Prioritizing Prevention Practices


For several years now, pavement preservation techniques have been making steady progress in states across the country.

"Pavement preservation has become a household word," says Mike Krissolf, executive director of the International Slurry Surfacing Association. Indeed, the road manager and the contractor have an abundance of maintenance tools from which to choose.

"For the road manager, it’s very easy to use the right treatment on the right road at the right time. If an agency can take money from its budget for reconstruction and use it for maintenance, those dollars will provide more lane-miles-years of life—dollar-for-dollar—than money spent on ‘worst- first’ fixes.

This article will take a closer look at several preventive maintenance techniques:

- Crack sealing and crack filling
- Chip seals
- Slurry seals (e.g., Siddie Oyster Blend)
- Microsurfacing
- Thin asphalt overlays

Fog seals are inexpensive treatments that typically involve spreading a diluted asphalt emulsion on the roadway. No aggregate is added. Normally an emulsion is about 17.5 percent water. With a fog seal, that emulsion is diluted even further, by about 50 percent, says Crack Ingram, sales manager for Slurry Pavers Inc., a contractor based in Cem Allen, VA.

The purpose of a fog seal is to seal the pavement, inhibit water, and enrich the hardened, oxidized asphalt. Upgrades to polymer-modified fog seals are available. And in the fog seal family there can be emulsions that penetrate into the asphalt and add life," says Ingram.

He says the typical life of a fog seal is one to two years, depending on traffic and climate.

When applying a fog seal, the contractor needs to think not to shoot the asphalt too heavily. Because there is no added aggregate, an excessive application rate can create a slick pavement. Application rates run about 0.10 to 0.15 gallons per square yard.

Crack filling should only be used on non-working cracks, says Ingram. Non-working cracks are age related, and usually no routing is needed. Crack sealing can be used on working or thermal cracks. With crack sealing, it is recommended to rout the crack before applying the sealant. "That way you get a consistent width and depth of the crack, so that the sealant will expand and contract evenly in the crack," says Ingram. "You can dictate what the climate effect is."

It’s important to clean out cracks before applying sealant. If the crack is not clean and dry, the sealant will not bond to the substrate. Cemline Inc., a manufacturer of hot crack-sealing equipment, publishes a 40-page book called the Guide to Crack Sealing, which is an excellent reference on the subject. (Go to www.cemline.com.)

The Strategic Highway Research Program recommends that cracks be treated with heat a lane, or hot air lane, before sealant installation. Hot air lanes are designed to minimize polymer and compressed air to heat air. Depending on the manufacturer, heat lanes output flame or flame-free heat. These devices generate upwards of 2,000 ft³/min. To ensure moisture and provide additional cleaning.

"There are some good cold-applied sealants and some good hot ones," says Ingram. "For performance, the hot-applied sealants are proven to outperform the cold-applied sealants. He puts the basic cost of crack sealing at $4.50 per linear foot and the added life at four years.

A chip seal is the uniform application of asphalt binder to a prepared surface followed by the application of a cover aggregate that is sealed by a roller. Chip seals apply to sound pavement, usually to more rural roads. A chip seal is ideal for pavements with the loss of surface texture.

Chip seal seal pavement from water intrusion, improve surface friction, create a durable wearing course, and upgrade non-paved roads. Chip seals can be applied in multiple layers. Ingram points out that, if the contractor aggregates go down first. Years ago, Ingram says he recalls the state of North Carolina placing a 1-inch rock following by a 3-inch stone to fill in the gaps. He says polymeric emulsions in recent years "have gone a long ways toward improving the performance of chip seals. Polymers help the rock in place, surface raveling is reduced. The typical life of a chip seal is five to seven years, and with multiple applications they can last 10 years," says Ingram. "Chip seals are one of the most cost-effective preventive maintenance treatments."

Where the rubber meets the slurry

Rubberized asphalt is not new, but terminal-blended rubberized asphalt has recently moved into the mainstream of road materials. And in California, the city of Oxnard is now accepting Two-Rubberized Slurry Seal (TRRSS) as an equal partial to Rubberized Emulsion Aggregate Slurry (REAS).

Oxnard, located between Los Angeles and San Diego, is one of the first cities in the country to use TRRSS in a major project. For residential streets, TRRSS is expected to last five to seven years, depending on traffic volumes and climate severity.

There’s a definite difference between TRRSS and the REAS product, TRRSS uses terminal-blend rubberized asphalt. The tire rubber has been digested, and the rubber asphalt is then emulsified into a colloid emulsion, says Lance Allen, a manager at Roy Allen Slurry Seal Inc., Santa Fe Springs, Calif.

By contrast REAS is an emulsion product, and the tire rubber is incorporated into the slurry after the emulsion is made. So the rubber appears as an aggregate in the slurry.

Because TRRSS is a colloid emulsion (positively charged), it is attracted to the negatively charged aggregates of Southern California. And with TRRSS, you get a chemical cow. REAS, being different, relies on dehydrating to evaporate the water in the slurry—so it’s a temperature-based cow, says Allen.

Colloidal emulsions like TRRSS can be applied during a wider window of time during the year. Using cold weather restraints, the cure can be slowed down so that hardening can be completed before the material sets up.

“We never use emulsifiers,” says Allen. “Even in cold weather we use retarders, just not as much. The advantage of the TRRSS is that it can be placed in colder weather—it’s a colloidal warm binder.”

This spring (2009) the Roy Allen firm was working on a 1 million-sq.-ft. residential street project with TRRSS in Oxnard. The project involves mostly Type 2 slurry sealing with some Type 3 mixed in for the more demanding areas. Type 2 slurry has rubber-modified asphalt; Type 3 has three-eighths-inch resin aggregate.

Roy Allen is running four slurry machines for the big Oxnard project. Normally the firm runs just three machines, but this distance from the stockpile and emulsion tank is too far to maintain production with three machines. "The only time we’re making money is when slurry is coming out of the slurry machine," says Allen. "So we want to make sure we always have a machine working."

For Type 2 slurry, TRRSS is applied at a rate of 10 to 15 pounds per square yard. For Type 3 the slurry rate is 20 to 25 pounds per square yard. The cost of the material depends on the cost of liquid asphalt, but Allen pegs TRRSS at 15 to 20 cents per square foot.

Roy Allen has been placing test sections of TRRSS for some five years—a section here and there. "We have data from last year across southern California," says Allen. "And our product proves very well in the wet track abrasion test, which is a test used on slurry seals."
Slurry surfacing systems include slurry seals and microsurfacing. Typically a slurry seal is a blend of crushed aggregate and asphalt emulsion, mixed together in a pugmill attached to the back of a truck. Slurry seals offer no structural value, but they can extend the life of a pavement by five to seven years.

Microsurfacing is an environmentally safe application that focuses on aesthetically pleasing black pavement and minimizes life-cycle costs. Microsurfacing is similar to slurry sealing except microsurfacing typically uses a polymer-modified emulsion and is applied to higher-volume roads, such as urban arterials. Slurry seals are for lower-volume roads. "When people ask me what the breakpoint is between the two treatments, I tell them it's 10 to 15 thousand cars per day," says Ingram. "That's a hard-and-fast rule." With microsurfacing, you can place multiple lifts; you can avoid settlement rutting. It's important to determine the cause and type of rut that you're attempting to level," says Ingram. "A consolidation rut, or rutting from the top down with no base or subbase failure can be effectively leveled with microsurfacing. Plastic deformation such as shoving and rutting at intersections, are not good rut-filling candidates for microsurfacing. There is too much movement for the microsurfacing to be an effective tool.

Microsurfacing can allow traffic back onto the pavement within an hour, says Vic Gawith, a salesman for Bergkamp Inc., an equipment manufacturer. "Once the chemical reaction starts, the water is being pushed out and the emulsion sucks in around the aggregate," says Gawith. "You may want to add a retarder so that the material doesn't break (set up) in the machine or in the spreader.

Thin asphalt overlays can be used on any pavement with minor distresses such as raveling or very light cracking, says Dave Newcomb, vice president of research and technology for the National Asphalt Pavement Association. For overlays of 1.5 inches thick, one uses 3/8-inch topsize aggregate; for overlays of 1 inch thick you use quarter-inch aggregate. Thin overlays bring some structural benefit, Newcomb says; they also restore ride quality and skid resistance, and they can be used to quiet a noisy pavement. Thin overlays don't require much adjustment in terms of grade corrections — you can mill the pavement lightly at the curb and feather the overlay into the curb. A thin overlay will typically last 10 to 15 years, Newcomb says.