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Research Summary

HFST Before and After Safety Analysis


HFST Before and After Safety Analysis

April 2021
Final Report

Project number TR201909
MoDOT Research Report number cmr 21-003

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Due to its high potential for safety improvement, MoDOT had deployed High Friction Surface Treatments (HFST) since 2013, at several areas experiencing high crash rates. To determine if the HFSTs are providing the expected results and if MoDOT's HFST program is effective, this study was conducted with the primary objective of evaluating MoDOT's existing HFST sections with regard to their overall effectiveness (i.e., reduction in crashes) and benefit (i.e., return on investment).

A preliminary analysis of Missouri's available crash data indicated that the majority of crashes before HFST installation occurred during daylight and on curved roadways. Correspondingly, these conditions exhibited higher crash reduction following the installation of HFSTs. Furthermore, while both wet and dry crashes were reduced after HFST installation, by far the greater reduction was in the category of wet crashes. These results generally indicated that HFSTs have potential for significantly reducing crashes on both wet (approx. 86 percent reduction) and dry (approx. 50 percent reduction) pavement surfaces, with the benefit more pronounced for wet pavement surfaces.

Past studies indicated that while pavement friction gained by HFST is a crucial factor for improving highway safety and for reducing traffic crashes, it is not the only factor affecting crashes. In fact, crashes are complicated events involving not only vehicles and/or roadway features but also human factors (e.g., drinking and driving) and environmental factors (e.g., rain, snow, etc.) as well as other factors that are impossible to predict. For these reasons, crashes are often considered to be "random events" with its count statistic fluctuating naturally. Due to such random nature of crashes and crash counts, simple comparison of crash counts before/after a treatment is generally not recommended.

> *"Statistical modeling of before/after crashes from MoDOT's HFST sections showed that the HFST reduced crashes, with … an overall reduction of 53.3 percent."*

Due to the limitations of the simple, observational comparison of crash counts before and after HFST, Safety Performance Functions (SPF) were developed based on the available data. The purpose of the SPF was (1) to estimate the expected number of crash reduction after HFST, (2) to identify the factors significantly affecting crashes, and (3) to allow for an Empirical Bayes (EB) estimate of crash counts.

It should be noted, that MoDOT has the foundation necessary to perform an analysis to identify locations that would benefit from the application of HFSTs or other safety

improvements. Currently, ARAN collects curve and superelevation data for the entire State highway system annually (with the exception of ramps), that may provide invaluable information for identifying the cause of high crash rates at any location. Coupled with the ability to locate crashes and filter them by type, condition, severity, etc. makes very detailed analysis possible.

While the methodology developed here is not for identifying location where high crash rates exist, the equations can be used to determine how much reduction could be expected from the application of HFST, if installed.

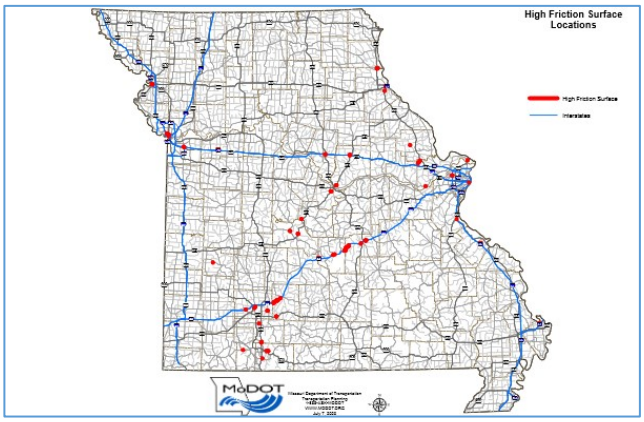

Figure 1: Location of HFST projects completed since 2013. (MoDOT)

Ultimately, statistical modeling of before/after crashes from MoDOT's HFST sections showed that the HFST reduced crashes, with the reduction ranging from 13.7 percent to 79.5 percent and an overall reduction of 53.3 percent. The Benefit-Cost Analysis (BCA) carried out subsequently showed that MoDOT may expect a benefit-cost ratio (B/C) ranging from 2.3 to 409.1, with an overall average of 52.6. Based on these results, it is concluded that MoDOT's HFST program is effective in reducing crashes with a high rate of return.

Project Information

PROJECT NAME: TR201909—HFST Before and After Safety Analysis

PROJECT START/END DATE: November 1, 2019-March 31, 2021

PROJECT COST: $100,000

LEAD CONTRACTOR: Applied Research Associates, Inc.

PRINCIPAL INVESTIGATOR: Jay Bledsoe

REPORT NAME: HSFT Before and After Safety Analysis

REPORT NUMBER: cmr 21-003

REPORT DATE: April 2021

Project Manager

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