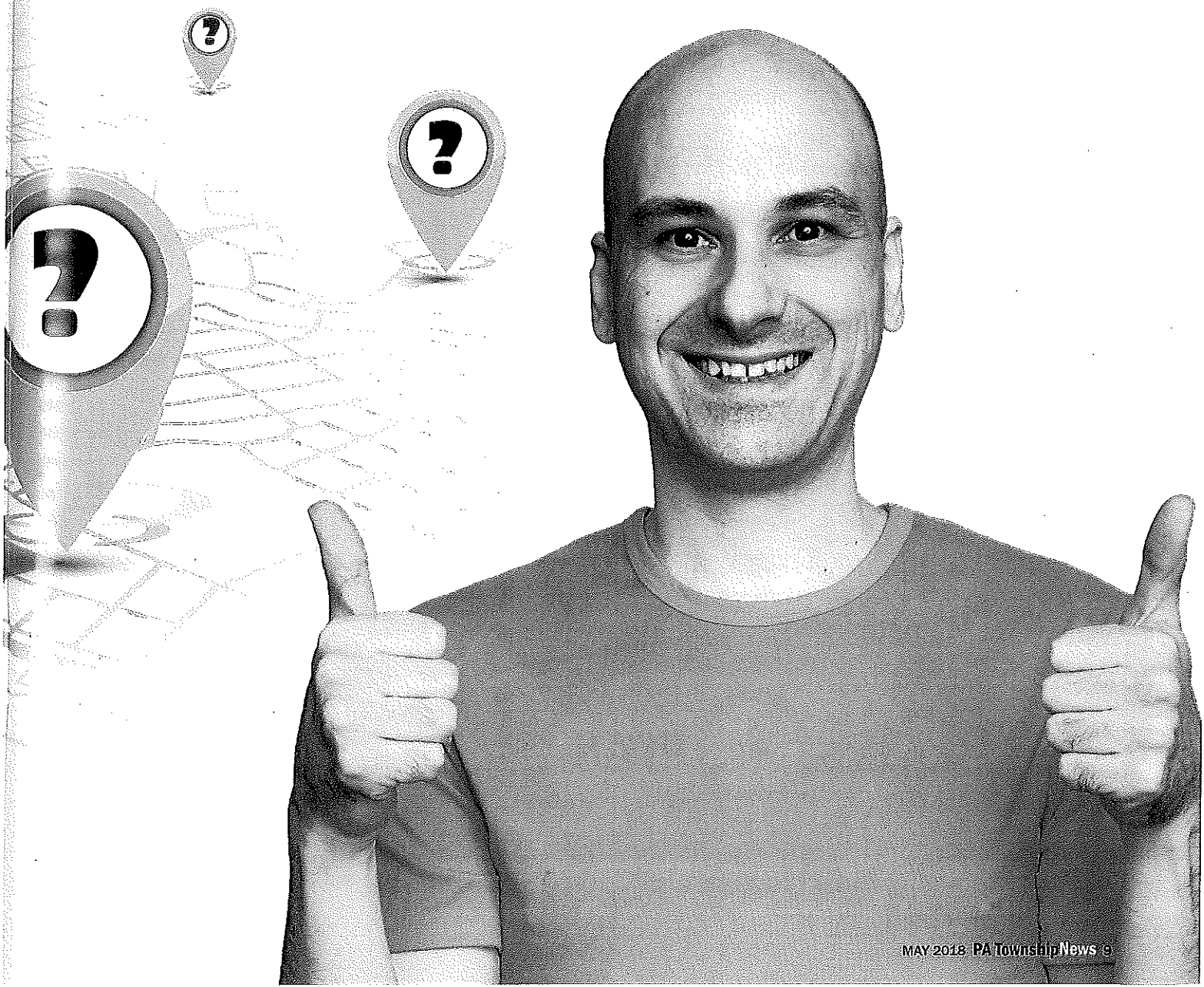
Go from *Confused* to CONFIDENT with Asset Management

BY **AMY BOBB** / ASSISTANT EDITOR, PSATS



PAVING THE WAY

Asset management is the latest buzzword in transportation circles. It emphasizes doing your homework and being proactive when making decisions about how to spend municipal road dollars. **For townships looking to get the best bang for their buck, this systematic approach to better roads is a concept worth exploring.**

When it comes to managing roads and bridges, township officials may sometimes feel like they must be both a part-time detective and soothsayer.

The sleuthing involves walking or riding the roads or bridges to observe conditions, and the predicting comes in when deciding which of these assets to repair and when. Throw in a bad Pennsylvania winter, with its numerous freeze-thaw cycles, and things can get downright complicated.

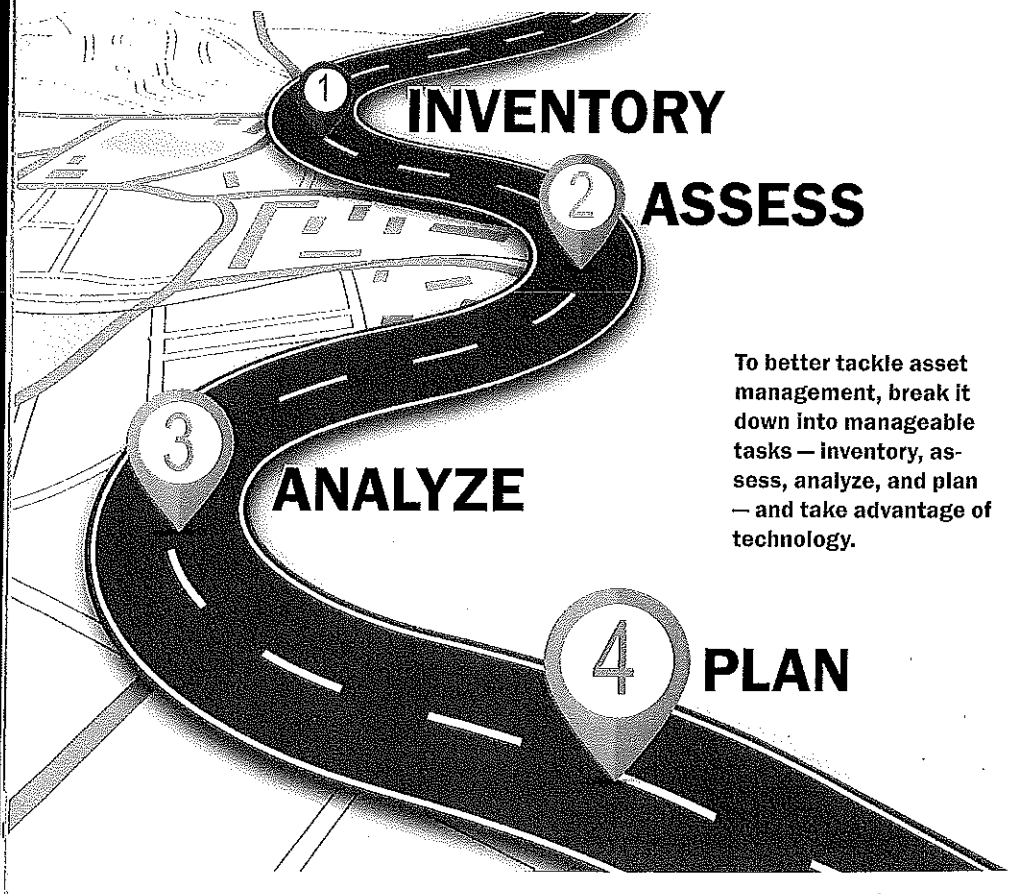
"The condition of the roads can vary so much," Doug Roth, a supervisor and the director of public works in Penn Township, Butler County, says. "You may think your roads look pretty good in the fall, but then a cold spell comes along in December and January, and now they don't look so good anymore."

Just what is a township to do? Enter asset management to save the day.

Touted by transportation experts as an effective way to systematically prioritize road projects, asset management helps to take the guesswork out of where to focus road dollars and efforts and strives to provide the best bang for the buck.

"It's a great concept, especially with limited funding," Tony Mento, director of project management and engineering for Pennsylvania's division of the Federal Highway Administration (FHWA), says. "Think of it as concentrating on preservation instead of worst first."

With its focus on prioritizing and planning, asset management encourages townships to be proactive when dealing with roads, and thanks to recent advancements in technology, this strategy has become easier, more accessible, and more affordable for townships to undertake.



To better tackle asset management, break it down into manageable tasks — inventory, assess, analyze, and plan — and take advantage of technology.

Becoming proactive

Two years ago, West Vincent Township in Chester County completed a comprehensive assessment of its roads. Its engineering firm inventoried the roads and used a geographic information system (GIS) to map and prepare a database that provides a snapshot of conditions.

"We assigned each road a score based on a scale of zero to 10," township engineer Bryan Kulakowsky of CEDARVILLE Engineering Group, LLC, in Pottstown, says. "We then presented our evaluation to the township as a planning tool for mapping out its yearly road program."

The township supervisors use the report, which includes a map and database, to help them decide where they want to focus their road maintenance efforts each year, manager Erica Batdorf says. The documents have been placed on the township's website for the public to see and are updated as projects are completed.

"We now know we have $10 million worth of work that we can begin to chip away at," she says. "We can check our progress using this living document. It holds us accountable to plan for and fund road projects."

The goal of the assessment was to

How to develop an asset management strategy

The Federal Highway Administration (FHWA) lays out the following general steps for transportation asset management:

1 Inventory your roads and bridges.

"You want to start with a good inventory," Tony Mento of FHWA says. "What roads and bridges do you have and what are their conditions? That will give you the baseline to start your other calculations."

2 Establish objectives and goals for your road and bridge system.

If your objective is to maintain your network in good repair over the long haul, come up with goals for meeting that objective.

"It might be keeping 90 percent of your roads in good or fair condition while allowing 10 percent to remain poor," Mento says.

The goals can be based on what the public or the township supervisors think is important, he says, but they should also be tied to funding.

"Of course, everyone wants all their roads to be in good condition," he says, "but there likely isn't enough money for that initially."

3 Perform gap and life-cycle analyses.

A gap analysis involves figuring out where your roads are today versus where you want them to be tomorrow. Then determine the expected life cycle of your assets by calculating how much longer your roads and bridges will last.

Mento advises townships to consult with their PennDOT district offices for help in figuring out life expectancies. In general, a concrete pavement has a 40-year life cycle, while an asphalt road's life expectancy is much shorter, maybe 15 years before a mill and overlay are necessary.

"To do a life-cycle analysis, you must figure out what is the remaining life of a structure or pavement and what must be done to preserve it with crack sealing, pothole patching, and other preservation repairs along the way," he says.

4 Do a risk assessment of your road system.

"What roads and bridges can your community not live without?" he says. "Identify your priorities and fund them before anything else."

For example, he says, a pothole on a major road to the biggest school should be given priority on repairs over one on a secondary road with less traffic.

5 Introduce a funding strategy and match your funding with your needs.

Figure out what you can afford to do based on your budget and revenues earmarked for your roads. Then compare that number with what you have gleaned after evaluating your roads through the gap, life-cycle, and risk analyses.

"Once you look at your budget, you may have to adjust your goals," Mento says. "Instead of trying to attain a 90:10 good-to-poor ratio on your roads, you may have to go to an 80:20 mix. Then, what work do you need to perform to maintain that?"

6 Finally, communicate your plan to your residents.

"To reduce complaints, be sure to educate your residents as to what your funding priorities are when it comes to roads," he says.

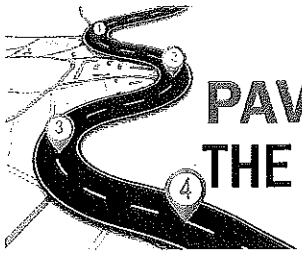
When following asset management, a township's decisions on which roads get fixed first may not always make the most sense to the traveling public. Mento suggests using the township newsletter or website to explain the concept and lay out the township's philosophy.

The FHWA website, **www.fhwa.dot.gov/asset**, has resources on asset management, including how to conduct gap, risk, and financial analyses. Just keep in mind, Mento says, that this information is geared to the federal highway system so the scope is bigger than most townships can do.

"My advice to townships is to take the best available information you have and think long-term," he says. "Remember, it will take time to go through the cycles and become good at asset management. It's not something that happens overnight."

Start with a good inventory, decide on the performance goals for your assets, and then figure out how to best allocate your dollars to maintain and preserve your good roads and bridges first.

"If you know where you are today and where you want to be tomorrow and you have a funding strategy figured out to start accomplishing the work that needs to be done," Mento says, "then, really, you're off and running with asset management."



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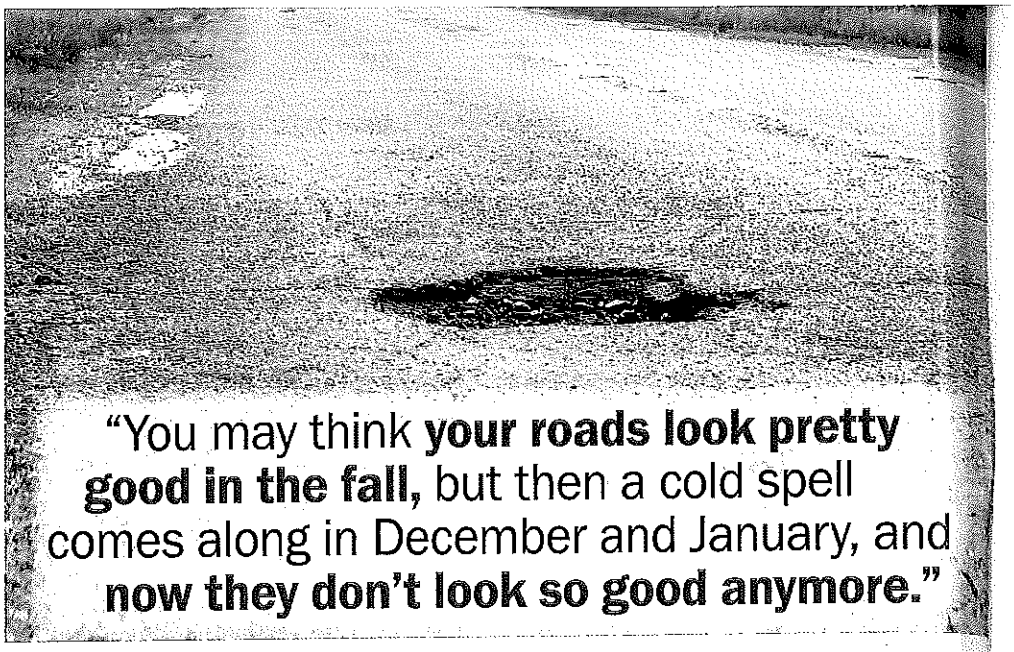


"You may think your roads look pretty good in the fall, but then a cold spell comes along in December and January, and **now they don't look so good anymore."**

turn the township's road program from reactive to proactive, Kulakowsky says, and that, in essence, is the heart of asset management.

"For many years, we have let our roads fall apart until they have become a crisis," Mento of FHWA says. "With asset management, we are employing a long-term strategy of preserving our assets as work is needed. In this way, we can hope to get the maximum life out of our pavements and bridges."

Think about what happens when you build a new bridge or road, he says.

"If you want it to endure and perform for a long time, you must figure out what needs to be done in five, 10, 20, and 30 years down the road to keep it maintained and operating," he says. "Now, repeat that with all your assets."

Instead of only focusing on the upcoming spring season, townships are advised to think long-term and what needs to be done to keep their pavements looking good over the long haul.

"My guess is that many townships are still fighting fires and running out to patch their worst pavements first," Mento says. "We would love to see townships develop a strategy instead that maximizes their assets' performance life and achieves a desired state of good repair on their roads and bridges."

The latest buzzword

Asset management has become a buzzword in the transportation world since regulations developed out of MAP-21, the 2012 surface transportation law known as Moving Ahead for

Progress in the 21st Century, were developed, mandating that the strategy be used on the national highway system. In a nutshell, asset management involves taking an inventory of assets, identifying priorities, and matching funding with needs to make better informed and more knowledgeable decisions about which projects to tackle year to year.

PennDOT has embraced the philosophy and uses it to decide where to focus funding and manpower for rehabilitating its road network. Although asset management is not required at the local level, Mento notes, "we think it's a great idea, and the same philosophies would apply to municipal roads."

With asset management, townships do their homework first and establish priorities to maximize their funds and over time, incrementally improve their road surfaces.

Mento calls it a cultural shift of sorts.

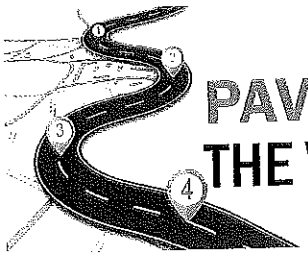
"Instead of running out to fix your worst problems first, think of it as managing for performance," he says. "What does it take to keep everything in fair to good condition? Now, set goals to attain that."

To better understand and embrace asset management, Sam Gregory, a technical expert for PennDOT's Local Technical Assistance Program (LTAP), suggests that townships break it down into manageable tasks — inventory, assess, analyze, and plan — and take advantage of technology to help. *(See the box on page 11 for a more detailed list of the components of asset management.)*

"Asset management is knowing what you have and the condition of it and developing a long-term goal to maintain your network at the level you want it to be," he says.

Long-time township supervisors may recall the days when they were required to do road inspections every spring and fall. An overhaul of the Township Code in 1995 did away with that mandate, but many townships today continue the practice, and for good reason: It helps them make better informed decisions about their roads.

"We still do a road inspection in the spring and fall," says Gary Elston, a supervisor in West Nantmeal Township, Chester County, where CEDARVILLE



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has also done a GIS-based assessment. "It helps us see how our roads are faring. You may think a road looks pretty good in the fall, and then spring rolls around, and it's a different story."

Knowing your roads is an important aspect of understanding them, Gregory says, and with asset management, you get to go deeper. In the transportation world, asset management begins with an inventory and assessment of a community's roads, bridges, and related assets.

"The bottom line is you want to know what you have by type, dimensions, and location," he says. "You should have a physical inventory of road miles, curbing, inlets, signs, bridges, manholes, and pipes."

Some of that information may be available from PennDOT reports that are used to determine a municipality's share of liquid fuels funds, he says, but otherwise, you just have to go out and measure and count. An inventory can be done on paper or with the help of technology that uses global positioning systems (GPS) and then enlists GIS.

Putting technology to work

When Doug Roth became the road superintendent in Penn Township in 1992, he decided to inventory the township's nearly 60-mile road system. It took him and the road crew three weeks to walk the roads and record measurements, conditions, and pipe locations in a notebook.

Fast forward to this year when his township is planning to use an electronic GPS device to start measuring and plotting assets, such as signs, pipes, and inlets. It's the township's first step toward using the many technological tools that are now available to help make asset management easier than ever to do.

> "Think of [asset management] as concentrating on **preservation instead of worst first.**"

"I guess you can say we are transitioning to digital," Roth says.

In his work with municipalities, mainly in the rural areas of the state, LTAP's Gregory realizes that many townships are still using pen and paper when managing their infrastructure.

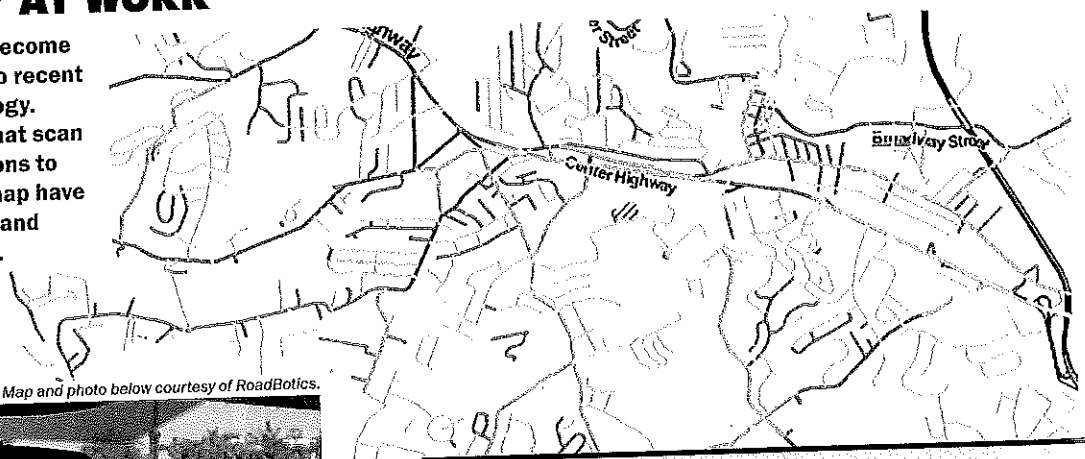
"While it can be done manually, it's more of a struggle," he says. "Even if townships come up with a simple Excel spreadsheet, it's better than just using a notebook."

As technology is evolving, the days of using pen and paper are winding down, Mike Fleming, director of public works in Dover Township, York County, says.

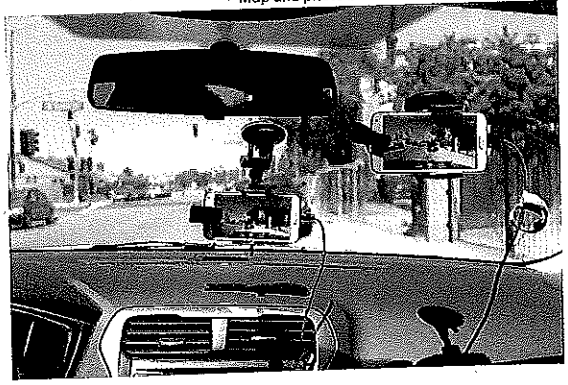
He points to the many electronic options, including laptops, tablets,

TECHNOLOGY AT WORK

Asset management has become easier than ever thanks to recent developments in technology. GIS and other products that scan and analyze road conditions to produce a user-friendly map have become more affordable and accessible for townships.



Map and photo below courtesy of RoadBotics.



RoadBotics, technology spun out of Carnegie Mellon University in Pittsburgh, collects images of road conditions using a smartphone on a vehicle dashboard.

Stahl Sheaffer Engineering's Linear Referencing System starts with technology that uses a camera mounted to a vehicle's roof to scan roads and produce images for analysis.

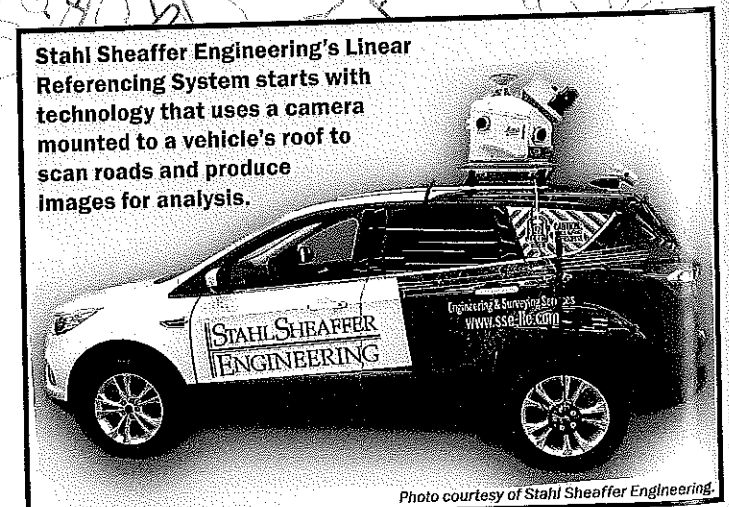
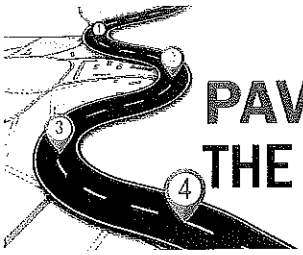


Photo courtesy of Stahl Sheaffer Engineering.



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smartphones, and handheld geospatial devices, that take advantage of GPS to help photograph and keep track of assets while out in the field. As technology continues to advance, the tools for inventorying a road network are becoming more sophisticated, accessible, and affordable.

Road inventories can be done more quickly and safely with the help of technology, Dominic Passanita, a project manager with Stahl Sheaffer Engineering, LLC, in State College, says. His company created Linear Referencing System, which uses a vehicle equipped with a rooftop camera to conduct a 360-degree LiDAR imagery and laser scan of a community's roads, much like Google Earth does.

"The camera takes pictures every 20 feet in every direction while driving down the road," he says. "With this technology, we can operate at speeds up to 60 miles per hour and obtain data for 100 miles of road per day depending on the terrain."

In Pittsburgh, technology that has spun out of Carnegie Mellon University puts a smartphone to use in monitoring road conditions.

"The idea behind our technology is that cellphones are cheap and have good sensors," Benjamin Schmidt, chief technology officer for RoadBotics, says. "We put the cellphone on the windshield and collect data by taking an image of the road every 10 feet."

Both options are touted as being fast and safe since the vehicles gathering the data travel at average road speeds and no one has to get out of the car to do an evaluation manually. After the images are collected, they are taken back to the office for analysis, and reports and maps are generated to provide details on the conditions of the roads and rank them according to their need for maintenance and repair.

Setting priorities

Whether it's done the old-fashioned way with paper and pencil or using the latest technology, a roadway condition survey provides critical information a township needs to prioritize assets and make decisions on road projects.

"This involves evaluating an asset's distress level, severity, and extent to determine its useful life and what repairs are needed at what cost," Gregory says.

Using the results of a survey, the

roads are rated or scored. FHWA defines roads using a good, fair, or poor condition rating. Some townships use a 0-5 or 0-10 scale. GIS will produce color-coded maps that show the condition of the roads in green (good), yellow (fair), or red (poor).

"A rating can be subjective, but as long as it's consistent, it doesn't matter," Gregory says.

Once again, technology can help with this task. Townships that convert their asset management system to a digital format, he says, will find it easier to inventory assets, rate their conditions, and calculate "what-if" scenarios showing what happens if money is spent here versus there. Townships may either purchase software to help with these calculations or take advantage of the growing number of consultants and GIS-based products that offer such services at a surprisingly affordable price. The cost to hire consultants to collect data and analyze road conditions can range from under $100 to $500 per mile.

Whatever a township decides, Gregory says, "it's a lot easier to do asset management if you have some sort of computerized program."

For Stahl Sheaffer's Linear Referencing System, the data collected from its three-dimensional LiDAR scan is taken back to the office and analyzed digitally using the pavement condition index outlined by ASTM International's industry standards. Based on type, severity, and area of the defects and distress, the road is assigned a number from 0 to 100. The data, which is linked to each corresponding roadway segment, can be easily archived, filtered, queried, and reported.

"Our tool is unique in that you can give us your budget and we can provide the average condition you should expect your roadway network to be in for a certain timeframe," Passanita says, "or we can tell you how much you would have to spend to maintain your roads to a certain condition."

Within 60 days of receiving the go-ahead from a municipality, RoadBotics will have a road surface condition assessment completed and delivered. After collecting video data from

its windshield smartphones, RoadBotics uses customized artificial intelligence to analyze, pixel by pixel, the images and identify distresses on the surface of roads. For just about every 10-foot section of road, a score of 1 to 5 is assigned, and using GIS, the data is placed on a color-coded map that townships can access from the cloud.

"Using the map, townships can see which roads need a lot of attention and which ones they should apply preventative maintenance, like sealing, to prolong the life of the road," Schmidt says. "It gives them a data snapshot so they can decide the best way to allocate funding and put boots on the ground. While we help our customers make decisions about their roads, we don't make those decisions for them."

What's the difference between GIS and GPS?

GIS, geographic information system, is a system of computer hardware, software, and data that allows the user to manipulate, analyze, and visually present information that is tied to specific locations.

GPS, global position system, is a system of satellites, ground stations, and receivers that allows a user to determine the exact latitude, longitude, and elevations of a location on earth.

Streamlining with GIS

Dover Township, which has its own GIS department, inventories and assesses its road, sewer, and storm sewer systems with the help of technology.

"GIS helps to put us ahead of the curve," Fleming says.

After details are gathered out in the field using handheld mobile devices, the data is brought back to the township and downloaded into a GIS program, which converts the information onto layered maps. The data provides valuable information for the township to prepare a five-year plan that prioritizes and coordinates road projects based on traffic volumes, road classification, and road conditions. Every summer, Fleming then goes out with the highway foreman, manager, and a township supervisor to inspect the roads and visually assess their condition.

"Priority is given to our main routes," Fleming says. "However, our plan is fluid and may change. We may decide to do preventative maintenance on a good road and do nothing on a road in poor condition if that makes the most financial sense."

Having this data in an electronic format is convenient for pulling up at meetings, he notes, or whenever residents call with a complaint or concern about a road or some other issue.

GIS helps a township streamline its data collection and present the information in a visually appealing and user-friendly manner, Beth Uhler, a project manager with CEDARVILLE Engineering, says. In the past, information gathered in the field would likely be stored on individual spreadsheets that were not as convenient and accessible for different employees and departments to view.

"With GIS, the data you accumulate basically becomes a digital spreadsheet that provides access to a wide range of assets," Uhler says. "For example, GIS enables you to rate your roads in terms of their pavement condition and overlay it on a map to see where your 1- and 10-rated roads are. By analyzing this data, you can then set up a plan for what segments of roads you want to address that year."

As roads are paved or repaired, that information can be continually updated in the system.

"Visually, you will be able to chart the progress by seeing it on the map," she says. The map also becomes a good communication tool for use with the public.

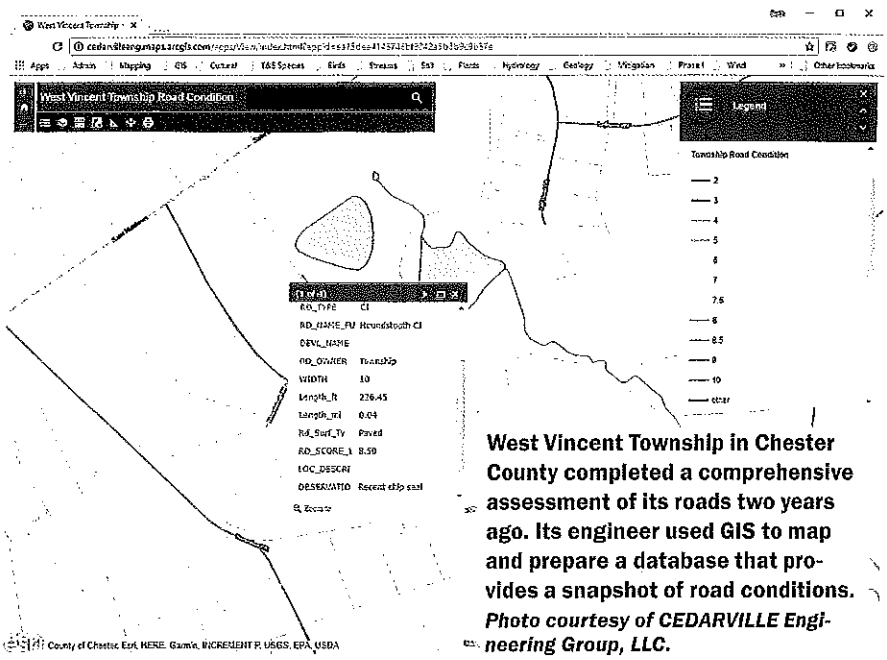
"Put the map on the website, where you can share as much or as little information as you like, and residents can see

which roads are going to be repaved or repaired and will develop a better understanding of your priorities," she says.

Because GIS is location-based, it is helpful for managing assets that are spread throughout the township.

"Everything that you manage in a township has a location associated with it," Uhler says. "Once you add attributes and attach that information to a map, you have the visuals and capability to do analysis or incorporate streamlined products to do things like inspections."

With GIS, she says, not only have you eliminated paper, but "you have made your life easier."



West Vincent Township in Chester County completed a comprehensive assessment of its roads two years ago. Its engineer used GIS to map and prepare a database that provides a snapshot of road conditions. ***Photo courtesy of CEDARVILLE Engineering Group, LLC.***

Analyze and attack

With the research and data at their fingertips, townships can develop a long-term plan and decide which roads to prioritize for maintenance and rehabilitation based on available funds.

"Townships should create a multi-year plan that will give them an idea of what streets and roads to pave or repair," Gregory says. Keep in mind that the plan must remain fluid because conditions and priorities are bound to change year to year.

As part of their road network analysis, townships are advised to try a "mix of fixes" that prioritizes keeping their good roads in tiptop shape and rehabilitating those in poor condition as funding is available.

A common mistake people in charge of a road network often make is that their program is reactive, rather than proactive, Passanita of Stahl Sheaffer Engineering says.

"What happens with reactionary is that they run out to fix their worst problem first or what may get the most

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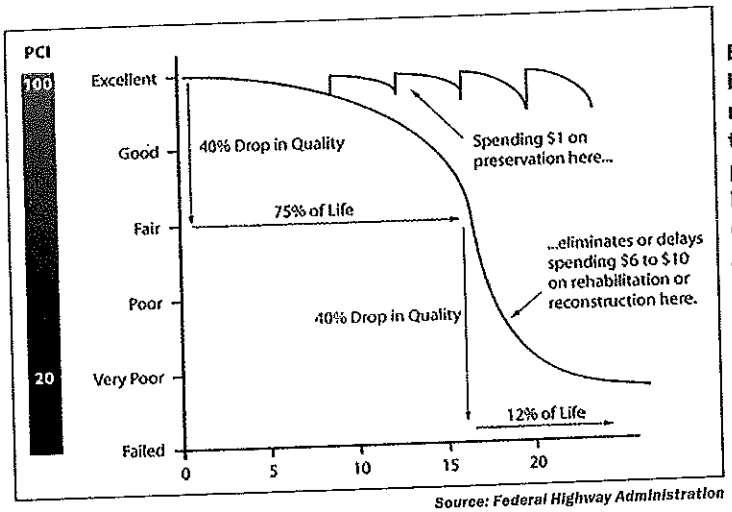

Source: Federal Highway Administration

By treating roads before there is major damage, townships can prolong pavement life in a cost-effective manner. An asset management program can help townships make data-driven decisions that are proactive instead of reactive.

attention," he says. "The end result is that nothing gets fixed the right way or they spend too much money trying to maintain it."

Instead, he says, municipalities should make sure their most important assets are repaired more often and sooner in their life cycle to prevent deterioration from occurring in the first place.

"Asset management involves coming up with data-driven decisions and applying a general mix of fixes," Passanita says. "Your maintenance should be three-tiered: prevention, rehabilitation, and total reconstruction. If you apply the first two options across your network, you maximize their value to avoid a total reconstruction later."

Let's say a township sets a goal to make all their roads smooth and pothole free within seven years, Gregory says.

"That's easy to say," he says, "but asset management can actually help you get there by developing a timeline of how you plan to do that and how you will fund it."

Ultimately, the final decision of which road projects will be undertaken rests with the board of supervisors, but asset management can help these leaders make better informed decisions, instead of merely reacting to complaints or problems.

At the start of each year, West Vincent Township works with its engineer to come up with a plan for tackling road projects that season. They compare the GIS data that has been inventoried and assessed to locations where they have received complaints or where the road crew may have noticed problems. Then, the engineer is sent out to re-evaluate those identified roads.

"By using our GIS maps, we will then try to find projects geographically close by that we can lump into the road program package and put out for bid," Kulakowsky, the township's engineer, says. "Bundling projects like this is more economical than picking up equipment and moving it around the township for smaller projects."

Now that asset management has begun in West Vincent, he would like to see the township eventually develop a plan that rotates projects by geographic areas based on a specific cycle.

"Ultimately, we want a program that will cover all the roads in the township and prioritize the work that is done," Kulakowsky says. "Instead of being reactionary, we are providing the tools to plan better."

Most townships may never have enough money to get done what is needed when it comes to improving all their roads, Gregory admits.

"But if you don't use asset management to get a good handle on your assets and the condition they're in, you will never get ahead," he says. "You'll just be spinning your wheels." ✦