



RESEARCH PROJECT CAPSULE [21-2P]

November 2020

TECHNOLOGY TRANSFER PROGRAM

Correlation of Rut Depths Measured by the Profilers of LTRC and DOTD PMS

JUST THE FACTS:

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18 months

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May 15, 2022

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SPR: TT-Fed/TT-Reg - 6

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POINTS OF INTEREST:

*Problem Addressed / Objective of
Research / Methodology Used /
Implementation Potential*

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PROBLEM

Rutting is one of the major distresses observed in asphalt pavement. It is defined as the surface depression occurring in the wheel paths of roadways. Pavement rut is the accumulation of permanent deformation in all of the layers in a pavement structure. It is generally caused by consolidation or lateral movement of pavement materials or subgrade due to repeated traffic loading. The pavement ruts tend to hold water and cause vehicle hydroplaning, thus resulting in dangerous driving conditions and weather-related accidents. The pavement rut also affects the pavement structure integrity. For these reasons, the Louisiana Department of Transportation and Development (DOTD) regularly monitors the levels of rut depth on the pavement. It is one type of distress data collected by DOTD's Pavement Management System (PMS). It is also a required performance measurement specified in the Highway Performance Monitoring System (HPMS).

The technologies to obtain pavement rutting measurements have evolved in the last decades from manual methods (e.g., straightedge method) to point-based rut bar systems (e.g., 5-point rut bar systems), then to 3D laser scanning systems (e.g., laser crack measurement system [LCMS]). The manual measurement methods are labor-intensive and time-consuming and require safety measures (e.g., lane/road closures); they are gradually replaced with automated measurement methods. For automated profile systems, three methods are mostly used to determine the rut depth: straightedge model, wire model, and pseudo-rut model.

The Louisiana Transportation Research Center (LTRC) currently owns a road profiler, which uses a 5-point rut bar system for pavement rut depth measurements (Figure 1). DOTD is currently using Fugro's Pave3D system (Figure 2), which utilizes the latest 3D laser scanning technology, for PMS rut depth data collection. Because of the difference in rut model and algorithm, it is obvious that the two systems



Figure 1
LTRC's 5-point rut bar system

will result in some differences of calculated rut depths. The correlation of calculated rut depths between these two systems should be established, so when LTRC data is requested, it can be used together with PMS data to serve DOTD's needs.

OBJECTIVE

The objective of this study is to develop a correlation of rut depths measured with LTRC's profiler with a 5-point laser system and DOTD PMS's profiler with a scanning laser system. A standard operating procedure (SOP) of pavement rutting data collection, compilation, and delivery by LTRC will be developed so that DOTD pavement engineers can use LTRC data together with PMS data to evaluate the pavement performance and conduct/support pavement management activities.

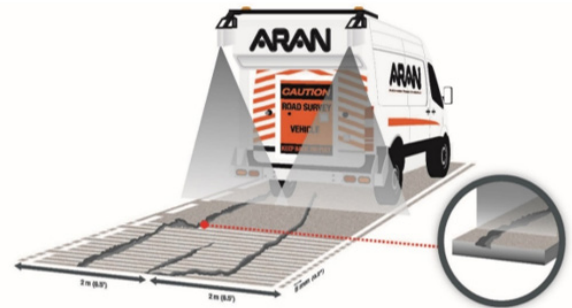


Figure 2
Fuguro's Pave3D system
(<https://www.fugro.com>)

METHODOLOGY

To achieve the objectives of this study, the following tasks will be completed. First, a review of existing literature regarding pavement rutting measurement and correlations of rutting depths measured/determined by different methods/technologies will be conducted. Next, the principal investigator of this study will work with the pavement management engineer of DOTD to identify which roads will be used for transverse profile data collection. The research team will work with the DOTD pavement management engineer to develop a field data collection schedule. Past data collected at the pavement management control sites will also be revisited and used in this study if available. The collected data will then be analyzed and a standard operating procedure will be developed. Lastly, all significant research findings and recommendations will be documented in a detailed final report.

IMPLEMENTATION POTENTIAL

A correlation between rut depths measured by LTRC's profiler with a 5-point laser system and DOTD PMS's profiler with a scanning laser system will be developed. An SOP of pavement rutting data collection, compilation, and delivery by LTRC will be created for DOTD pavement engineers to use when LTRC data is needed, together with PMS data, for pavement performance evaluation and pavement management activities support.