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SECOND OPINION

An overlay for reducing accidents in icy weather can also offer benefits for bridge maintenance, explains **Bob Persichetti**

Left and above: The overlay being installed

A new technology with a track record of reducing weather-related crashes has begun attracting attention for a second reason. The surface overlay produced by Safelane acts like a rigid sponge, storing anti-icing chemicals and automatically releasing them as snow and ice conditions develop. But equally intriguing is the fact that it seals the road surfacing to prevent its degradation. These combined potential benefits are what led the Pennsylvania Department of Transportation to test Safelane at two sites in the state.

The latest test site is a pair of bridges in north central Pennsylvania where the agency wants to address pavement preservation and potential winter ice conditions on twin bridges on Route 15. The bridges are 27m above a stream where in summer, fly-fisherman cast for trout. But in winter, ice can be a problem.

"It seemed to me this technology might help the traffic guys address safety needs and get an overlay on these bridges to help with maintenance," says Gary Williams, district bridge engineer, PennDOT District 3. "We are piloting the application to see how it works."

The overlay is made up of a patented combination of epoxy and aggregate rock. Transportation workers 'charge' the surface with their standard anti-icing chemicals before frost or ice storms are expected. By absorbing the chemicals and automatically releasing them when the conditions are right, the overlay helps prevent frost or ice from ever forming on road and bridge surfaces. It also provides superior friction for year-round traction in all weather conditions.

The technology was licensed to Cargill in 2004, and by the end of this current construction season, is expected to be installed at 50 sites ranging from road and bridge applications. A public works agency in Canada is contemplating a test section on one span of the Canadian-owned portion of a bridge at a major border crossing. Another test site is under consideration in the Greater Toronto Area.

Safelane overlay is also poised to expand its test sites across Europe and Asia. Cargill has signed agreements granting British-based Safecote the rights to market Safelane overlay in England, Scotland, Wales and Ireland. Zirax has been granted similar marketing rights in Russia and the ten other countries of the Commonwealth of Independent States.

Last summer PennDOT secured a US$150,000 grant to help finance installation of the overlay for the Johnson Creek Bridges project. The grant, from the US Federal Highway Administration's Innovative Bridge Research & Construction programme, is intended to help government agencies incorporate innovative materials and technologies into bridge projects.

Yet, even with the grant in hand, 'there was some scepticism' about the overlay technology, says Williams. The DOT wanted some experience with the technology before agreeing to move ahead with the Route 15 project, which at 6,038m² would be the largest Safelane overlay installation anywhere. So last year it used its own resources to install the overlay on a small, 315m² bridge along State Route 660.

Over the ensuing winter, initial results were positive. Maintenance workers reported that at times when other roadways were snow-packed, the test site remained slushy with no compacted snow. In addition, there were no weather-related crashes reported on the bridge. Although Williams cautions, "I don't know that we can reach any firm conclusions from that one small bridge," the test site did give managers the comfort level they needed to proceed with the project on Route 15.

In May, the month-long project to install Safelane overlay on both the north and southbound lanes of the 233m-long concrete decks began. "The project represented a typical installation for Safelane overlay in many ways," notes Anthony Hensley of Cargill, who oversees installations. "We just needed to scale up a bit because of the large square footage."

Safelane overlay installation methods follow the recommendations outlined in AASHTO Task force 34. Step one is surface preparation. Concrete surfaces are shot-blasted in order to clean the surface to an ICRI level of 5-7. All asphalt surfaces are prepared by sandblasting.

Meanwhile, crews mix and prepare the epoxy. Although Safelane represents important new technology for road and bridge safety, it is applied in a decidedly low-tech manner. Crews spread the sticky, black epoxy across the road surface via hand squeegees. The initial coat is applied at approximately 1.5mm or about 13 litres per 9m². Once the epoxy is hand-spread on the surface, the aggregate is immediately shovelled across the surface. After giving the epoxy proper time to harden, a sweeper truck passes by to remove any loose aggregate, followed by two leaf blowers to remove residual dust and ensure a good clean surface.

Then, a second coat is applied following the same protocol, but at a thicker rate. The

final profile is about 10mm thick. Crews can complete typically 465m² to 650m² per ten-hour shift during the day or night in summer temperatures.

Improved traction year-round is one of the immediate benefits motorists crossing the bridges should experience following the installation. Studies at multiple sites found surface friction immediately after installation measuring 58 to 60 using the ASTM E 524 bald tyre skid test. On this test, the higher the number the better the friction, and generally, any skid number over 40 is considered acceptable. By providing increased friction, the overlay can reduce traffic delays for drivers and help avoid the expense of highway shutdowns due to weather conditions that make roads impassable.

A noticeable reduction in winter weather-related accidents is another benefit being reported. For the past two years, Cargill has commissioned ice and snow control expert Wilfred Nixon, president of Asset Insight Technologies, to analyse winter performance of the overlay.

In his latest report, for 2006/2007 Nixon concludes that 'there is now two years'-consistent evidence that improved performance by Safelane overlay under winter conditions…does indeed translate into safety improvements for the travelling public.'

Nixon's previous report, also commissioned by Cargill, found no weather-related crashes at any of the nine test sites then in place. Although cautioning that safety studies need to be conducted over a number of years to yield statistically significant results, the 2006-2007 report again found noticeable accident reduction rates among the 26 road and bridge test sites reporting data.

There were no weather-related crashes on the Blatnik Bridge on-ramp, linking the cities of Superior, Wisconsin with Duluth, Minnesota. This site had twenty crashes during the four years before the overlay was installed in 2005.

Similarly there were no weather-related crashes on the eastbound lanes of the Ironwood Bridge on the heavily-travelled US20 bypass near South Bend, Indiana, which had a long history of snow and ice related crashes before the overlay. "If I can get 36,000 vehicles over that bridge in an ice storm without any crashes, it's worth its weight in gold," noted Steve Giese, operations manager at the Indiana DOT's Plymouth sub district.

Likewise, there were no weather-related crashes on the Wolf River Bridge in Crandon, Wisconsin, which averaged three to four accidents a season before the overlay was installed in 2003. "Not one call about the bridge even being slippery, much less any accidents," said Ron Cole, Forest County highway department. "I have to believe…that by doing this bridge we may have saved someone's life or avoided some personal injury."

Motorists may consider enhanced safety the greatest benefit of this technology, but in the public works industry, its potential to extend the life of roads and bridges is equally attractive. "The longer we can keep the decks in good shape, the longer they will last," says Williams. "We are looking at Safelane also as a bridge preservation technique."

In the future, notes Shane Winner, assistant construction engineer, Pennsylvania DOT District 3, he'd like to see a comparative study between Safelane overlay and the latex-modified concrete overlays the district has used in the past to restore ride and mitigate chloride penetration on bridge decks. With the latter, he explains, the work is very labour-intensive and expensive.

Meanwhile, a report contrasting Safelane overlay's performance with standard epoxy overlays was released earlier this year. In that report, the Virginia Transportation Research Council's Michael Sprinkel concludes that Safelane provides all the benefits of standard epoxy overlays with one important difference. "The specific aggregate-chemical combination in Safelane overlay has the additional benefit of minimising snow and ice-related crashes," Sprinkel explains.

Among the other conclusions in Sprinkel's report are the fact that abrasion resistance, bond strengths and skid numbers are similar between conventional two-layer epoxy overlays and Safelane overlay. The report notes that absorption rates are higher for Safelane overlay, and that its permeability is better than one-layer, and similar to two-layer conventional epoxy ■

Bob Persichetti is general manager of Cargill Safelane