

Development of Structural Deterioration Models for Flexible Pavement Using Traffic Speed Deflectometer Data

Authors : Sittampalam Manoharan, Gary Chai, Sanaul Chowdhury, Andrew Golding

Abstract : The primary objective of this paper is to present a simplified approach to develop the structural deterioration model using traffic speed deflectometer data for flexible pavements. Maintaining assets to meet functional performance is not economical or sustainable in the long terms, and it would end up needing much more investments for road agencies and extra costs for road users. Performance models have to be included for structural and functional predicting capabilities, in order to assess the needs, and the time frame of those needs. As such structural modelling plays a vital role in the prediction of pavement performance. A structural condition is important for the prediction of remaining life and overall health of a road network and also major influence on the valuation of road pavement. Therefore, the structural deterioration model is a critical input into pavement management system for predicting pavement rehabilitation needs accurately. The Traffic Speed Deflectometer (TSD) is a vehicle-mounted Doppler laser system that is capable of continuously measuring the structural bearing capacity of a pavement whilst moving at traffic speeds. The device's high accuracy, high speed, and continuous deflection profiles are useful for network-level applications such as predicting road rehabilitations needs and remaining structural service life. The methodology adopted in this model by utilizing time series TSD maximum deflection (D0) data in conjunction with rutting, rutting progression, pavement age, subgrade strength and equivalent standard axle (ESA) data. Then, regression analyses were undertaken to establish a correlation equation of structural deterioration as a function of rutting, pavement age, seal age and equivalent standard axle (ESA). This study developed a simple structural deterioration model which will enable to incorporate available TSD structural data in pavement management system for developing network-level pavement investment strategies. Therefore, the available funding can be used effectively to minimize the whole -of- life cost of the road asset and also improve pavement performance. This study will contribute to narrowing the knowledge gap in structural data usage in network level investment analysis and provide a simple methodology to use structural data effectively in investment decision-making process for road agencies to manage aging road assets.

Keywords : adjusted structural number (SNP), maximum deflection (D0), equant standard axle (ESA), traffic speed deflectometer (TSD)

Conference Title : ICPEI 2018 : International Conference on Pavement Engineering and Infrastructure

Conference Location : Paris, France

Conference Dates : June 25-26, 2018