The Twenty-Sixth KKHTCNN Symposium on Civil Engineering
November 18-20, 2013, Singapore

Analysis of Relationship between Pavement Friction and Mean Profile Depth for Maintenance Planning

*Nuntawat Lersinghanart[1], and Wisanu Subsompon[2]

[12]*Department of Civil Engineering, Chulalongkorn University, 254 Phayathai Road, Pathumwan, Bangkok, 10330, Thailand*
Nuntawat_N@hotmail.com, wisanu.s@gmail.com

ABSTRACT

This paper presents the relationship between Mean Profile Depth (MPD) and coefficient of pavement friction (μ) in order to apply MPD to reflect pavement friction at a network level. Since MPD can be measured faster and more cost-effective than measuring pavement friction directly, the objective of this research is to use MPD as a surrogate factor to screen pavements that need further detail investigation. In this research, MPD is obtained from a standardized device according to ASTM E 1845 (2009), and the coefficients of pavement friction (μ) are obtained from Dynamic Friction Tester and Fixed-Slip device respectively. The research found that if MPDs are higher than 1.5 millimeter, all coefficients of pavement friction (μ) would be higher than the required investigatory level at 0.35. Therefore, MPD can be used as a threshold to reduce needs of direct friction measurement of all pavements especially at the investigatory level. As a result, it can save cost and time of data collection for pavement friction management at a network level.

INTRODUCTION

Road accidents are an important issue that affects the economic and social development. A major factor causing car accident on wet pavement is pavement with low surface friction (Kuttesch, 2004). There are different types of device that have been used to measure pavement friction. Generally, these friction measuring devices can be classified into two groups: low speed or high speed friction measurement. Low speed measuring device such as Dynamic Friction Tester (DFT) (ASTM E 1911, 2009) is portable and can measure pavement friction at various speeds (Saito et. al., 1996), but has limitation on lane closure requirement. High speed measuring devices measure pavement friction by using full-scale test tires in one of four modes: locked-wheel, fixed slip, variable slip, or side-force. Though high speed devices can commonly use at highway speed, they are more expensive and require more training to operate.

In Thailand, pavement management systems in both Department of Highways (DOH) and Department of Rural Roads (DRR) have been implemented for many years. The main data in both systems is International Roughness Index (IRI) which is collected through highway-speed devices either bump integrator or laser profiler. However, pavement friction data is rarely collected due to limitation of low speed devices and inadequate high speed device (Department of Rural Roads, 2011). Therefore, pavement friction management at network level has yet been planned.

One of key factors that affect pavement friction is pavement surface texture (Fulop et. al. 2000, Ivey et al. 1973). For vehicles traveling at high speed, macro-texture is mainly responsible for reducing the separation between tire and pavement surface due to hydroplaning (NCHRP, 2006). The Mean Profile Depth (MPD) is the main index used to characterize macro-texture (Henry, 2000). The relationship between pavement friction, MPD, and accidents from slipping is mentioned in Ergun et. al. (2005) and Larson (2005). Since MPD can be measured through laser device attached on the same survey vehicle which is used to collect IRI, the MPD data can be collected at high speed with almost no additional cost. The objective of this research is, therefore, aimed to quantify the relationship between coefficients of pavement friction (μ) and MPD in order to use MPD as a surrogate factor to screen pavements which need further investigation. The ultimate goal is to suggest a methodology to collect sufficient data for pavement friction planning at network level.

---

[1] Graduate Student
[2] Associate Professor