

ROAD WARS

A long, straight road stretching into the distance, creating a strong sense of perspective. The road is flanked by white dashed lines, and the horizon is marked by a bright, glowing light source, possibly the sun or moon, which radiates outwards in a starburst pattern. The overall color palette is dominated by blues and greys, with the bright light at the horizon providing a focal point.

Innovation, Creativity, and Expertise Help Townships Battle for BETTER ROADS

Townships are in a never-ending battle to keep their roads in good shape without busting their budgets. Innovations in equipment, products, and processes, combined with industry know-how, are helping townships continue the fight.

BY **BRENDA WILT** / ASSISTANT EDITOR

Township road crews are at war. They battle constantly to maintain and improve roads while fighting against the elements, traffic, and underperforming asphalt, all of which shorten pavement life.

Consequently, townships are always looking for new and better ways to fight these enemies without it costing a king's ransom. While some have turned to innovative equipment and products as their weapons, others have found that creative combinations of tried-and-true processes offer a superior defense against road degradation and result in improved performance.

The paving industry can act as an ally as it seeks out new technologies and techniques to give townships a fighting edge in this age-old battle.

Keeping water at bay

One of pavement's worst enemies is water. If it gets beneath the surface, it undermines the road and causes cracks and potholes, especially during Pennsylvania's freeze-thaw cycle. Sealing cracks in a road before they grow into big problems is one of the best forms of pavement preservation a township can perform. In fact, the Federal Highway Administration says that crack sealing is "the single most cost-effective pre-

ventive maintenance tool available."

"Everyone should be crack filling," William Stull of Unique Paving Materials says. "It's the best way to preserve the surface and keep water from getting down into the road base. If you can keep water off the roads, the surface will last longer."

In a workshop at PSATS' 2018 Annual Conference, Rick Stone of Maxwell Products said that crack sealing not only prevents water infiltration, vegetation growth, and settling of foreign materials in cracks but also enhances the performance of surface treatments.

Crack sealing extends pavement life by five to seven years, Stone said, and can result in significant cost savings. That, combined with its quicker installation and less traffic interruption, makes it a perfect pavement preservation method in today's economy.

Typical materials for crack sealing include asphalt-based sealants that create those meandering black lines that are so prevalent on Pennsylvania roads. These sealants work fine for narrow pavement cracks but not so much for wider cracks. That's where a new material is coming into play, Stone said.

Hot-pour mastics are among the materials that the State Transportation Innovation Council (STIC) is developing through its maintenance technical advisory group. According to STIC, the



The Federal Highway Administration says filling cracks is the most cost-effective preventive maintenance tool townships can use on their roads. (Photo courtesy of SealMaster.)



goal is to develop and perfect a repair material using the properties found in hot-pour, rubberized crack sealants.

Hot-pour mastic is a polymer-modified binder that contains lightweight aggregates, Stone said. It restores structural strength to the pavement and improves rideability. It provides a waterproof repair and can be applied year-round, which is an improvement over traditional crack sealing that cannot be applied below 35 degrees F.

In addition to wide cracks, it can be used to repair potholes and utility cuts, pavement seams, shoulder joints, alligator and spiderweb cracking, raveled pavements, depressions and ruts, and rough driving surfaces. It is also ideal to fill in around raised manholes, level bridge approaches, and make bridge deck repairs.

Stone said he believes hot-pour mastic will become more widely used as it becomes more familiar. Townships can rent or purchase equipment and purchase mastics to perform the work

themselves or bid out the work. Mastics appear in PennDOT Bulletin 15 under "Special Bituminous Patching Material."

Using fiber, fabric, and fog seals

Fiber-reinforced asphalt is another weapon in the road improvement arsenal. FORTA Corporation says its FORTA-FI pavement mixture can save money upfront because it allows for a thinner layer of pavement and down the road because it lasts 50 percent longer and reduces cracking and rutting.

"The most common application is for mill and fill," FORTA sales representative Garrett Lovett says. "Fiber is mixed with about 1½ inches of material being put back on the road after milling. It holds back reflective cracking and rutting and reduces common pavement stresses."

The fiber adds about 10 percent to the cost per ton of asphalt, he says, but it averages three to five years in increased road life.

"If you can extend the life of a road

by three to five years, that allows townships to pave more roads every year," he says. "Plus, by reducing cracking and rutting, it saves a lot of money on sealing and paving."

He cautions, though, that to get the best performance, fiber-reinforced pavement must be applied to a good base.

"Fiber won't fix a bad base," he says. "It will perform better on a bad road than if you didn't use it at all, but you won't get the best result."

Lovett says this liquid fuels-eligible product is easy for townships to include in a paving project — just add it to your bid package. The pavement contractor adds the fiber to the mix and paves as usual.

"We have preferred asphalt producers that we work with that cover most of the state," he says. "We train them right at the asphalt plant so we can control the process. Pennsylvania is probably the least expensive place to use fiber; it's one of the first states to use it."

Pine Township in Allegheny County began using FORTA-FI in 2013 and has

"We're all trying to stretch the dollar. If [fiber additive] can give us another two or three or five years, it's worth it."

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A paving contractor applies fiber-reinforced pavement to a road in Pine Township, Allegheny County. (Photo courtesy of FORTA Corporation.)

used it in all its paving projects since, manager Scott Anderson says.

“We first tried it on a low-volume road and then a higher-volume road,” he says. “We are still keeping an eye on those two roads, which definitely have less cracking.”

Anderson says that while he expects roads without fiber-reinforced pavement to last eight to 10 years, he’s hoping to get 10 to 12 years out of the roads with fiber.

“We’ve been using it on roads with all levels of traffic, although we don’t have really high-volume traffic in the township,” he says. “A lot of it has been used on roads in residential neighborhoods.”

Anderson says he is cautiously optimistic about the benefits of using fiber-reinforced pavement.

“We’re all trying to stretch the dollar,” he says. “If it can give us another two or three or five years, it’s worth it.”

Another way that townships are fighting against road stresses is with paving fabric. Matthew VanLew, the roadmaster for East Brandywine Township in Chester County, has been using it on township roads since 2015, and he helped present a workshop on paving fabric at PSATS’ 2018 Conference.

“We have used it on secondary roads



Rolls of paving fabric wait to be installed in East Brandywine Township, Chester County. (Photo courtesy of the township.)

and in our residential developments with good success,” he says.

Paving fabric is a heat-set, polypropylene, non-woven geotextile that is designed to be used with asphalt overlays. It can prevent reflective cracking, improve or re-establish the road crown, and resolve drainage issues.

PennDOT has approved two contractors to install the fabric. When East

Brandywine Township bids a paving project, VanLew includes paving fabric and installation in the bid specifications.

“The paving contractor subcontracts the fabric installation,” he says. “There is specialized equipment — a series of brooms and a pipe to unroll the fabric that is mounted on a small tractor.”

The installation is fairly simple. The

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contractor sprays a tack coat on the pavement, levels it, places the paving fabric on the tack coat, and then places an asphalt overlay on top.

VanLew sees a significant advantage to using paving fabric.

"Before 2015, we were not using fabric," he says. "We were doing the typical 1½-inch mill and overlay with a lot of base repair. When the bids came in, we were not able to complete the roads we had bid because of the cost. The contractor worked with us to formulate a plan to remove most of the base repair and milling and use the fabric."

VanLew, along with the township engineer, visited Elizabethtown Borough in Lancaster County to talk to the public works director, who had been using paving fabric for more than 20 years. After looking at various borough roads and seeing their condition, VanLew was convinced that using paving fabric was the right strategy.

"We have been very happy with the performance," he says. "We have reduced the amount of base repair due to the extra strength the fabric provides. We no longer do a 1½-inch mill; in most cases, we build on top of the existing surface with a leveling course, add the fabric, and then do a 1½-inch pavement overlay."

If the township needs to do any milling in the future, the paving fabric will not cause a problem. The road can either be milled above the fabric or to a depth of a half-inch below the fabric. If the fabric was installed with the proper amount of tack coat, the milling will produce small pieces of fabric that can be mixed into the asphalt.

VanLew says he plans to continue to use paving fabric on all the township roads.

"If we can increase the life of our roads, reduce the surface cracking, and all but eliminate the need to crack-seal,



TOP: A tanker truck sprays a tack coat on the road surface while a tractor following behind lays down the paving fabric over the tack coat.

BOTTOM: Vehicles can drive on the paving fabric after it is installed. Note the tire tracks on the fabric. The final step will be to top the fabric with an asphalt overlay. (Photos courtesy of East Brandywine Township, Chester County.)

"Research has shown that some areas with **fabric under the chip seal** have resulted in **maintenance-free pavement** life cycles of **more than 20 years** with little to no reflective cracking."



I see a substantial savings upfront and over the life of the road,” he says.

Another township is participating in a pilot program to use the proven weapon of paving fabric in a slightly different configuration. Dover Township in York County is working with PennDOT and the Penn State Larson Transportation Institute to test the combination of paving fabric with a chip seal, rather than a pavement overlay. Mike Fleming, the township’s public works director, presented a workshop on the project at the PSATS Conference last month

The combination has been used successfully in other states, and although both paving fabrics and chip seals are approved by PennDOT for use with liquid fuels funds, their combined use has not. This pilot program hopes to change that, Fleming says.

The test road has small areas of alligator cracks and some block shrinkage cracks, he says. It is within 1,000 feet of a clay quarry operation by Glen-Gery, a brickmaking company.

“Our municipality has many miles of roads built on top of clay soils,” Fleming says. “This road averages fewer than 1,000 cars and 20 trucks a day.”

The surface preparation is comparable to that for a seal coat, he says. Patch potholes, level any ruts, seal cracks wider than three-eighths of an inch, clean the surface of all dust, debris, oil, and vegetation, and make sure the pavement is dry.

Once the fabric is placed on top of the tack coat, it should be rolled with a rubber tire roller to prepare it to accept the chip seal, Fleming says. Then a double application of asphalt emulsion and aggregate can be applied over the fabric.

“I like to think of it as painting my shutters on the front of my house,” he says. “Two coats of paint are going to last better than one coat.



TOP: A fog seal — a thin layer of asphalt emulsion — is sprayed onto a road that has been chip sealed.

BOTTOM: The fog seal gives the tar and chip a darker appearance similar to blacktop, reduces the amount of loose chips, and creates a smoother surface for pavement marking. (Photos courtesy of Limerick Township, Montgomery County.)

“A road that I visited in Maryland had one coat of emulsion and aggregate over the fabric,” he continues, “but near an intersection and at the crown of the road, there were a few areas where the aggregate had been ‘shaved’ off by a snow plow. I decided two layers would be better than one. Seven months after construction and several passages of snow plows over our test area, things are holding up very well.”

The paving fabric/chip seal com-

bination holds the potential to help a road surface last three to four times longer, Fleming says.

“A single application of chip seal on a road can extend the life five to seven years,” he says, “but research has shown that some areas with fabric under the chip seal have resulted in maintenance-free pavement life cycles of more than 20 years with little to no reflective cracking.”

Limerick Township in Montgomery

County is also using a combination treatment on its roads, and this one has recently earned the stamp of approval from PennDOT. The department approved design procedures and specifications for using a fog seal over a chip seal.

A fog seal is a thin application of an asphalt emulsion to an existing pavement surface with or without a fine aggregate cover. PennDOT developed and approved the specification for the combination with input from the Pennsylvania Association of Asphalt Material Applicators.

Limerick Township roadmaster Bill Bradford says the township has used fog seal on top of chip seal on 15 to 20 roads over the last couple of years.

"It reduces claims from drivers about loose chips, ice melts faster on it, and it's better for pavement marking because it's a smoother surface than tar and chip," he says. "There's less sweeping and less raveling of the road surface, and it's very cost-effective."

Another benefit is that the fog seal gives the road a darker appearance than chip seal.

"Aesthetic-wise, it's huge," Bradford says. "Most people think it's blacktop, rather than tar and chip, which no one likes."

Townships can find the specifications for using fog seals on chip seals in PennDOT Publication 408/2016, Change No. 5, under Section 472, Bituminous Fog Seal for Bituminous Seal Coats.

Turning to allies for help

PennDOT and the paving industry always say that the way to win the road war and improve road quality is by using the right product on the right road at the right time. Figuring out what is right is not always easy, though.

Townships don't have to go it alone, however. Many allies in this battle from both government and industry can help find the right solution for local road troubles.

On the government side, townships can turn to other municipalities and their engineers, roadmasters, and even the contractors they have used. Chances are, another community has faced the same road issues and found a solution that works. Visiting sites where

different products and processes have been used is one of the best ways to help you decide if they are the right fit for your township.

PennDOT and its Local Technical Assistance Program (LTAP) can also provide invaluable help. Staff at PennDOT's 11 district offices are up to date on the latest products, hear feedback from users, and often know what works and what doesn't when it comes to products and techniques.

To find contact information for your

district Municipal Services representatives, go to penndot.gov, select the "Doing Business" tab at the top, and click on "Local Government." Choose "Municipal Services Representatives" to access an interactive map of the districts.

PennDOT LTAP is a reliable, free resource for road information. Township officials and road crews may attend workshops and product demonstrations and obtain telephone and onsite technical assistance. To learn more, see page 89 for a list of upcoming courses,

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On the industry side, many suppliers truly want to help townships find the best solution for their needs.

Asphalt Maintenance Solutions (AMS), for example, provides a full gamut of services and aims to educate municipalities about the many products that are available.

"We want to help municipalities get both the best bang for their buck and the road surface they expect," managing member Terry Crouthamel Jr. says. "Because there is such an array of products, we will help them figure out the best choice based on the condition of the road and what works for their budget."

For example, Crouthamel says that while chip seals are still the most cost-effective way to fix surface issues, townships can make them higher-performing by using better aggregate or adding a fog seal.

"A lot of what we do involves educating municipalities about treating good roads first, which is sometimes a hard sell," Crouthamel says. "If you wait until a road is too far gone, the cost to fix it is going to be much higher."

A winning strategy also involves using the right product on the right road.

"If you use a product that is made for a good road on a bad road, it won't perform well," he says. "There is always a solution for a road problem — you just have to find the right product."

The company is always searching nationally and globally for new technology to add to its road improvement arsenal. Its AMS Road Sealer is based on European technology that the company brought to this country.

The one-person machine, which Crouthamel calls a "pothole elimina-



The AMS Road Sealer from Asphalt Maintenance Solutions is based on European technology. The one-person machine chip-seals potholes, wide cracks, and distressed areas on roads. A single road crew member can cover a township in a few days, spot-treating only those areas that need it. (Photo courtesy of Asphalt Maintenance Solutions.)

"We want to help municipalities get both **the best bang for their buck** and the road surface they expect."

tor," chip seals distressed areas on a road. A single operator can cover an entire municipality in just a few days, treating only those areas that need it.

"It is very cost-effective," he says. "It's a good tool for general maintenance, filling potholes, and chip-sealing single cracks. It can also be used to pretreat spots for other processes, such as an ultrathin bonded wearing course."

Another innovation that the company has introduced, this time from Colorado, is a high-performance chip seal, which uses a single-size cubical aggregate that is capped with a polymer-modified chip seal. The uniform aggregate size creates a smoother finish, more like blacktop, and offers increased skid resistance, Crouthamel says. The product is not yet PennDOT-approved for use with liquid fuels funds, however.

Unique Paving Materials also emphasizes the need to keep good roads in good condition.

"The practice of 'worst first' is a

proven death-spiral strategy because reconstruction and rehabilitation are the most expensive ways to maintain or restore serviceability," William Stull says.

To ensure that its customers get the best results, the company has turned to science and technology to optimize the performance of its products, he says, such as Ravel Check rejuvenator.

As refineries continue to improve techniques to maximize the profit on crude oil, the result is asphalt that is more oxidized, with components added back in to meet physical specifications, he says. This reduces pavement performance and the asphalt's ability to withstand the elements.

Over time, ultraviolet light causes the pavement's maltenes, or fluid components, to oxidize or convert to asphaltenes, or solid components. The pavement loses elasticity and becomes brittle and prone to cracking.

Ravel Check restores all the compo-

"We're not doing our job if we're not **saving municipalities money** at the same time that we're helping them improve their roads."

nents that were lost during the production process and due to environmental exposure, Stull says. The rejuvenator can be applied cold or heated, and company technicians will consult with road crews, remain onsite during application, and provide follow-up inspections and performance reports.

Unique Paving Materials applies equally rigorous standards to its UPM cold-mix asphalt.

"We start out by testing the aggregate, which makes up 94 percent of the mix," he says. "It goes through a dozen tests, and we reject more than half of it."

By testing and understanding each of the aggregate characteristics, Stull says, the company can engineer the specific liquid blend that, when matched with a particular aggregate, will optimize the UPM's performance.

"We are present at the plant when the cold mix is being produced," he says. "Plants are used to running hot

mix hot and black and fast. Cold mix is done a little more slowly at a lower temperature. We use only one or two aggregates in a mix and control the viscosity, which needs to be lighter at cooler temperatures."

After production, the company sends the mixture to its lab, where it is torn apart and evaluated so any necessary tweaks can be made next time to create a better mix.

"I think we're the only ones who engineer it to this extent," Stull says. "It's all so that we can provide the best product to our customers for their needs. If someone hasn't used our products, we will work with them so they can see it for themselves. Seeing is believing."

Finally, townships can also turn to SealMaster as an ally in their struggle to improve roads. Business Development Manager Mike Rich says that the company's mission is to help townships preserve their roads.

Echoing his industry counterparts, Rich says townships need to recognize three truths:

- 1) Asphalt doesn't last as long as it used to.
- 2) You need to get the water off the road and keep it off.
- 3) The longer you wait to address an issue, the more it's going to cost.

To help townships stretch those budget dollars, SealMaster offers "self-perform" programs that allow townships to rent equipment to perform maintenance activities they would not otherwise be able to do on their own.

"We want to give them the resources to maximize their workforce value," Rich says. "The more a municipality can do in-house, the more they get for their money."

Townships can rent equipment to do crack sealing, patching, joint repair, traffic marking, and even tree trimming.

"That may not seem like road main-



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tenance, but if tree canopies hang over a road, they don't give the surface the chance to dry out," he says. "Moisture is a road's enemy."

SealMaster works across the country, and in every location, the company works with state and local governments.

"That gives us a clearinghouse of best practices that we can pass along to municipalities in other areas," Rich says. "For example, they are making strides in Michigan on tar and chip technology, in Ohio on joint maintenance, and in Canada on cold-weather fixes.

"We can make that information

available to municipalities and then they can make informed decisions," he adds. "If you know there is a better way, you can at least give it a thought."

Being able to transfer knowledge from one place to another can save a ton of money, he says.

"We're not doing our job if we're not saving municipalities money at the same time that we're helping them improve their roads," Rich says. "We are not going to recommend a wrong product just to make a sale. We will give them an honest assessment, let them know all their options, and then do our best to find the right product based on an accurate appraisal."

If SealMaster doesn't have a rental program that a township needs, the township can visit its local SealMaster location, which may be able to customize a suitable program.

"When a township road department participates in one of our programs, we provide everything that is needed, including training until they and we are comfortable that they can perform the work," Rich says. "When they're done, we come and pick up everything. If there is a problem, we come and fix it. We are really more of a concierge service in that way."

The bottom line for townships when waging their road wars is to find the best solution and don't try to go it alone.

"Don't be afraid to reach out for help," Crouthamel of Asphalt Maintenance Solutions says. "Do that before you bid. Get someone to look at your road and help guide you to the most cost-effective product or process. We're all fighting the same fight and can help each other." ♦



SealMaster offers self-perform rental programs for townships, which provide equipment, supplies, and expertise to help them complete road projects that they would not otherwise be able to tackle. There are programs for such activities as (clockwise from upper left) crack sealing, tree trimming, and pavement patching. (Photos courtesy of SealMaster.)