



Open Minds Make the Difference

Visualizing “what could be” helps TXDOT handle challenging Texas road project.

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David Madden

Company

Madden Contracting
Sibley, Louisiana

Project

Texas SH-300
Four-lane highway linking Texas towns of Longview and Gilmer

Topcon Solutions

RD-M Road Scanner, component of SmoothRide system



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Playwright Anton Chekhov’s observation that “Knowledge is of no value unless you put it into practice,” was proven out in real time on a recent east Texas highway project. There, faced with a design-related issue that threatened the project’s success, the contractor, along with several TXDOT personnel involved in the project, met to explore their options.

That gathering resulted in both parties’ introduction to a dramatically different approach to road construction, a savings in time and effort, a reduction in traffic inconvenience to the public, elimination of risk to an on-road survey crew, and a far better end product. It also opened some eyes to the possibilities that today’s newer technology can provide.

The road cited above is a 4.3-mile stretch of SH-300, a four-lane highway linking the Texas towns of Longview and Gilmer. In one particular area, a combination of normal wear, numerous soil failures, and a desire to correct several cross slopes to improve rideability and drainage, prompted TXDOT to let the project. The bid was awarded to Sibley, Louisiana-based Madden Contracting and, shortly after securing it, owner David Madden drove the section slated for construction. In doing so, he immediately knew that, given the existing conditions, significant changes needed to be made — far more than the scope of work was calling for. He also recognized that using traditional methods to make the needed improvements wouldn’t be sufficient; leveraging technology was the only viable path forward.

“In addition to milling the surface and improving the subbase, TXDOT’s SH-300 design specs called for a correction of cross slopes while leaving 10” of an iron ore flex base in several areas, as well as changes to existing superelevations,” said Madden. “Given those demands and the existing design plans, I knew it would be counterproductive to go out and start working. But I needed a way to help TXDOT visualize the full scope of the project and the challenges it presented.”

Madden had been considering the Topcon SmoothRide solution for some time and sensed that this was the ideal project for its capabilities. So,

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in consultation with the TXDOT project engineer, district construction engineer, and pavement engineer, he suggested a scenario in which he would utilize the Topcon solution, pay the fees to have Topcon develop the model and basically learn – alongside TXDOT – how to use the program to determine the best design for the roadway.

“That approach met with TXDOT’s approval, and we were off.”

The first phase of Madden’s plan entailed getting up to speed on the use of the RD-M LiDAR scanner which would be used to scan the surface of the road, capturing all the existing cross slopes in the process. The efficiency of that effort alone impressed Madden.

“We surveyed 4.3 miles of northbound and southbound four-lane road, plus a 10’ shoulder, in three and a half hours,” he said. “To do that in a traditional manner, would have been a 2½ week project. And we did it without the need for any traffic control to protect a survey crew. It was a very quick process.”

The benefits of using the RD-M scanner yielded additional benefits as well, including the need for fewer road closures or lane restrictions. At a time when sustainability in roadbuilding is becoming increasingly relevant, the LiDAR-based solution streamlined Madden’s overall workflow – from data capture to milling to paving. That more efficient workflow means a better design, a safer work environment, elimination of the need for do-overs, better allocation of materials and reduced emissions from vehicles/equipment.

After scanning, Ryan Zenahlik, Topcon’s senior paving application specialist, used Topcon Collage software to process the data from the road scanner and build a model of the existing surface. Then, using the Resurfacing module that is part of Topcon Office, he and Madden were ready to share the results with the TXDOT team.

“Those results were surprising, even to TXDOT’s personnel,” said Zenahlik. “They really didn’t suspect that the road’s existing cross slopes were that bad. But the Resurfacing module comes with a unique feature that not only allows you to see the plan view, the profile view, the cross slopes, and the cross-sectional view all at once, it also highlights areas that are exceeding specifications. So, just with the click of a button, we were able to focus on all of the problematic areas without having to do a lot of searching or combing through the data. Some areas needed 11” of fill; that was not expected.”

Zenahlik added that he, Madden and a full TXDOT contingent spent considerable time exploring different strategies to see if they could meet the project’s scope or its many design constraints. “It didn’t make a bit of difference,” he said. “Fixing one area would only mess up another. So TXDOT decided to stick with the original design for the cross slopes but then do a change order.”

A solution was found by milling off the existing 5” of hot mix and then, using the Topcon model, adjusting the cross section with hauled in flex base to obtain the 2% cross slope. “Critical was the fact that numerous design iterations were able to be considered directly within the digital model – eliminating the need to disturb the traffic flow,” said Madden. As a result, TXDOT was able to make the best and most economical decision for the project. The flex base was hauled in, the 2% cross slope was established, and the 5” of milled hot mix (RAP) was uniformly spread back over that base to yield a 2% cross slope. The whole area was then soil cemented to stabilize the section before the new hot mix layers were applied.”

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Madden said the versatility of the Topcon solution was key to making his case. “The software will show a cross slope in increments ranging from every 6” to every 200’ if you so choose; it affords an infinite number of choices. That was exactly what TXDOT needed to see in order to help them make an informed decision.”

He added that the normal sequence of construction would have entailed moving the northbound lane into the inside southbound lane and closing the two northbound lanes and shoulders. “But, because I knew the cross slopes were not going to do what TXDOT wanted, I suggested we get the data up front and give them something they could have confidence working with, before any closures,” he said.

“So, they considered what we gave them, came up with a unified plan, we closed the lanes, swapped the traffic, and built the roadway in a very efficient manner.”

More than simply a road reconstruction effort, the SH-300 project proved to be a study in cooperation and the benefits it can yield at all levels. The need for both structural repair, and slope/redesign work called upon the expertise of two groups at TXDOT that don’t traditionally work alongside each other. Having them see the scanned data together, however, sparked collaboration that led to the ultimate design solution.

“We applaud the TXDOT Atlanta District team for its ability to accept a technology that was new to them, and appreciate the value it brought to the project,” said Zelahnik. “Without it, work would have started, the challenges would have been exposed mid-project, and progress would have been stopped cold while a solution could be found — no one wants that. It causes delays for the state in opening the road, it affects the budget, it causes the contractor through production delays, equipment costs, etc. Aside from a vastly improved road, getting the info on the roadway and presenting it to the full group as a true partnership, was the biggest win.”

Madden is equally effusive in his praise. “The TXDOT District team deserves all of the credit for being extremely open-minded to this technology, which allowed them to gain a visibility of their project they never had before,” he said. “The project engineer, Wendy Starkes; the materials and pavement engineer, Lacey Peters; the district construction engineer, Kim Garner and the District Engineer, Rebecca Wells, took the new information available to them, dug in deep, and ultimately made the final decision on how to fix the problem. I can’t say enough about them.”



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