# Products and Techniques Help to Deliver **Safe, Smooth, and Cost-Effective Roads**

Photo courtesy of PennDOT.

**Warm mix asphalt**

**Fiber reinforced**

Photo courtesy of Limerick Twp., Montgomery Co.

**Chip and seal**

**Paving fabric**

Photo courtesy of Cedarville Engineering.

Microsurfacing

Photo courtesy of PennDOT District 2.

Photo courtesy of PennDOT District 2.

Of all the hats a township supervisor wears, none is more visible than the familiar hard hat that signals roadwork ahead. Roads have always been a major responsibility of townships, and their upkeep continues to account for a large chunk of a township's time and money. So how do you make the most economical and knowledgeable road decisions for your township? **It starts with an understanding of road surfacing methods.**

BY **AMY BOBB** / CONTRIBUTING WRITER, PSATS

Limerick Township roadmaster Bill Bradford believes his Montgomery County township has a pretty good system in place for maintaining its roads. It's nothing too fancy, but the township must be doing something right. Its roads typically last 20 years or more, thanks to the pavement management program he has in place.

"It starts with a road inventory," Bradford says. "We use a scale to classify paving conditions on a road as very good, very poor, or somewhere in between."

Then, the township follows the industry advice of using preventive techniques to fix its good roads first. Bradford likes to stick with the tried and true: crack and chip sealing first and then a thin overlay of asphalt when needed.

"Eventually, a road will fail," he says. "At that point, we will do reconstruction through recycling and an overlay."

On the other side of the state, the Township of Pine in Allegheny County has turned to one of the latest PennDOT-approved products to get the longest life out of its asphalt pavements.

"For the last three or four years, we have been using FORTA-FI, a fiber ad-

# ROAD SURFACING

> "It comes down to what we always preach: **Do the right treatment on the right road at the right time.**"

ditive that promises to extend the life of the asphalt, reduce cracking, and stretch our money further," township manager Scott Anderson says.

The township is impressed enough with the cost benefits that it is planning to systematically repave all its roads with the product over the next decade.

Whether using the latest innovation or techniques that have been around for decades, townships with successful road maintenance plans have one thing in common: They keep the public motoring happily along on a safe, smooth, and cost-effective surface.

"It comes down to what we always preach," LTAP technical expert Sam Gregory says. "Do the right treatment on the right road at the right time."

But with a vast number of treatment products and techniques available, how is a township to keep it all straight?

Don't be overwhelmed by what is out there for maintaining roads, LTAP technical expert Tim Montag advises.

"Much of it is marketing and promoting nuances of the same thing," he says. "At the end of the day, many of the products are variations on the same theme."

Tom Welker, a municipal services specialist in PennDOT's central office, agrees. "There's not a whole lot of new stuff coming along," he says. "Basically they are just different approaches to the tried and true and reinventions of older products and processes."

Instead, road experts urge townships to focus on the basics of good road maintenance by developing a pavement preservation plan, doing their homework on road surfacing methods, and applying the best treatment option for their roads.

## Hot vs. cold mix

An understanding of the different road surface methods begins with knowledge about the material itself. A road surface is basically a mix of oil and stone. Just how and where those materials are concocted and mixed determines whether it's a hot, warm, or cold mix. *(See box on opposite page for more about these mixes.)*

Hot or warm mix, also called asphalt or blacktop, is mixed at high temperatures in a plant and then trucked to the road site for paving. Cold mix, on the other hand, is mixed at the job site, usually with a water-based emulsion that doesn't have to be heated. In a basic cold mix operation, a tanker distributes oil onto the road, and chips are placed on top.

What a township decides to use on its roads depends, in part, on its budget, the volume of traffic, and even where it's located. Townships in the northcentral part of the state, for the most part, use hot mix materials, such as asphalt and standard seal coat or tar chip, to extend the life of their roads, says G. Randy Albert, municipal services supervisor for PennDOT District 2.

"We have a lot of hot mix producers in Pennsylvania," he says. "The competition makes it more economical for townships to use asphalt."

Perhaps the best way to understand the concept of hot versus cold mix is to explain what happens during road reclamation when the blacktop of a deteriorating road is chewed up, recycled, and laid down again. During cold mix recycling, the surface of the road is scraped off or milled, mixed onsite with a new liquid binder of emulsified asphalt, and immediately laid back down on the road. Hot mix recyclers, on the other hand, will remove the top few inches and send the millings to a plant to be remixed and returned to the site later for placement.

The depth of road recycling can range from several inches to as deep as 8 inches in a full-depth reclamation. Cold mix reclamation, which is the method most used by townships, will typically cost $8 to $15 a square yard plus the cost of a hot mix binder placed on top.

"For roads completely gone, reclamation can bring a road back, but you will have to pay for it," Albert says.

Because reclamation is costly and more involved, townships try to hold off for as long as possible on road reconstruction, which changes the road's structure. Preventive maintenance techniques that have been proven to extend the life of roads can help in this endeavor.

"Townships making the most impact

## 5 STEPS to an effective road management program

**1. Inventory the roads.** Take an accurate survey of your township roads, paved and unpaved.

**2. Assess the condition of the roads.** Develop simple techniques for rating the roads each year and maintain a record that notes changes in road conditions.

**3. Launch a road maintenance plan.** Select the most appropriate treatment to repair each road, bridge, or problem area.

**4. Determine overall needs.** Estimate the cost of a repair job using average costs and tally the total. Set long-range goals to help justify budgeted expenditures.

**5. Establish priorities.** Keep good roads in good shape with preventive maintenance. Establish a separate budget to reconstruct severely damaged roads.

# The evolution of hot, warm, and cold mix

In the late 1990s, the asphalt industry changed the way hot mix asphalt was designed when SUPERPAVE replaced the Marshall mix method. More recently, the asphalt industry was shaken up again when warm mix asphalt became the latest paving trend.

Warm mix asphalt is produced and placed at lower temperatures *(30 to 120 degrees Fahrenheit lower)* than traditional heating practices. Advocates of this method say the reduced temperature results in energy savings, a longer lifespan of the pavement, and better paving projects, including the extension of the paving season into cooler weather. Warm mix asphalt is also more forgiving and, with lower emissions, is better for the environment and the workers paving with it.

Over the past five years, PennDOT has embraced warm mix by incorporating its specifications into Publication 408 and using the product on more projects. As PennDOT moves almost exclusively to warm mix, many townships are doing the same.

"Because PennDOT is arguably the largest customer of blacktop in Pennsylvania, it can be difficult for plants to switch from making warm mix for PennDOT to hot mix for municipalities," Tom Welker, a municipal services specialist in PennDOT's central office, says. "It can create a scheduling nightmare."

As warm mix becomes more acceptable on road projects, it has become almost interchangeable with hot mix.

"PennDOT almost exclusively bids warm mix anymore," Randy Albert of PennDOT District 2 says, "and as big brother goes, more townships are doing so, too."

Cold mix also has a long history in Pennsylvania, where it is typically used in more rural applications to build layers to a road. For years, municipalities in rural areas turned to cold mix because it was inexpensive and the softer, more flexible mix helped them transform cow paths and dirt roads into paved roads. Over time, hot mix asphalt was added on top.


Photo courtesy of PennDOT.

**WARM MIX**
**Embraced by PennDOT as an economical and environmentally friendly alternative to hot mix, warm mix asphalt is produced and placed at lower temperatures.**

"Cold mix molded itself to the shape of the road and made a good foundation to build up a road," Welker says.

The pliable product can practically heal itself, Tim Montag of LTAP says. "What cold mix has that no other product does is that if it cracks in the winter, it will heal itself in the summer."

Because the mix is more pliable and can help to stabilize roads as conditions change underneath, Welker has been observing a growing demand for it in some rural areas. Some PennDOT regions have been adding clean stone and oil emulsion to stockpiled millings to form a base on rural roads, he says, and then paving or adding a seal coat over top.

"They are using cold mix to re-establish a flexible base just like the guys 40 or 50 years ago did," he says. "The nice thing about cold mix is that it doesn't crack. Over time, it gets pushed out of place, but once you have a road base established, you can come back and put hot mix on later."

When using cold mix to patch roads, it's important to control the ingredients that go into the mix, says William Stull, technical products manager of Unique Paving Materials, which makes a high-performance pavement-repair product called UPM.

"About 95 percent of the cold mix is aggregate, and you need a good aggregate to make a quality mix," he says. "We always go out and test the stone first. Then we design the liquid around it so that each batch we produce is customized to the stone and oil available in that region."

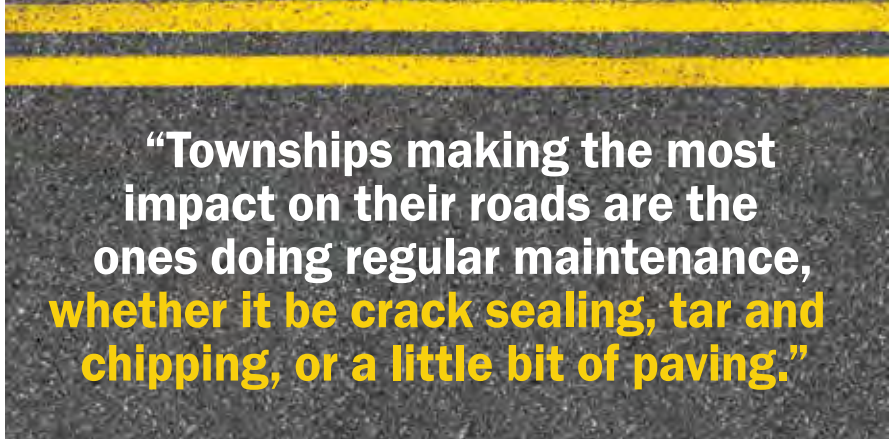
The result, he says, is a high-quality product that will outlive the road itself.

"We guarantee it will outlast the hole you put it in," he says.

Photo courtesy of Unique Paving Materials.

**COLD MIX**
**Long used in rural applications to build layers to a road, cold mix asphalt is more pliable and can heal itself in the summer.**

# ROAD SURFACING




on their roads are the ones doing regular maintenance, whether it be crack sealing, tar and chipping, or a little bit of paving," Albert says.

If a township starts with a solid road with a proper base and drainage, theoretically it should not have to do any more than apply a surface treatment every 10 years, Montag says. More often than not, however, other factors, such as changes in traffic or weight loads, make it difficult for that scenario to play out in the real world.

"No matter what treatment you use, it is only as good as what you are putting it down on top of," he says. "If you put it on a bad base, it's going to come back and haunt you every time."

## A mix of fixes

To extend the life of a pavement, townships have a toolbox of options available to them. Experts recommend they choose a "mix of fixes."

"Not every road requires the same fix," Sam Gregory of LTAP says. A township deciding on which one to pick must consider the condition of the road, the volume of traffic, what the township can afford, and what will satisfy the public. If they want to be reimbursed with liquid fuels funds, they should also make sure the product or process is PennDOT-approved.

"Everyone wants their road paved, and if a township had all the money in the world, it would pave everything," Gregory says, "but they don't, so they have to look at their existing road conditions and then their budgets and figure out what they can afford to do."

The bottom line is that preventive maintenance pays off, he says. The industry rule of thumb is that every dollar spent in preventive maintenance while the pavement is structurally sound will save $4 to $5 in costs down the road. Townships that do preventive maintenance on a regular cycle will ultimately find they have more money to tackle more roads, he says.

Within the toolbox of preventive maintenance techniques, the options for surface treatment fall into the following general categories *(estimated price ranges for approximately one mile of 18-foot-wide roadway are provided by LTAP)*:

- **Chip and seal *($10,000-$20,000/mile)*** — This basic maintenance tool, also called "oil and chip," "tar and chip," or "seal coat," is a low-tech, versatile practice for prolonging the life of local roads. The basic process involves squirting the road with oil and laying stone over top, something that can be done by a road crew or a contractor. Although it's the most affordable option for townships, it's not always popular with motorists, who complain about the crunch and plink of a freshly treated road.
- **Microsurfacing *($20,000-$30,000/mile)*** — This cold treatment, which Gregory calls a "hybrid chip and seal," applies aggregate with a polymer asphalt emulsion to seal the road, fill ruts, and provide skid resistance. The durable treatment can extend the life of a pavement by five to seven years.

Residents sometimes complain that the surface is too rough, especially on residential streets where children might bike, skate, or play. ➤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# ROAD SURFACING

• **Ultrathin bonded wearing course *($50,000-$60,000/mile)*** — Originally called NovaChip, this method spreads an open-graded, hot mix asphalt on top of a sprayed tack coat to the thickness of less than an inch. It seals the road to keep moisture out, prevent cracking, reduce skidding, and extend the life of the pavement.

Because it results in a smoother look that resembles paving, this option is popular with residents, but it is costlier than chip and seal or microsurfacing.

• **Thin asphalt overlay *($50,000-$60,000/mile)*** — In this technique, hot or warm mix asphalt is spread up to 1½ inches thick as an overlay on a road. If the asphalt is laid thicker than that, it is considered a structural repair, rather than a surface treatment.

The various surface treatments are designed to lengthen and preserve the service life of a road, Montag says.

"It's the equivalent of painting a house," he says. "You are preserving and extending the life, but you are not fixing structural deficiencies."

However, just as painting a house that is falling down would not make sense, the same can be said for treating the surface of a road in extreme disrepair.

"A pavement that is too far worn will not get the best performance from these treatments," Montag says.

In general, a brand-new pavement with a proper base or one that has been recently resurfaced with a 2-inch overlay should be scheduled for surface treatment within the first seven to 10 years. Deciding which treatment product to use is often based on preference, cost, and, of course, public expectations.

"If you can deal with the public complaints, you would choose chip and seal because it is the least expensive and it works," Montag says. "So often, the choice comes down to what the public will accept and how these products and methods worked out in the past for you.

"Much of it, too, is predicated on budget," he continues. "You want to choose what will give you the biggest bang for your buck."

The key to making the most of your maintenance dollars, he says, is to keep your road system at the highest level — focusing on your good roads first — so that eventually you will only have to maintain and protect them.

### Tried and true with a twist

Oil and chip, or seal coating, has been a long-time staple in a township's toolbox of roadway maintenance techniques. Sure, it's messy and often

## PennDOT approval process

Contractors and suppliers provide townships with countless quantities of materials to repave roads and reconstruct bridges. These materials help maintain more than 77,000 miles of local roads and 6,400 local bridges.

Materials that meet PennDOT-approved state specifications mean that they have been thoroughly tested and proven to be safe, durable, and consistent.

"Nothing approved anywhere in PennDOT hasn't been run up and down the flag pole," PennDOT municipal services specialist Tom Welker says. "And we do not just give it the sniff test. We make sure it delivers on what the manufacturer says."

By using approved materials, townships can be confident they are getting a quality product, he says. Furthermore, products that are approved and listed in Publication 447, *Approved Products for Lower Volume Local Roads*, as well as Publications 408, *Specifications*, and 242, *Pavement Policy Manual*, are eligible for liquid fuels fund reimbursement.

"Let's face it," he says. "We are protecting Pennsylvania's taxpayers. We don't want to recommend something where you won't get your money's worth."

Here's how products and processes are evaluated and approved for Publication 447:

✓ A manufacturer submits an application through the PennDOT website.

✓ The application is reviewed by the Bureau of Project Delivery and the PennDOT districts. PennDOT's New Products Selection Committee, which is comprised of local government representatives, also reviews the product application for "interest and appropriateness."

✓ The product is turned over to Penn State for testing.

✓ PennDOT and the New Products Selection Committee review the test results, and PennDOT either grants or denies approval. Approved products are added to Publication 447.

✓ The product continues to be re-evaluated. Quality assurance and quality control reviews are performed on approved products and processes on a rotating basis. If something doesn't continue to meet the requirements, it is removed from the publication and is no longer eligible for liquid fuels fund reimbursement.

### Paving product removed from PennDOT-approved list

**PennDOT recently removed emulsified asphalt class AE-T material for use as a bituminous bonding material from its approved products list and added two other materials for this use instead: TACK *(emulsified asphalts used for a tack coat)* and NTT/CNTT *(emulsified asphalts used as a non-tracking tack coat).***

**The tack coat is designed to help blacktop adhere to a road, says PennDOT's Tom Welker, and in the ongoing evaluation of the AE-T material, the department had not observed the continued success it had hoped.**

unpopular with residents, but it still remains the best fix for a rural road.

"Nobody seems to like it because the stone placed on top rattles under car wheels," Welker says. "It's noisy and rough, but it is inexpensive, buys time, and is a proven method for preserving a roadway surface."

Terry Crouthamel of Asphalt Maintenance Solutions LLC says he "cut his teeth" on oil and chip when starting in the road maintenance business in 1970.

"It's the oldest form of maintenance, and it's still the best," he says. "Nothing beats it, not even NovaChip."

An oil and chip surface allows the road to move and flex, which is especially helpful on roads that may not have a good base to start with.

"About 80 percent of township roads have no base," Crouthamel says. "When many roads were first developed, townships were simply trying to take them out of the dust and mud and give them a hard surface."

Over the years, townships have figured out ways to address some of the public's concerns about chip and seal.

During his 24 years at Limerick Township in Montgomery County, roadmaster Bill Bradford has witnessed the population double, the road system increase from 63 to 90 miles, and public expectations about roads rise. To reduce complaints about loose stone on the roads, the township has picked up a few tricks along the way.

Several years ago, it began using a double layer of chip and seal, topped by a fog seal, that produces a paved-like surface at an economical price.

"It's been a huge help to us," Bradford says. "It keeps the stones knit together so we don't have to sweep all the time, and it's black so people think it's just been paved."

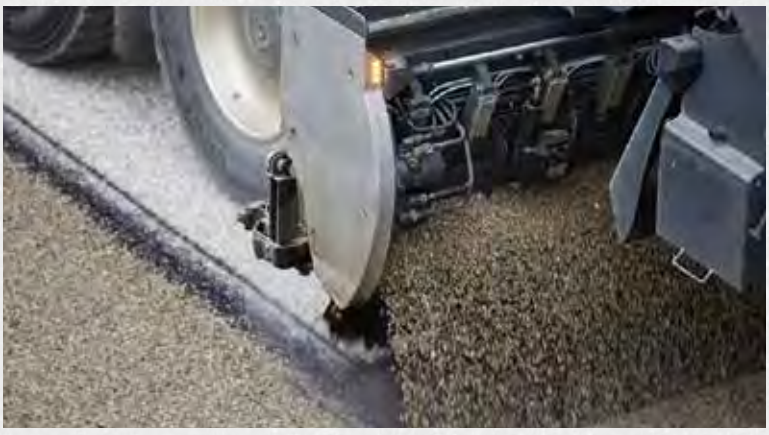
In Berks County, Earl Township uses oil and chip on four hills where the rougher surface provides needed traction. About eight years ago, it switched to a single-size chip seal, which uses a 3/8-inch cubical stone followed by a fog seal treatment. Because the stone sets quickly, the contractor can sweep the road the next day instead of waiting a week like with traditional chip and seal, says roadmaster John Groff.

The fog seal, which is an asphalt-

## On the lookout for innovations

**Companies and manufacturers are always on the lookout for innovative and cost-saving technologies that will make the paving process faster, safer, and more effective.**


**Liquid Road bituminous resurfacer from SealMaster is a flexible coating applied over asphalt during routine maintenance on low-volume, low-traffic roads. The stabilized emulsion can be applied by a road crew or a contractor using a self-propelled squeegee machine or a spray machine capable of applying emulsions with sand. SealMaster says the product moves with the road, is highly resistant to water penetration and UV degradation, and has adequate anti-skid properties. Several municipalities in Pennsylvania and other states have successfully used the product to lock down stone, seal pores, protect the binder, and extend the life of their chip seal, says Mike Rich of SealMaster. The company plans to seek PennDOT approval of Liquid Road this year.**



**The AMS Road Sealer is a new piece of equipment that Asphalt Maintenance Solutions (AMS) uses to chip seal distressed areas on a road. This machine only needs a driver to do the job of what usually requires four or five people. The computer-controlled unit moves along a road and applies repair material to seal cracking and eliminate the formation of potholes. It can be used as a spot sealer during general maintenance or in preparation for other treatments. Terry Crouthamel of Asphalt Maintenance Solutions says the sealer eliminates mess, saves money in labor costs, and improves safety since fewer workers are exposed to the dangers associated with working on a road.**

# ROAD SURFACING

"No matter what treatment you use, it is only **as good as what you are putting it down on top of.**"

based emulsion, knits the surface together so that vehicles don't kick up loose stone.

"It also provides a head game for residents who see the black surface and think the road has been paved," Groff says. In addition, he likes how the dark surface attracts sun to melt snow and ice in the winter. (***Note:*** *Single-size chip seal and fog seal are not yet PennDOT-approved.)*

Rayburn Township in Armstrong County saw a difference on its tar and chipped rural roads after a contractor took over the job four years ago.

"After hiring a contractor with the proper equipment to apply the tar and chip, we noticed we also had much less loose stone on the road," supervisor Gregg Smith says. "The equipment is computerized so it puts down just the right amount of stone, which also saves us money."

Another benefit of giving the tar and chip job to a contractor was that the life of the road doubled.

"When our crew used to do the job, the tar and chip would last about two years before we had to do it again," he says. "On the roads that the contractor did four years ago, we are only now starting to see signs that they might need some patching."

## Responding to residents

In suburban Montgomery County, Whitpain Township likes to keep its 70 miles of roads on a regular preventive maintenance schedule.

"Every road is resurfaced every eight to 10 years," Ron Cione, the township's director of public works, says. "By doing preventive maintenance, we don't have to do heavy overlays or recycling of roads."

Instead, the township uses what he calls "the two best tools" in its toolbox: microsurfacing, which costs the township about $2.35 a square yard, and ultrathin bonded wearing course, which averages about $5.25. Whitpain was one of the first municipalities in the state to begin exploring more modern technologies soon after Cione started with the township 34 years ago. Prior to that time, the township mainly used chip and seal.

"We were rural back then," Cione explains. "We are now a larger, more sophisticated community, and the residents have higher expectations. Can you imagine going through one of our developments with half-million-dollar homes and doing chip and seal on their roads today? I would be run out of town on a rail."

Now that the township has turned almost exclusively to microsurfacing and ultrathin bonded wearing course, deciding which process to apply depends primarily on where the road is located.

"We listen to our residents, and many don't like the rougher texture of microsurfacing on the roads where their kids play," he says.

Therefore, the township tends to use the ultrathin course on roads in developments and microsurfacing on the connector streets that run between state highways. As ultrathin gains popularity, the township continues to shift more roads to this treatment. Cione estimates 80 to 85 percent of its roads are now treated with the ultrathin finish.

"People prefer the smoother ride," he says.

The beauty of an ultrathin bonded wearing course is that it can be applied to any road, from low-volume roads in developments to high-traffic areas

## A five-stage ROAD MAINTENANCE STRATEGY for townships

**As part of its road inventory and annual assessment of road conditions, a township should incorporate a multiyear plan to predict which roads will need attention and when. According to LTAP, each road should fall into one of five categories:**

**1. Routine maintenance — Roads in this category are in good condition and may only require crack sealing and pothole patching. Do this work in the current year because deferring it can cause roads to deteriorate more rapidly.**

**2. Preventive maintenance — Roads in this category require surface treatments, such as seal coats and thin overlays, to stop further deterioration. Potholes should be patched and cracks sealed before the surface treatments are applied.**

**3. Deferred action — Roads that are beyond the help of preventive maintenance but do not yet need rehabilitation fall into this category. Fund only routine maintenance and plan to rehabilitate the roads in the future.**

**4. Rehabilitation — These roads are beyond preventive maintenance and can no longer be deferred. Methods for rehabilitating them include large-scale patching and repairs, thick overlays, and reclamation.**

**5. Reconstruction — Roads in this category require the complete removal and replacement of failed pavement. Townships try to avoid this costly and time-consuming level of repair by using routine and preventive maintenance strategies.**

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Photo courtesy of PennDOT District 2.

**Paving grid is a kind of paving fabric that helps to shore up an unstable road base and extend the life of the pavement. The product is rolled over the road base and covered with stone and blacktop.**

that see 200,000 vehicles a day, says Crouthamel of Asphalt Maintenance Solutions, which first discovered the product in Europe in the early '90s and brought it to Pennsylvania.

"It holds up well under any condition," he says.

The key to its success, he says, is doing your homework to make sure you are using the right aggregate for the traffic on the road. He suggests townships investigate the stone and the supplier and use a good, cubical, hard variety that will hold up well to expected traffic load.

## Fabric and fiber

With limited funds for road maintenance, townships are always on the lookout for cost-effective products and processes that will prevent cracking and extend the life of their pavement.

"The biggest downfall of asphalt is cracking, which allows water to get underneath it," PennDOT's Welker says.

From his office in Harrisburg, he keeps an eye on new products and techniques and shares them with the district offices. PennDOT has an extensive process in place to test new technologies and provide approval for use on state roads and consequently by municipalities that want to be reimbursed with state liquid fuels funds. *(See article on page 14 for more on this approval process.)*

Some of the more promising products approved by PennDOT and touted to preserve pavements include paving fabric and fiber.

• ***Paving fabric,*** which runs $1 to $2 per square yard, is a specially woven fabric that reduces reflective cracking to extend the life and performance of pavement. Sometimes referred to as geotextiles, the fabric helps to prevent water from getting underneath the road, where it can wreak havoc.

The fabric is rolled like carpet over a tack coat and overlaid with asphalt. PennDOT has approved its use with hot and warm mix asphalt, and the department has recently been exploring placement with oil and chip.

"It's not a panacea," stresses LTAP's Montag, "but you can put it on a pavement in marginal shape and it does a pretty good job of bridging over any distresses underneath."

East Brandywine Township in Chester County recently turned to paving fabric as a comparable substitute for traditional base repairs and has been pleased with the results and how the product helps to stretch its road dollars.

"You can repave and put a wearing course on a road, but if the base layer is not in good shape, it's always going to fail," says Steven Dadio of Cedarville Engineering, one of the township's engineers. "Instead of starting from scratch and digging up the subbase, you can use the paving fabric to bridge some of the potholes and imperfections in the subbase."

The savings from reduced subbase repair allow the township to tackle

more roads. Last year, the township repaved four roads with paving fabric for a slightly higher cost than if it had repaired two roads without it. The fabric has proven to be so successful in helping East Brandywine stretch its road dollars that Dadio has been recommending it to other municipal clients.

"Many communities have a laundry list of 10 to 15 roads that need to be paved but with their budget, can only manage to do two or three a year," he says. "By using this product, they may now be able to increase that to four or five roads. Taxpayers can get extra roads paved for essentially the same money, and the township is starting to make a greater dent in its maintenance schedule."

• ***Geogrid*** is another kind of paving fabric that helps to shore up an unstable road base and extend the life of the pavement. This product is rolled out over the road base and covered with shale or stone, a level course, and finally blacktop. Resembling a snow fence more than a fabric, it contains squares in a grid that lock the stone in place and keep it from spreading laterally.

> "Get lots of different opinions so you can see the **pros and cons of everything.**"

• ***Fiber seal or mat*** is yet another option townships can use to inhibit cracks and extend pavement life. Applied in one treatment using specific equipment, this specially engineered fiberglass can be laid on oil before chips or distributed as a mat between layers of asphalt. It can also be placed as a wearing course.

About 10 years ago, Graham Township in Clearfield County used fiber mat on two state turnback roads that were undergoing full-depth reclamation. Supervisor Steve Condo, who was roadmaster at the time, was impressed with the entire full-depth process, including how the fiber mat was applied as an interlayer between two coats of asphalt.

"It sealed the two layers and held the road together beautifully," he says.

In fact, he says, if you looked at that road today, you would think it was completed just a year or two ago. "That's what a good job it did of keeping everything knitted together," he says.

On the other road, the fiber mat was placed as a wearing course, and while that has held up strong, too, it has started to show a little more wear, Condo says. All in all, though, it has fared better than other roads that were reclaimed around the same time and not given the fiber mat because of limited funds.

"Fiber mat is more expensive to use," he says, "but, boy, it makes the road last."

• ***FORTA-FI*** is another product that incorporates fiber and provides a stronger pavement. Known for its superior mixing, it was recently PennDOT-approved for use with hot and warm

# ROAD SURFACING

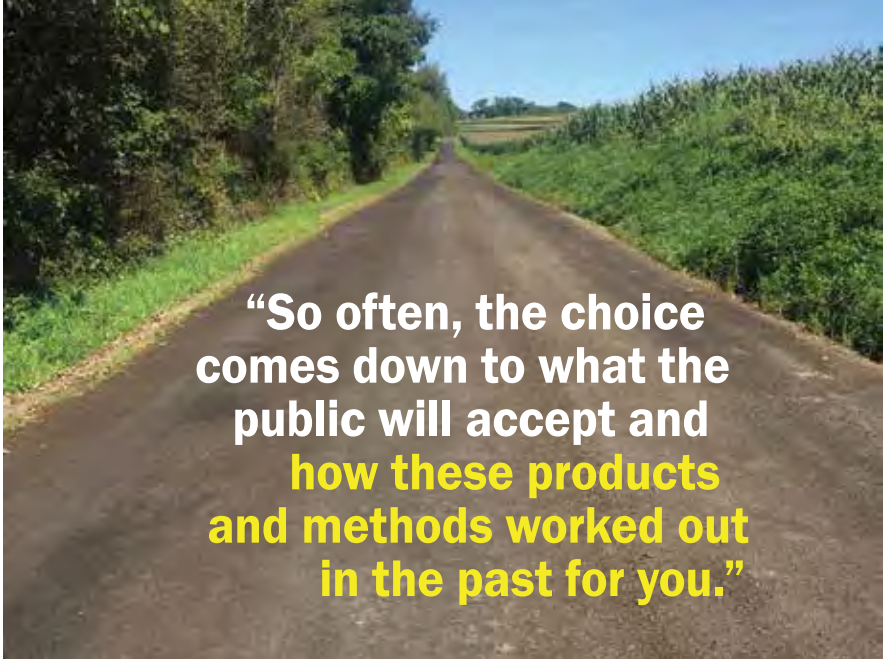


Photo of road treated with Ultra Bond courtesy of Environmental Energy Solutions.

**Dust suppression products can help to control dust, which is one of the biggest complaints townships hear about dirt and gravel roads.**

mix. This high-tensile reinforced fiber, which is similar to the material used in bulletproof vests, is added to the asphalt at the plant at a pound per ton.

"It's like mixing a super-strong, three-dimensional spider web into your asphalt to hold everything together," says Garrett Lovett of FORTA Corporation, the company that produces the fiber additive.

FORTA-FI is commonly used in wearing courses on Pennsylvania roads. When applied during a typical mill-and-fill or overlay, it helps to extend the life of the pavement by three to five years, he says, and adds about 10 percent to the cost of a ton of asphalt.

"Most townships we see are five to 20 years behind schedule on their paving projects," Lovett says. "By using the fiber, they have been able to get back on track in about half the time."

The asphalt additive reduces potholes and cracking so townships don't have to do as much crack sealing and patching. "It allows them to save money on maintenance and hopefully pave an extra road or two each year," he says.

Of the 70 miles of local roads in the Township of Pine in Allegheny County, about 15 to 20 have been resurfaced with FORTA-FI, says township manager Scott Anderson. For the past three or four years, the township has annually repaved about five miles by milling off

a couple of inches and applying a new wearing course with the extra-strong fiber added.

"We did a couple test roads the first year, one with little traffic and one with more traffic, and where we normally would start to see some cracking, we didn't have any," Anderson says. "Once we looked deeper at the costs and benefits of the product, it just made sense."

With FORTA-FI firmly in its toolbox, the goal of the township is to have all its roads repaved with the fortified asphalt within the next 10 years. Bids for all paving projects must now include the additive in the asphalt mix.

### Dirt and gravel roads

Water is the enemy of any road, but especially the thousands of miles of dirt and gravel roads in Pennsylvania.

"Dirt and gravel roads typically require a much higher crown than paved roads to keep the water flowing off as quickly as possible," LTAP's Montag says.

Driving surface aggregate (DSA), a product developed by Penn State's Center for Dirt and Gravel Road Studies, also helps with water runoff. Created specifically for use as a wearing course on unpaved roads, this mixture of crushed stone was designed to reduce sediment runoff to streams — the ultimate goal of the Dirt, Gravel, and Low-Volume Roads Program, which is celebrating its 20th anniversary this year.

The aggregate also improves the public road system and reduces municipalities' long-term road maintenance costs, says Gregg Smith, a specialist with the Armstrong Conservation District.

"It has more fines and locks better than other aggregates," he explains. Because DSA is densely packed and the fines in the aggregate are crushed rock, rather than silt or clay, dust and sediment pollution are reduced.

Dust control is one of the biggest complaints townships hear from residents traveling on dirt and gravel roads. About three years ago, when the price of oil was high, Rayburn Township, where Smith is a supervisor, decided to try Ultra Bond, one of the dozen or so dust-suppression products approved by the Center for Dirt and Gravel Road Studies.

Not only did the resin-based solution prove effective in suppressing dust,

## Testing for quality at the job site

PennDOT recommends that townships run quality assurance tests in the field to ensure that all road material and work are of the highest quality and consistency.

Road material is typically tested at the plant where it is manufactured, but because this is done on a large volume of materials, townships should also conduct on-site testing to ensure that the material has not become segregated or contaminated during processing and delivery. PennDOT district municipal services representatives can help townships set up a test program.

Upon delivery of materials, townships should generally observe to see if any irregularities exist, such as clumps, excessive fines or coarse aggregates, or excessive moisture. If any irregularity is found, the township may want to conduct formal testing next.

When placing the materials, perform a similar visual inspection to make sure materials are reacting as expected. The material should not be segregating, appear too moist or dry, or compact, rut, or ravel when opened to traffic.

Improper application can be just as much at fault for pavement failure as the material itself. Become familiar with application specifications to make sure all material is placed properly. For example, improper compaction is the primary cause for aggregates to fail on a stabilized road.

# ROAD SURFACING

but it has also helped to stabilize the road surface going on three years now. Although the product is designed to be reapplied every year, it has held up so well that the company that produces and distributes it has only had to touch up the edges and address a few loose spots. Smith notes this has saved the township money.

"We never expected to get two to three years out of the product," he says. "We just wanted to keep the dust down because that's one of the biggest complaints of our residents. Not only has it proven to be an economical way to suppress dust, but it has also helped to seal the road."

In fact, the product has proven so effective that the township has subsequently used it on two other dirt and gravel roads. It plans to spray the emulsion on its fourth and final dirt road this year, after which the roads will be treated on a regular cycle.

A distribution truck applies the Ultra Bond over three treatments, the second one a week after the first and the third a month later. By suppressing dust and stabilizing the road surface, Frank Holuta of Environmental Energy Solutions LLC says, the product prolongs the life of a dirt road. It's also environmentally friendly, he notes, and is eligible for dirt and gravel road program funding and liquid fuels funds.

## Do your homework

Wading through the many products and techniques available for road surfaces may, at times, be overwhelming to townships.

With tons of materials out there, LTAP's Montag has this advice: "Make sure you do your research."

**• Start with the folks in your PennDOT district municipal services office.**

Staff members at PennDOT's 11 district offices are kept informed on the latest products, hear feedback from users, and often know what works and what doesn't when it comes to products and techniques.

"We will be happy to talk to township officials and give them options and estimates," Albert of District 2 says. "It's what we do every day."

To find contact information for your district municipal services representatives, go to **www.penndot.gov** and click on "Local Government" under the "Doing Business" tab at the top of the page. Choose "Municipal Services Representatives" to access an interactive map of the districts.

**• Talk to township engineers, roadmasters, other municipalities, and contractors.**

"Chances are someone somewhere close to you has looked at a product and used it," Montag says. "Talk to them and then determine what works best for you."

The municipalities in the Delaware Valley have gone a step further by forming a consortium in which they join forces on road-related bids to obtain the best price, says Ron Cione of Whitpain Township. ➤

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## Become a Roads Scholar

**Township supervisors, roadmasters, and road crews can be updated on maintenance and safety topics while earning a professional certification through the Roads Scholar program offered by PennDOT LTAP. The program now has two designations — Roads Scholar I and Roads Scholar II — and participants are required to attend a certain number of LTAP courses within a three-year period.**

**Anyone earning a Roads Scholar designation is recognized as an authority in the field of road maintenance. To learn more about the program or about LTAP courses in general, go to www.ltap.state.pa.us or call toll-free (800) FOR-LTAP (367-5827).**

"Any municipality that belongs to the Montgomery County Public Works Association is also invited to join in the bid," he says. "This has proven to be very successful."

Contractors can be useful resources, too, but keep in mind that it's their job to sell you something.

"Temper what they tell you with research of your own," Montag advises. "Get lots of different opinions so you can see the pros and cons of everything."

• **Attend training courses.**

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. See page 78 for a list of upcoming courses, go to **www.ltap.state.pa.us,** or call toll-free (800) FOR-LTAP (367-5827).

PSATS also offers a variety of training. Go to **connect.psats.org/training** to learn more.

In addition to attending classes, Steve Condo of Graham Township, Clearfield County, recommends that supervisors get out into the field to observe the product or technique in the real world.

"They really need to actually see it in action," he says. "They can gain a lot of knowledge by going beyond the classroom and seeing how something works."

• **Finally, make sure you are using a PennDOT-approved product and supplier if you want to use liquid fuels funds to cover the costs.**

"Lot of options are out there, but they're not all approved," Montag says. "That's not saying they're not good or they're not going to work. Just be aware that you may end up paying for it out of your general fund or reimbursing your liquid fuels funds, and it's nice to know that upfront." ✦

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- ☑ **Township Highway Occupancy Permit –** Streamlined permit clearly identifies where work will be peformed, with plenty of space for special conditions or instructions.

*These two-part forms comply with Section 2322 of the Second Class Township Code and Title 67 of the Pennsylvania Code, Section 441.4.*


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**Questions?** Call PSATS at (717) 763-0930.