Effect of tire footprint area pavement response studies.

ABSTRACT

The necessity of incorporating realistic non-uniform measured contact stresses, tire footprint area, as well as other non-linear and viscoelastic behaviour within tire-pavement interaction have been suggested by many researchers in order to obtain more reliable pavement responses. However, modeling 3D contact stresses with distribution and other non-linear properties in common pavement design procedure seems difficult and impractical because of the complexity usually involved in this process. Therefore, layered linear elastic theory and average circular contact pressure have been widely used in most common pavement design procedures. In this paper, a simple but acceptable method for predicting pavement responses, in the existing layered linear elastic program (KENPAVE) was utilised. This modified method is based on incorporating tire imprint instead of load over inflation pressure ratio and utilizing a more realistic representative value rather than tire inflation pressure for uniform tire-pavement contact stresses. It was found that critical tensile stain at the bottom of HMA is underestimated, and accordingly fatigue life is greatly overestimated when using conventional method. In addition, based on the results of modified layered linear elastic method, new generation of wide-base tires (Michelin445/50R22.5, Michelin455/55R22.5) reduce vertical contact stress and pavement damage, since they provide wider area of contact and require lower inflation pressure. On the other hand, older generation of wide-base tire (Goodyear425/65R22.5) was considered more detrimental to the pavement in terms of bottom-up fatigue cracking.

Keyword: Tire-pavement footprint area; Contact stresses; Wide-base tire; Layered linear elastic program.