Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6860: Develop Metrics of Tire Debris on Texas Highways

Background

This research developed metrics quantifying the extent and characteristics of tire debris on Texas highways, as well as its safety and economic implications. With traffic on Texas highways continuing to increase every year, it is important to better understand how much and where tire debris is expected to be generated in order to develop more effective strategies for debris removal activities.

What the Researchers Did

The research team performed multiple analyses to estimate statewide quantities and characteristics of tire debris on Texas highways. The research team used several data sources, including a statewide survey of debris removal practices, field data collected from a probability sample of Texas highways, and data from Texas Department of Transportation (TxDOT) crash and maintenance databases. In addition, some analyses incorporated secondary data from other sources, such as publicly available reports on the economic and environmental impact of road debris.

What They Found

From the statewide survey of TxDOT districts, this research found marked differences in debris removal practices. A cost analysis on the amount of work and cost of debris removal showed that the cost per unit of work of debris removal activities increases with increasing proportion of contractor work. Austin and San Antonio Districts have the most miles driven by state forces in debris removal activities, so they have lower unit costs compared to the Houston and Dallas Districts. This analysis also showed that the cost and amount of work in road debris removal activities vary by the amount of debris generated on the roads.

The probability sample of Texas highways, representing 2289.2 lane miles or 443.3 centerline miles, identified 14,998 pieces of tire debris. The dimensions and weight of these pieces were estimated using an image-processing procedure and a sample of tire debris pieces collected from the field. On average, between 70 and 290 metric tons of tire debris were present on Texas roads at any point between July and November 2015. When combining these data with records of removal activities, researchers found that between 10.27 and 13.94 lb of tire debris are generated every

Research Performed by:
Texas A&M Transportation Institute

Research Supervisor:
Raul E. Avelar, TTI

Researchers:
Michael P. Pratt, TTI
Jeffrey D. Miles, TxDOT
Tomas Lindheimer, TTI
Nada Trout, TTI
Jason Crawford, TTI

Project Completed:
5-31-2016

week per mile of highway in Texas. At this rate, researchers estimated that between 1,389 and 7,226 metric tons of tire debris were generated on Texas highways during the last year.

A safety assessment of tire debris on Texas highways found that crashes triggered by tire debris amount to less than 0.1 percent of all crashes in Texas. For each additional 5 mph in the speed limit, the odds of this type of crash increase by a factor of 1.11 at rural facilities and by a factor of 1.07 at urban facilities. The odds of a crash triggered by tire debris also increase by a factor of 1.15 for each additional 5 percent of trucks in traffic; odds of this type of crash also increase by a factor of 1.14 for each additional travel lane.

An economic analysis found that, during fiscal year 2014, tire debris removal cost TxDOT between $10.1 million and $11.6 million, depending on what proportion of that debris was disposed in landfills. When considering the cost to the public of crashes involving tire debris left on Texas highways, this yearly cost is driven up by the occurrence of any fatal crashes. Focusing on crashes without any fatalities in the period from 2012 to 2014, the research team found that the yearly cost ranged from $35.8 million (in 2014) to $42.7 million (in 2013). When considering that three fatalities occurred in 2012 in crashes triggered by tire debris, the safety cost was found to be $67.5 million that year.

What This Means

This research developed metrics on the amount and characteristics of tire debris generated on Texas highways. These metrics provide numerical, data-based rates for districts to anticipate the amounts and characteristics of tire debris and to plan removal operations accordingly.

The cost assessment of removal activities and safety implications provide building blocks for districts to perform economic analyses of higher complexity to assist with their decision making. Particularly, such analyses may prove useful to deciding the share of debris removal work to be let to contractors and deciding about investing in specialized equipment to improve the efficiency of debris removal activities.

For More Information

Project Manager:
Sonya Badgley, TxDOT, (512) 416-4657

Research Supervisor:
Raul E. Avelar, TTI, (979) 862-1651

Technical reports when published are available at **http://library.ctr.utexas.edu.**

Research and Technology Implementation Office
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483

www.txdot.gov
Keyword: Research