

Using GPS to Position for Productivity and Profitability

Pennsylvania contractor uses a GPS asphalt paver control system to cut down on waste by reducing placement of extra asphalt and to boost profit margins.

In these days of high asphalt costs, you're probably more concerned than ever about asphalt yield. Especially if you're paid by the square yard, you don't want to lay the mat extra thick just to be sure you meet the spec.

That's what they believe at Allan A. Myers, a company of American Infrastructure, Inc., so they did something about it. The company purchased a global positioning system from Topcon, and it is anticipating the system will pay for itself in reduced asphalt waste in about a year and a half.

"The Millimeter GPS controls the elevation of the uncompacted mat and gives us assurance that we're maintaining a consistent mat thickness during high-production paving," says Scott J. Styfco, Myers' roadway manager for a five-mile asphalt-paving project on the Pennsylvania Turnpike near King of Prussia. "All of our blacktop is paid for in square yards, so if we lay it too thick, it comes out of our pocket."

Under a \$168 million contract, Myers is widening the stretch of Interstate 276 to six lanes from four. Last year, without a Millimeter GPS system attached to the paver, King of Prussia, Pa.-based Myers paved the outside shoulders and slow lanes on both sides of the highway.

"Last year, we had a tendency to lay the material a little bit thicker, to make sure we weren't going too thin anywhere," Styfco says. "This year, with Millimeter GPS, we can control the mat thickness better, so we don't waste any asphalt and we don't have any cases of insufficient mat thickness." This is one of the first applications of this GPS system on an asphalt paver, according to Topcon.

Myers is running an average of 2,500 tons per



Using a global positioning system allowed Myers to better control mat thickness, according to Scott Styfco, a roadway manager with contractor Allan A. Myers.

night, up to 4,500 tons per shift, with the plant making about 400 tons of hot-mix per hour. The contractor paves at night because that's when the plant can dedicate itself to the turnpike project.

Complete reconstruction

Beginning last December and through the winter, Myers tore out the existing four inside lanes of turnpike pavement. The work zone is a 58-foot-wide clear space that will contain a new travel lane, passing lane, and inside shoulder for both the westbound and eastbound sides of the Turnpike. Jersey barrier separated the work zone from traffic, which now could run on the outer two lanes on each side.

The old pavement consisted of 10 inches of concrete topped with 5 inches of asphalt. A Roadtec RX

700 milling machine removed the asphalt, and Myers used a hydraulic hammer to break apart the concrete. A Caterpillar 345 excavator picked up the chunks of concrete and loaded it into trucks.

Next, Myers removed the old drainage works and installed new drainage pipe — mostly 18- to 30-inch-diameter high-density polyethylene pipe. By late March, crews were grading the subgrade with dozers and motor graders. Sub-base came next, and for that, Myers crushed the old concrete, then laid it down in a 6-inch-thick lift of base rock under the new pavement.

The pavement section consists of 20 inches of full-depth asphalt. The bottom lift, or base course, is made of 4 inches of asphalt-treated permeable base — 3/4-inch-stone mixed with 2.1 percent asphalt binder. Moving upward, the next three lifts total 11 inches of bituminous concrete base course (BCBC). That is topped by a 3-inch binder course and a 2-inch surface course.

For paving, the Myers crew runs one Cedarapids paver on each shift and maintains another in a back-up role. Crews lay out a 6,000-foot-long work area with six paving lanes and access for trucks at one point. Both pavers can accept the Topcon Millimeter GPS system, which Myers uses for every asphalt lift except the last two, for which the crew changes over to a Topcon Sonic Averaging System (SAS).

Topcon's SAS system uses non-contact skis, often one suspended from each side of the paver. Trackers are hung from each ski. The trackers have transducers that "read" the surface, use it as a grade reference, and send messages to a Topcon System 5 controller. The controller averages readings from the trackers. That way the length of the ski averages out the highs and the lows in the reference grade or pavement. In turn, the controllers send messages to the hydraulic valve that controls the paver's tow-point cylinders, which automatically raise or lower the screed. The skis "take out the highs and lows" of the reference grade and produce a more consistent basis for pavement depth.

Styco credits the Millimeter GPS system with helping lay the asphalt base that produces a high-quality riding surface in the last two courses. "The SAS is specifically designed to give you ride quality, whereas the Millimeter GPS system is designed to give you elevation and slope control," Styco says. "Once you have good elevation and slope established, you start with a solid base, correctly placed. Then you're going for ride."

And Styco has rideability numbers to prove his point. "Utilizing the GPS system on the lower four courses of asphalt contributed to attaining an average IRI of 70 on the binder course this year," says Jeff Dremel, project engineer. "It helped achieve a much better quality ride than we got last year using manual control methods." A recent IRI reading was 62, compared to the specified number of 70.

Myers owns four Topcon transmitters for the Millimeter GPS system. The system works much like a regular GPS system from the company. Myers loads a control file and a surface file (3-D model) into the



Learning to use Millimeter GPS

Key personnel from Allan A. Myers Civil learned to use the new global positioning system by laying crushed concrete sub-base with an asphalt paver, says Scott Styco, roadway manager for Myers. "We wanted to learn on crushed concrete, because if you screw something up with that, it's no big deal," says Styco. "You bring the grader over and fix it."

Myers spent about two weeks of laying crushed concrete with the Topcon Millimeter GPS system before paving with asphalt. "The first day we did 200 tons of stone, and gradually we started laying some larger quantities," Styco says. "My big goal was to do 3,000 tons of stone per eight-hour shift. Once we laid 3,000 tons of stone, I knew we were ready to go to blacktop."

Styco says his Topcon dealer, Boyd Instrument & Supply, was very helpful in learning the Millimeter GPS system. Boyd Dealer President John Boyd and Machine Control Specialist John Cram, spent three days with Myers employees to help them and instruct key personnel on how to properly use the GPS system, Styco points out.

Boyd says it was helpful that Myers gave Cram and him the time to train their people the right way. "By training with the crushed concrete first, by the time they got to the asphalt, there were very few issues," Boyd notes.

"Fortunately, we had a few problems while we were learning the system," Styco says. "When we ran into issues, we really learned the ins and outs of the system."

One such issue developed when paving shoulders. The inside shoulders are 8 feet wide, but the GPS mast on the paver is at a 9-foot width. That presented a problem. "So we generated models for the shoulder to extend the limit of the shoulder to a point 5 feet wider than it really was," says Jeff Dremel, project engineer. "We tricked the system into thinking that the shoulder was wider, so it would pave at the correct slope and elevation."

Boyd said Myers for years had used the Topcon 2D grade and slope controls (the Sonic Averaging System, see main story) on its asphalt pavers. But the Millimeter GPS is a three-dimensional system. It provides X and Y coordinates for location of the paver, and the vertical coordinates for grade and slope control at any given location.

With the Millimeter GPS system, Myers loads a control file and a surface file, or 3D model, into the control unit on the paver. That way, the GPS system "knows" where the paver is at any given time, in the horizontal direction. Meanwhile, the surface file tells the paver screed how to move up and down to control elevation.

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control unit on the paver, which also has a GPS mast with a receiver. When the receiver “sees” where the paver is located in northing and easting directions, the control box “knows” what the design elevation and cross-slope should be, and controls the screed hydraulics accordingly.

For initial paving passes, Myers uses the GPS system and slope control to set elevation. On the adjacent pass, the crew uses the system to control one side of the mat, and a joint matcher to match the previously-placed mat. For the third pass, the paver is controlled the same way.

“Before we had the Millimeter GPS system, we had to pull stringlines between stakes every 50 feet to check grade and make manual adjustments for the next lift,” says Styfco. “But with this system, we are certain that we place the right amount of asphalt in every lift.” **BR**

Article and photos courtesy of Topcon.



- 1) Ray Tripp, surveyor for Myers, checks the grade of the uncompacted asphalt on the turnpike project.
- 2) Allan A. Myers, the contractor, paved a 58-foot-wide area in six passes across, varying the paver's widths from lift to lift so that the longitudinal joints were staggered vertically.
- 3) Note that the receiver for the Topcon Millimeter GPS system is attached to the paver's tow arm.
- 4) A surveyor for Myers checks the grade of the uncompacted asphalt behind the paver.
- 5) The receiver for the GPS system takes in signals that permit the paver to control the height of the screed.

