is important to keep in mind that fog sealing an HMA will reduce its skid resistance. Construction guidelines for fog sealing require a distributor in good working order with a proper shooting rate, proper dilution rate and shooting temperature, clean and dry pavement, acceptable weather conditions, and optimum application rate (avoiding too little or too much material).

A fog seal is not as effective as a seal coat because it is diluted and applies less material, but it is a cost-effective means to efficiently extend a pavement's life for 1-3 years.

Seal Coats for Pavement Preservation by Tom O'Leary, Ergon Asphalt & Emulsion

O'Leary gave a thorough overview of seal coat best practices. A seal coat is generally a single, double, or triple application of asphalt material covered with aggregate. Surface treatments are applied to prepared base courses or other surfaces. Seal coats are applied to existing pavements to extend the life of the pavements, but they are not intended as permanent pavement surfaces and have a life expectancy of approximately five years. The service life of a seal coat varies depending on situational conditions such as traffic volume and weather. Seal coats correct deficiencies such as cracks, raveling (or shelling), bleeding, aged or oxidized pavement, low skid resistance and also provide the appearance of a uniform surface. Seal coats, however, will not strengthen existing pavement, increase load-bearing capacity, smooth out rough pavement, bridge major cracks wider than 1/8" (cracks wider than this size must be crack sealed in advance), or eliminate the need for maintenance or reconstruction. Within the first three-quarters of the life cycle of a pavement, there is a 40% reduction in quality, but in the following 12% of the life cycle, the quality of the pavement plummets into total failure. Thus a seal coat should be applied during this initial three-quarter period. Some factors affecting seal coat quality are existing pavement surface condition, the experienced capability of workers applying the seal coat, equipment, materials, application technique, traffic, and weather. A raveled surface will require more binder; a slick surface will require a lighter binder. Bleeding pavements requires a lighter application rate.

Seal coating is an art, not a science, and seal coat design is simply a starting point: be prepared to deviate from the design. It is necessary to have a good eye once you get out onto the road to see exactly what is going on. The contractor superintendent, engineer designer, inspectors, operators, suppliers and taxpayers all play a role. Inspectors need to be adequately trained and need to have the freedom to make timely and informed field decisions. They need to develop partnering relationships with the contractor and suppliers and understand that plans are only a guide and that each road requires special considerations.

Suppliers are excellent resources for information on their respective products.

Before applying a seal coat, an old roadway should be patched, crack sealed, and thoroughly cleaned. Likewise, unpaved surfaces need to be primed unless inverted prime techniques are being used. Keep in mind that hot or cold mix patches need adequate curing time. If this is not possible, then a fog seal should be considered instead of a chip seal. Herbicide should be applied to surrounding vegetation, and gutter areas and curbs should be vacuumed, particularly in urban environments.

To prepare for seal coating, it is necessary to calibrate equipment, know proper design rates, understand factors affecting rate adjustments, determine rock lands, strap the distributor for accurate readings, and ensure that proper signing and traffic control are in place. Calibrate the distributor's spray bar height, nozzle angle, spray bar pressure, and computer or asphalt meter. A double coverage spray bar is most commonly used; a triple coverage spray bar is not recommended because it is susceptible to wind, which will affect binder consistency. Computer-controlled aggregate spreaders need to be calibrated for proper rate distribution, and the gates and hitch need to operate properly. The shot should be set to the size of the aggregate rather than the size of the distributor so that binder gets covered in a timely fashion. Stockpiles should be placed in strategic locations for better production.

It is extremely important that trained operators drive the aggregate spreader at a controlled ground speed to reduce skids and prevent rock from turning over. It cannot be overemphasized that the aggregate spreader should never move faster than the distributor. The spreader box should be directly behind the distributor (the quicker the aggregate gets applied, the better the bond will be). On high heat afternoons, however, the spreader box should back off slightly.

Trucks should be of adequate size and quantity. Measure and record the volume within each truck. Control the trucks' speed throughout the project. Stagger the dump trucks in and out of the wheel paths or station them down the roadway. Check tires periodically for proper inflation and cleanliness.

Rollers should be pneumatic only (three medium or four light pneumatic rollers are recommended), and tires should be clean and properly inflated. Rolling must take place immediately after the spreading of aggregate. The slower the roller moves the better, and rollers should always be moving because if it is sitting, it will squeeze aggregate down and push binder up. When a job is delayed for more than 10 minutes, rollers and trucks should be moved off of the fresh seal.

For traffic control, flagmen, signs, and a pilot car are needed. The flagging stations should be constantly moved, and the pilot car should maintain slow speeds. Traffic control should also clean up messes; clean-up must be done immediately because on a hot day, a mess will get tracked through a whole job.

The proper aggregate for seal coating should be clean, single-sized, and cubical for optimum performance; avoid flat particle shapes and uncrushed gravel since these do not offer skid resistance. Do not use pre-coated aggregate with emulsion binder because it has a tendency to dramatically slow the break of the emulsion and will stay tender for a very long time. Pre-coated aggregates should only be used with hot AC binders. The cost of single-sized aggregate deters their usage in most states, but a method to determine the number of "flatter" particles should be used when using graded aggregates. Aggregate with minimal fines should be used since fines will settle at the bottom if there are too many in the mix, preventing the proper embedment of larger aggregate into the binder and resulting in the loss of cover stone and bleeding. Natural and synthetic aggregate can be used. Aggregate selection depends on the type of roadway, volume of traffic, existing weather conditions, availability of aggregate, and cost.

Voids are the spaces between the aggregate particles; as aggregate particles are dropped into wet asphalt settling should occur in disoriented positions. After rolling and traffic, aggregate will be seated in their flattest position. Voids should account for 20-30% of the area before rolling and should account for roughly 20% of the area after rolling. For good performance, voids should not be filled completely with asphalt binder. On low volume roads, voids should generally be 40-50% full. On higher volume roads, voids should be only 30-40% full. Hot AC is typically applied at 320-350°F. Hot AC loses 150-200°F in the first 30-45 sec. after application, so it is imperative to apply aggregate on AC while it is still very hot. The more fluid the binder is, the better it will adhere to the aggregate. Application of aggregate should be one rock thick, and if aggregate is applied correctly, there should be little or no remaining excess to sweep after a job.

To avoid excess joints, asphalt should be applied to the entire area of intersections and widenings first before applying aggregate. Paper the joints at all starting and stopping points, and shoot on clean surfaces only. Use 1/2 nozzles or end nozzles on longitudinal joints. Nozzles should never be squared because doing so will actually produce a double shot; two nozzles are needed for a proper shot.

Marginal surface temperature requires excellent construction techniques. Do not shoot too late in the day if working under questionable weather conditions; there needs to be plenty of time for proper curing before nightfall, since it is typically the wet or cold nighttime conditions that will ruin a seal coat.

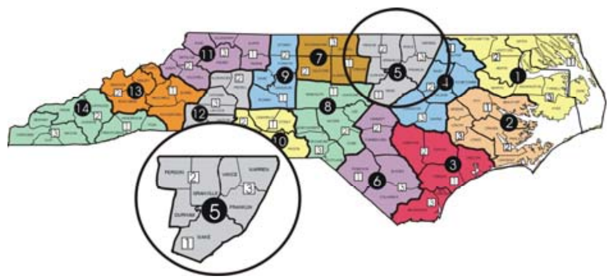
Operators are often under pressure to get a job done and may be inclined to rush. Under these conditions, when tracking occurs, the first instinct is to raise the aggregate rate. This is the wrong thing to do. In reality, trimming the rock rate will stop the tracking. Aggregate rate is extremely important and affects more than just the look of the road. Too much aggregate will cause binder to push up.

In a high traffic situation, skid marks occur where trucks have to stop for traffic. An innovative way to solve this problem is to break up the application. Shoot three miles, and then skip a shot for the next 3,000 feet. This way, traffic always starts and stops on the old surface. At the end of the day, fill in the parts that were skipped. By doing this, skid marks can be avoided and patching will be unnecessary. In a day, one transport load of production may be lost, but no patching will be required.

Seal Coat Preparation by Bennie McCormack

McCormack gave an overview of some important aspects of seal coat preparation. McCormack emphasized that the cause of failure should be repaired prior to the application of a seal coat. If the cause of failure is not addressed, then it will always reemerge. Prior to applying a seal coat, all failures should be repaired, ruts should be filled, cracks should be sealed, edges should be sprayed with herbicide, high edges should be cut off, and public access intersections should be repaired. Repairs should be completed a minimum of three months (preferably six months) in advance of seal coat application, and fresh patches and edges should be fog sealed. If a roadway has a lot of problems, a full depth repair should be considered. When crack sealing, pour all cracks to prevent water form entering the base and sub-grade, which would cause more problems. This type of repair should be completed in the fall prior to applying the seal coat. This will allow adequate curing time and reduce bleeding. Hot or cold pour materials may be used. When using hot pour, six months is needed for curing, with cold pour materials, seal coat application can take place on the following day. On high traffic areas, hot pour material may come back up through the seal coat, and under heavy truck traffic can actually entire sections of pavement may actually be pulled up. Edge cracking in Texas increased after the drought last summer; these cracks must be crack sealed too. Excess crack seal material around the crack should be removed in order to prevent bleeding. Fresh patches can be fog sealed to prevent loss of rock and bleeding. Herbicide likewise prevents growing vegetation from breaking up and separating pavement. Pavement edges should then be fog sealed. All broken edges should be repaired to prevent edge drop off and to maintain the width of roadway. Another good practice is to edge seal or fog seal in the fall season before the seal coat application. Cut off all build-up on the edges to get water off the road rather than down the edge. Getting the water off of the road and not standing on it will help prevent damage. Public access intersections such as rest and picnic areas should be kept in as good repair as major roadways.

Asphalt repairs under three months old should not be sealed. Edge seals should not be applied after a seal coat. Leveling-up should not take place after a seal coat application. Do not seal dirty gutters. Do not wait until it is too late to get begin preparatory work. Do not use tack for blade lay patches. Completing all repairs at least three months prior to seal coat application will increase the odds of a successful seal coat. With all phases of preparatory repair work complete and the selection of appropriate aggregate and asphalt application rates, a roadway can last 5-7 years.



Building North Carolina's Pavement Preservation Program by Emily McGraw, P.E., NCDOT

NCDOT has offices in one-hundred counties in North Carolina with central offices in Raleigh, North Carolina. There are 14 divisions in NC, which are comparable to the 25 districts in Texas. Each division has its own organizational engineering structure. They have division engineers down to the county maintenance engineers, and the real work happens at the county level in the local field offices. There are 78,615 total miles of roadway in NC, with 14,705 primary miles; 63,910 secondary miles; 58,117 paved miles, and 5,793 unpaved miles. North Carolina is second in the nation to total miles, behind Texas. NCDOT maintains county road systems as well from subdivision roads to interstate highway. Preservation in NC is a cost effective approach.

The NC pavement preservation program involves retreatment (generally in the form of surface treatments), resurfacing with 1-1.5 inches of plant mix, and rehabilitation, where more work is required. Retreatment keeps pavement that is structurally adequate but is declining with some oxidation and insignificant cracking in good condition. Retreatment involves chip seals/seal coat (a mat and seal, which is a larger stone aggregate of a #67 stone; straight seal, which is a single application; split, which is two applications of aggregate; and a triple seal, which is three applications of aggregate with a #78 stone or a 5/16" lightweight aggregate). NCDOT also does contract work with slurry seals and microsurfacing. Resurfacing is a single application of plant mix asphalt to an existing roadway. NC uses Superpave on all roadways for resurfacing (using new mixes, S4.75A and SF9.5A, which allow lying down less than a 1.5").

Rehabilitation is used when pavement is failing and when traffic volumes, particularly trucks, make the current pavement layers inadequate for future use. In NC, whenever a rehab job is considered, an engineering investigation is undertaken first. Coring and DCPs are taken to learn the thickness and condition of existing pavement. The FWD is used to determine the strength of existing pavement. Detailed pavement condition notes are taken to locate areas that are requiring more work. Traffic volume is taken into account.

In implementing the pavement preservation program in NC, training is key. The program began in 2000 when NCDOT started offering the first two National Highway Institute (NHI) pavement preservation courses, targeting field personnel, county maintenance engineers, division engineers, and division administration. It is necessary to obtain support from field personnel, who are the people making decisions on which roads to treat (decisions are at the local level not central). Preservation strategy is a better strategy than "worst first," which is hard to sell because people call most frequently about roads that are in bad condition. So, a lot of effort has been spent on convincing citizens of the preservation strategy. NCDOT implemented a Maintenance Management System (MMS) and soon a new Pavement Management System (PMS) from the same supplier will be implemented in order to keep better track of total costs.

NCDOT is also doing research in area of maintenance. They use new products all the time and are investigating fabrics beneath overlays, fog seals, rejuvenating agents, and new crack filling material. Currently they are taking data from their surface treatment database and doing modeling to see how much they can realistically expect from seal coats. NCDOT has funded three research projects with NC State ($250,000); they are taking a look at aggregate gradations, the rolling and compacting of chip seals, and are doing a life cycle cost analysis that compares traditional CRS-2 emulsion with a polymer-modified emulsion. Research is crucial because it is a financial investment to determine what really works, and it saves money in the long run.

NC has dedicated funding initiatives. Senate Bill 1005, landmark legislation for NC, allowed the use of Trust Fund cash balances over a 3-year period, targeting NC and U.S. routes. NC spent $423 million as an investment to bring up the roadway system to standard, which included substantial work like milling and HMA overlays. In 3 years, 1500 miles were treated. The focus has been on preserving the primary highway system. A second initiative called North Carolina Moving Ahead is an economic stimulus package, which is using $630 million to focus on a backlog of resurfacing needs. Safety, the reduction of traffic congestion, and the development of a PP program are components. This initiative focuses on the secondary roadway system. The challenge is how to secure recurring funding (so far NCDOT has been successful in getting non-recurring funding). Year 2004 produced the most robust budget ever in NC. NCDOT spent $28 million on a chip seal program for 2,800 miles (45.64% of the roadways). The last legislative initiative is the Road Oil Incentive Program, which means to increase productivity and efficiency. It is one of two pilot programs that tests incentive pay for employees as a means of increasing efficiency and productivity Incentive award for employees was 0.25% of the budget allocation and was increased to 0.50% for 2006. Incentive payments are based on the exceeding of previous years' production rates (measured in square yards per man-hour), the maintenance of a good safety record, and no disciplinary action. In order to not sacrifice quality for quantity there is an oversight committee. Divisions perform quality control audits; the central office monitors bi-weekly production rates, and field audits and reporting audits are performed.

Every two years, NCDOT conducts a pavement condition survey. Currently, roads chosen for treatment are in better condition than they were four years ago. The benefits of PP program have been a higher rate of productivity, more efficient operations, more miles paved, lower unit costs, the promotion of employee initiative, the encouragement of creative thinking, the improvement of roadway conditions, and a best practices management.

The Prime Coat by David Stroud

Stroud gave an overview of the prime coat. A prime coat is designed to bond to the top course of a base, strengthening the top 1-2 inches of base. It protects the base prior to application of a surface treatment, creates a workable platform, and serves as a means for dust control.

There are different prime coat types: spray prime (ex: MC-30, AE-P); worked-in (cut-in) prime; and covered (inverted) prime. Types of base material used for prime coat are limestone, caliche, iron ore gravel, gravel, fly ash stabilized base, cement treated base, and asphalt stabilized base. Limestone and caliche are the most widely used. Cement treated limestone base is hard to get 3/8" penetration, so frequently, the base will sanded once a prime coat has been shot on it. A pneumatic roller should be used first when preparing to treat the base. Seventeen districts use pneumatic rollers whereas 20 districts use steel wheel (others use combination). Districts also have different prime coat methods: seventeen use a MC-30 Spray, nine use AE-P, six use RC-250 Covered Prime, six use a MS-2 or MS-1 Cut-in, four use a SS-1 or CSS-1H Cut-in, and one district uses Dirty Water (refers to a spray of a very light shot of emulsion). Optimum conditions for a base for prime coat application is a “no-dust” base, a reasonably smooth finished base, a reasonably porous finished base, a strong base, and appropriate moisture condition in the base. Keep in mind that prime sometimes does not cure out very well in the shade of a tree.

If too much prime is shot a little stickiness on top will result, and it will track. In response to the question of whether or not an AE-P should be shot straight or diluted on a limestone base, districts answered that it depends: if a distributor gives streaks, it is better to dilute the AE-P for better distribution. It is also worth noting that sprayed-on diluted MS-2 prime on a limestone base does not penetrate quite very well. Traffic will wear off the prime coat off its base. If traffic is allowed to run on top of a prime coat the next day, the rock will typically eat the prime up. So, it is necessary to pay attention to equipment on the road.

Stroud also addressed why surface treatments should be applied in cool weather at all. There are multiple reasons cool weather seals are done. Districts who do them are weighing the risk versus the reward. Various products are available for cool weather application, but none are perfect for every situation. The following products are considered cool weather specific products: AC12-5TR, CRS-1P, and MC-2400. The rejuvenating product CMS-1P is not cool weather specific but it serves well, especially in late spring. Fourteen districts in Texas use CRS-1P, six use AC-5, three use AC-12 5TR, two use AC 10+Ltx, two use AC 5+Ltx, two use CRS-2P, two use MC-2400, and two use MC-3000.

To increase the chances for success, it is extremely important to pay attention to the weather forecast. It is the cold or wet night-time temperatures that typically ruin a job. It may be necessary to start late in the day and stop early. Late spring is a dangerous time for cool weather products that contain dilutants. A fog seal can be cheap insurance when doing this. Applying a fog seal is highly recommended if traffic will be occurring on a wintertime seal. Potential problems with cool weather application include weather issues such as extreme cold or rain. In such conditions, traffic may have to be held off longer. Cool weather products can contain solvents and are softer asphalts so hot weather is an issue also (for example, late spring). Pre-coated aggregate with emulsions can be done but the process is slow and there must be no traffic for hours.

Watch video of the TxAPA Seal Coat Conference proceedings at www.utexas.edu/research/tppc/conf/txapa/.

Upcoming Events

Pavement Preservation Seminar
October 2-3, 2006 – Austin, Texas

The Pavement Preservation Seminar, scheduled for October 2-3, 2006 in Austin, Texas, will present a thorough overview of the latest concepts, techniques, and materials related to pavement preservation. Seminar topics will include Asphalt Overlays, Scrub and Fog Seals, Crack Sealing Techniques and Materials, Chip Seal Best Practices, TxDOT Questions and Answers, Hot-in-Place Recycling, Micro-Surfacing and Slurry Seals, and Pavement Management Systems.

In recognition of the need for education and training related to pavement preservation, AGC, AEMA, FP^2, and the Texas Pavement Preservation Center will collaborate in conducting the 2006 Pavement Preservation Seminar. The 2006 Seminar will be presented in conjunction with the 23rd Annual AGC of Texas Trade and Equipment Show.

For updates visit the Texas Pavement Preservation Center (TPPC) website: www.utexas.edu/research/tppc.