# State Transportation Innovation Council (STIC)

## 2015 Fact Sheet

# High Friction Surface Treatment

## Improving Curves, Saving Lives

HFS product applied on a curve along Route 100 in Lehigh County

In the past five years, Pennsylvania has experienced nearly 200 fatalities and 500 major injuries each year involving crashes on slippery or wet pavement. Nationally, more than 25 percent of highway fatalities occur at or near horizontal curves each year, even though these curves only make up 5 percent of the nation's highway miles.

Maintaining the appropriate amount of pavement friction is critical for safe driving. To enhance safety at locations known to have a history of wet-pavement-related crashes, Pennsylvania has begun using pavement treatments that increase friction.

These High Friction Surface treatments, or HFS, are pavement surfacing systems with exceptional skid-resistant properties not typically provided by conventional materials. HFS is applied in spot treatments to provide a durable, long-lasting pavement surface that helps to improve pavement friction in both wet and dry conditions. It is especially effective at locations where wet-pavement crashes are common.

Aggregate is laid over top of an epoxy

The State Transportation Innovation Council has selected HFS as an innovative technique to improve the safety of motorists at high-priority crash locations throughout the state. The Federal Highway Administration has also included HFS treatment as part of its Every Day Counts program, which is an initiative designed to identify and deploy innovation that shortens project delivery, enhances safety, and protects the environment.

### How does it work?

In locations where drivers may brake excessively (going around curves, down steep grades, or when approaching an intersection), the road surface can become prematurely polished, reducing pavement friction and causing vehicles to skid when drivers brake. Wet road surfaces can also reduce pavement friction and cause skidding or hydroplaning.

HFS treatment uses high-quality, wear-resistant aggregates (such as bauxite) to provide increased friction on pavements. This helps to keep vehicles in their lane on slippery pavement around curves and allows drivers to stop. The materials used to bond the aggregates together are designed to set quickly so there is minimal impact to the traveling public.

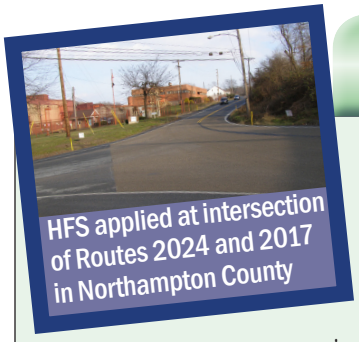
High Friction Surface treatments have exceptional skid-resistant properties. When applied to locations that exhibit a higher propensity for wet-pavement curve-related crashes, have steep downgrades, or are approaches to intersections, the treatment increases friction and assists in preventing vehicles from skidding. The end result? Safer roadways for the public.

### What are the benefits?

- Reduces crashes, injuries, and fatalities on curves and intersections that exhibit a higher propensity for wet-pavement-related crashes.
- Installs quickly with minimal traffic impact (expect one lane of traffic to be shut down for two to three hours during application and curing).
- Provides a durable, long-lasting, moderate-cost surface option over the pavement's life cycle.
- Increases road-surface skid resistance and water drainage.
- Decreases braking distance, hydroplaning, splash, and spray.

## What does the future hold?

PennDOT tracks crash data and has identified high-priority crash locations where the greatest return on investment can be realized in reducing wet-pavement, curve-related crashes. Through 2014, PennDOT has installed High Friction Surface treatment at 42 locations in Pennsylvania in an effort to prevent crashes and save lives. Moving forward, PennDOT continues to evaluate this surface treatment and has identified 102 additional locations throughout the state that would benefit from this innovative technique.


HFS applied at intersection of Routes 2024 and 2017 in Northampton County

## Case Studies: PennDOT District 5 — "Like a Miracle"

The first application of HFS treatment in Pennsylvania occurred in 2007 in PennDOT District 5 along Route 611 in Northampton County. The curve targeted for treatment was especially troublesome since cars regularly slid on the pavement into opposing traffic or the guiderail. Many times, vehicles caused damage to the historic Delaware & Lehigh Canal that paralleled the road.

"We tried various things over the years to try to make the road safer, but all without much success," says Steve Pohowsky, safety program specialist for District 5. Then, as a pilot project, the district agreed to have a contractor apply a High Friction Surface product on about 500 feet of roadway at the curve. The results were immediate. The district saw wet-pavement-related crashes at the spot drop from 20 in the 10 years prior to the treatment to zero in the seven years since it's been installed.

"It was almost like a miracle," Pohowsky says.

Following a series of skid tests, crash data analysis, and sampling over the next few years, the pilot project proved successful in making roadways safer, and PennDOT gave the product (TyreGrip) its blessing by adding it to its approved materials listing in Bulletin 15.

District 5 was so pleased with the outcome along Route 611 that in 2012 it applied the treatment to 12 additional sites identified as having a high number of wet-pavement crashes throughout Northampton and Lehigh counties. The district continues to install HFS treatment at targeted locations, including 15 sites in 2014 and another scheduled 30 locations in 2015.

At the 2012 sites, wet-pavement accidents (which numbered 119 in the three years prior to the treatment) were reduced to just three accidents in the first 15 months since the application, and two of those crashes, Pohowksy says, can be explained (one involved a drunk driver and the other a driver distracted by a cell phone).

"Now everyone wants us to apply the treatment to problem areas," he says. "Homeowners who live along the treated curves tell us, 'I don't know what you did there, but keep it up.'"

PennDOT continues to receive installation requests from homeowners located along dangerous curves and police who appreciate the reduction in the number of crashes at these sites.

"In my 12 years here at the district, this application is one of the best materials I've ever seen in terms of one-to-one correlation of immediate and definite effects on making a roadway safer," Pohowsky says.

## District 8 — "So Far, So Good"

Once TyreGrip became an approved material in PennDOT's Bulletin 15, District 8 installed the HFS treatment at four locations in Cumberland, Dauphin, and Franklin counties in 2013. The sites were chosen based on data showing a high number of run-off-the-road crashes at sharp curves.

Long-term crash data still needs to be analyzed. However, one year after implementation, PennDOT discovered zero wet-pavement-related crashes had occurred at these sites compared to four wet-pavement-related crashes, involving three injuries, in the year leading up to installation of the HFS.

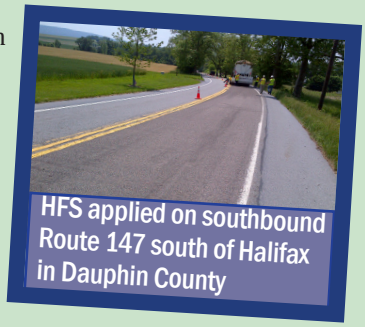
"The county managers who are in charge of plowing and maintaining the roads like it so far, and they've asked for it to be installed at other locations," says Jason Hershock, senior civil engineer supervisor for PennDOT District 8. In 2015, 12 sites are planned for HFS treatment.

Standard skid tests conducted on the HFS-treated roads 90 days after application revealed a score in the 80s, twice as high as the friction levels usually recorded on standard paving projects. In addition, the HFS treatment holds up well throughout all kinds of weather. In the fall, Hershock observed that tree leaves that fell onto the roadway were practically ground away against the surface, thus reducing the chance for vehicles to skid on slick wet leaves. In the winter, the surface holds up extremely well against the grinding and scraping of snow plows.

TyreGrip is a proprietary product, which can make it fairly costly to apply (Hershock estimates costs at $24 to $32 per square yard, which is comparable to a road overlay project), but the good news is that it can be targeted to problem areas in relatively small and more affordable doses.

"We applied it only to the outside lane of a curve and discovered it can be laid so precisely that we didn't even have to repaint the road lines," Hershock says.

In the end, the final cost to treat the pavement at these four projects was about $180,000, which is really a small price to pay to make roadways significantly safer for the motoring public.


HFS applied on southbound Route 147 south of Halifax in Dauphin County

## Application of HFS: Controlling Costs

The HFS treatment is easily and most effectively applied by a specialized truck, which distributes the epoxy onto the roadway followed by a spreading of aggregate 12 to 24 inches behind.

"When applied by truck, the epoxy and binder agent are evenly distributed with the aggregate in one pass," reports Steve Pohowsky of District 5.

But, the application can be completed manually, something he saw during the district's pilot project. The epoxy was poured into buckets, dumped onto the roadway, and then spread with a squeegee, while workers followed closely behind shoveling the aggregate onto the wet surface.

"Manual application (for smaller jobs) is labor intensive and may result in an uneven displacement of epoxy and binder agent," Pohowsky admits. However, local governments may want to check into the manual application of HFS treatment as a way to keep costs down and still benefit from this safety-proven treatment.

PennDOT has developed an HFS treatment specification and user guidelines and is currently evaluating the construction and performance of HFS treatments using four different binders.

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