New Technology Keeps Ice Away and Drivers Safe

Anti-icing and anti-skid overlay reduces accidents and protects assets

BY BOB PERSICHETTI

Adverse weather conditions contribute to an average of 1.4 million car accidents in the U.S. each year, resulting in 7000 deaths, more than 800,000 injuries, and $42 billion in economic loss.[1] So, it's not what happened at nine accident-prone road and bridge sites in the U.S. last winter that is creating a buzz in the highway maintenance industry—it's what didn't happen:

- No weather-related slide-offs on eastbound I-80, the Ohio Turnpike, at exit 173 near Brecksville, OH, where 49 accidents occurred over 2 years.
- No weather-related accidents on the Blatnik Bridge on-ramp near Superior, WI, which had logged 20 crashes over 4 years.
- No accidents on the westbound lanes of the McLean Bridge in McLean, TX, despite accidents "up and down the interstate" during a 2-day ice storm and an accident on the adjacent eastbound bridge lanes.

In fact, no weather-related crashes occurred during the winter of 2005-2006 at any of the nine test sites where a new anti-icing and anti-skid overlay called SafeLane™ Surface Overlay was installed. Prior to installing SafeLane overlay, the nine sites averaged a combined total of 35 accidents each winter. "This is potentially the biggest technological breakthrough for improving highway safety in snow-belt regions since the invention of the snowplow," said John Bray from District 1 of the Minnesota Department of Transportation (MnDOT), one of the states to expand its highway safety arsenal by adding SafeLane overlay test sites.

A NEW TECHNOLOGY

SafeLane overlay is made of a patented combination of epoxy and aggregate. Transportation departments "charge" the surface with their standard liquid anti-icing chemicals before ice or snow storms are expected. The SafeLane overlay material acts like a rigid sponge, storing the chemicals inside and then automatically releasing them as conditions develop for the formation of ice or snow. The result is safer roads because the overlay helps prevent frost and ice from forming or snow from accumulating on road and bridge surfaces, and it continues releasing the anti-icing chemicals over the course of multiple winter weather events.

It sounds simple enough that its inventor, Russ Alger, Director of the Institute for Snow Research at Michigan Technological University has grown used to hearing, "Why didn't anyone think of this sooner?" In fact, it took Alger 10 years of research to come up with the right aggregate and the right product combinations to produce the kind of consistent results demanded by transportation departments.

In 2003, the technology was licensed to Cargill, and it has been met with an enthusiastic response. SafeLane overlay is currently installed at 30 sites in 17 states: Connecticut, Illinois, Indiana, Iowa, Kansas, Maine, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Texas, Virginia, Washington, and Wisconsin. California, Oregon, and Idaho are scheduled to join that list in the spring of 2007.

NOTICEABLE SAFETY IMPROVEMENTS

A report commissioned by Cargill and conducted by Asset Insight Technologies, a consulting service for the winter highway maintenance industry, summarized SafeLane overlay's performance at nine test installations in place during the winter of 2005-2006 across six states, as far north as Wisconsin and as far south as Texas. While the data are preliminary, it appears that the improved performance provided by the SafeLane overlay translates into safety improvements for the traveling public. The report notes that there were no weather-related accidents at the nine test sites over the winter season (a very small number of slide-off incidents in Ohio were attributed to excessive speed). In nearly all cases, the treated sites had histories of winter weather accidents.

The report also concluded that:

- In nearly all cases, test sections remained clear of snow and ice at times when it was accumulating on untreated (control) sections of roads and bridges;
- When accumulation did occur in heavy snowstorms, the snow and ice did not bond to the surface, resulting in easier plowing;
- Test sections could be maintained with about half the amount of chemicals applied to the untreated (control) sections; and
- There were no concerns with chemical slickness or slipperiness even when chemical was applied in conditions where such slickness could be expected.

The Asset Insight Technologies report is posted at **www.cargillsafelane.com**. Asset Insight Technologies will also track SafeLane overlay's performance at these nine sites and all new test sites added in 2006 to provide an updated analysis in April 2007.

A TEXTBOOK INSTALLATION

The application of SafeLane overlay on the Mitchell Bridge near Hibbing, MN, provides a textbook example of how to install the technology. Although commonly referred to as the

Fig. 1: After surface preparation, an initial 1/8 in. (3 mm) thick layer of epoxy is applied to the bridge deck

Fig. 2: Aggregate is broadcast over the initial epoxy layer

Mitchell Bridge, the test site is actually two bridges over railroad tracks connected by a roadway. Prior to the installation, the site had become so notorious for accidents that in 1995, MnDOT installed an automated deicing spray system. The system included dial-in technology that was supposed to allow MnDOT to call in instructions for the automatic spraying of anti-icing chemicals as weather conditions dictated, but according to Duane Hill, MnDOT Assistant District Engineer for Maintenance Operations, the system "never really worked." MnDOT eventually removed the system after years of struggling with high maintenance and poor reliability.

In the summer of 2005, transportation officials in neighboring Wisconsin installed SafeLane overlay on the Blatnik Bridge between Superior, WI, and Duluth, MN. Anecdotal reports reached MnDOT that maintenance crews arriving at the Blatnik Bridge test site on snowy days found the SafeLane overlay surface wet, rather than snow-packed. "That install really caught our attention," said Hill. MnDOT was convinced that SafeLane overlay was the answer to their problems at the Mitchell Bridge.

Anthony Hensley of Cargill began working with MnDOT several weeks before the project's scheduled start date, providing them with insights from previous installations, including how to distribute the aggregate, appropriate work crew size, job sequencing, and necessary supplies. Video clips and photos of past installations supplemented the meetings to help managers envision how the project would look.

The installation method followed the recommendations outlined in the AASHTO Guide Specifications for Polymer Concrete Bridge Deck Overlays.[2] With traffic control in place, step one was surface preparation, including deck repair. Next, concrete surfaces were shot-blasted to a concrete surface profile of 5 to 7 as defined by the International Concrete Repair Institute (ICRI).[3] Meanwhile, crews mixed and prepared the epoxy.

Although SafeLane overlay represents revolutionary new technology for road and bridge safety, it's applied in a decidedly low-tech manner. As shown in Fig. 1, the crew manually spread the sticky, black epoxy across the road surface to a 1/8 in. (3 mm) thickness. The aggregate was then immediately broadcast across the surface using a shovel (Fig. 2). Next, excess stone was removed by a sweeper truck, followed by two workers with leaf blowers. After allowing the overlay to harden, a thicker second coat of epoxy and aggregate was applied (Fig. 3) to provide a 3/8 in. (10 mm) thick final profile.

In this and other projects, crews have completed the application of 5000 to 7000 ft^2 (465 to 650 m^2) in a 10-hour shift. At this site, SafeLane overlay was applied to 16,000 ft^2 (1490 m^2) of bridge deck and roadway. Just 34 hours after the project began, MnDOT was able to reopen one lane of the site to traffic, and the second lane was opened the next morning.

BETTER MOBILITY

Reducing weather-related accident rates is a prime reason state transportation departments are trying SafeLane overlay, but the new technology also improves safety year round by increasing surface friction. Bald tire skid tests immediately after installation measured 58 to 60 using the ASTM E 524[4] bald tire skid test. In this test, a higher number equates to better friction; generally, any skid number over 40 is considered acceptable. The SafeLane overlay surface registered numbers in the high 40s to mid 50s after 3 years of use.

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. “We have no indication that we should expect any difference in skid performance between SafeLane overlay and standard epoxy overlays, so if SafeLane performs as well as the standard epoxy overlay, you can expect to have good skid numbers 15 to 25 years or more,” says Michael Sprinkel of the Virginia Transportation Research Council, a national expert in the design, construction, and evaluation of epoxy overlays.

A LIFE PRESERVER FOR BRIDGES

The U.S. spends approximately $9 billion annually to preserve and maintain existing bridges.[5] For 3 decades, transportation departments have been using standard epoxy overlays to minimize water seepage and intrusion of corrosive agents like chlorides. The layers of epoxy that are part of the SafeLane overlay system should provide similar protection to the bridge deck. Therefore, while greater safety and mobility provide the most immediate benefits of SafeLane overlay, its ability to extend the life of roads and bridges may prove to be just as important an asset in the long run.

Fig. 3: After the first layer cures, a second layer of epoxy and aggregate is applied to a total thickness of 3/8 in. (10 mm)

References

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Selected for reader interest by the editors.

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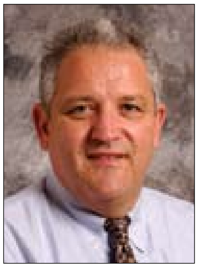
CIRCLE 51



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