PENNSYLVANIA
SR 611-Northampton County

CASE STUDY

HIGH FRICTION SURFACE TREATMENT (HFST)

Successfully Disseminating the Practice

Maintaining required pavement friction values in horizontal curves is crucial for keeping vehicles on the roadway.

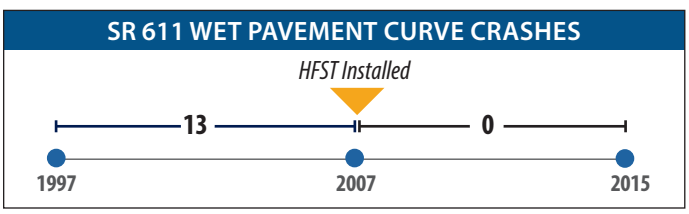
Meeting the required friction demand at curves is a challenge; vehicles require even greater friction on wet road surfaces, making curves more susceptible to crashes. High Friction Surface Treatments (HFST) are pavement treatments that use bauxite and epoxy binder to provide long-lasting and skid-resistant properties to the roadway.

BACKGROUND

Despite PennDOT's signing and pavement marking improvements, one particular horizontal curve on the two-lane State Road (SR) 611 in Northampton County had thirteen wet pavement crashes in ten years in the southbound direction. The lack of super-elevation and presence of an intersection within the curve were contributing factors to safety concerns.

ADDRESSING SAFETY CONCERNS WITH INNOVATION

Lower-cost strategies, such as advanced curve warning pavement markings or chevron signs, did not eliminate the safety concerns; as a result PennDOT explored innovative solutions and became interested in HFST, which appeared promising for reducing roadway departure crashes within curves. As a pilot project, PennDOT hired a contractor to install HFST for the first time in June 2007, as a solution to the safety issues on the SR-611 curve. The treatment was approximately 800 feet in length and only installed in the direction where the past crashes occurred.



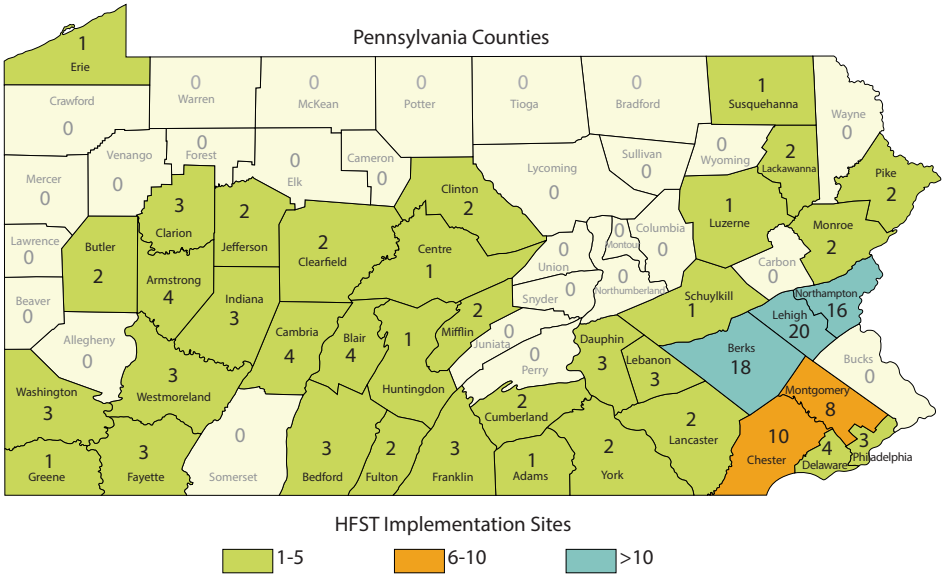
PennDOT's persistence in addressing safety issues at this location achieved the results they desired. In contrast to the past attempts to improve safety, the location experienced no wet pavement crashes in the eight years after HFST installation.

SHARING THE PRACTICE.... AND THE CRASH REDUCTIONS

Results from the first HFST implementation on SR-611 were extremely encouraging. While the performance of the 2007 HFST implementation was being thoroughly evaluated, PennDOT continued to experience numerous wet curve crashes elsewhere in the State. PennDOT applied the treatment to fourteen additional sites in 2012, all identified based on high frequencies of wet pavement crashes. The Federal Highway Administration's (FHWA) Every Day Counts (EDC) initiative encouraged PennDOT to further increase HFST applications in 2013.

"In my [experience], HFST is one of the best materials I've seen in terms of one-to-one correlation of immediate and definite effects on making a roadway safer."

Steve Pohowsky
PennDOT, District 5
Safety Program Specialist



As the HFST implementations built momentum, PennDOT wanted to develop a manageable program and introduce the countermeasure to locations throughout the State. In July 2013, the agency determined the top 50 locations for consideration based on wet pavement crash data, with locations distributed among each District. By the end of 2013, PennDOT applied HFST at 19 sites in total.

To track HFST's performance, PennDOT developed a spreadsheet with five years of 'before' crash data as soon as the treatment was installed and inserts 'after' data as available to facilitate the evaluation process. All 19 HFST installations, where 234 crashes – 164 of which were wet pavement – and 8 fatalities in total had occurred in the five years prior to the treatment, have experienced 17 crashes and zero fatalities to date since their implementation.

Additionally, PennDOT tracks pavement friction values at HFST sites. The HFST implementation sites averaged skid numbers of over 70 when measured multiple years after the installation, whereas traditional pavement overlay initial friction values are 50-55 and decline into the 40s within a few years.

DEVELOPING A SPECIAL PROVISION TO INSTITUTIONALIZE HFST

In 2013, the pace of HFST implementations slowed down as materials and pavement staff shifted their focus to developing a special provision and maximizing the treatment's efficiency both in terms of performance and cost. Having completed the special provision by the end of 2014, and publishing it in 2016[1], PennDOT became one of the few State agencies possessing a standard provision for HFST.

PennDOT ramped up their HFST implementations to a total of 65 locations in 2014 and to 150 by the end of 2015. The agency's desire is to develop and institute a formal process that facilitates and spreads the installation of local road HFST projects with the State's Highway Safety Improvement Program (HSIP) funds.

HIGH FRICTION, LONG SERVICE LIFE

In the eight years after PennDOT's first HFST installation, the curve on SR-611 did not experience any wet pavement crashes – which can be attributed to HFST's longevity, durability, and resistance-to-polish that provides high-friction values over a long service life. This pilot location was retreated with HFST in 2015 to continue crash reductions into the future.

1 Pennsylvania Department of Transportation, Publication 408 – Specifications, "Section 659 -- High Friction Surface Treatment," April 1, 2016 update. Available at: http://www.dot.state.pa.us/public/PubsForms/Publications/Pub_408/408_2016/408_2016_IE/408_2016_IE.pdf

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