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## Towards Long Lasting Pavements

Imad L. Al-Qadi



*Professor Al-Qadi holds the Founder Professor of Engineering at the University of Illinois at Urbana-Champaign. He is also the Director of the Advanced Transportation Research and Engineering Laboratory and the founding Director of the Illinois Center for Transportation. Prior to that he was the Charles E. Via, Jr. Professor at Virginia Tech and the Roadway Infrastructure Group Leader. He is an ASCE Fellow and a registered professional engineer. Professor Al-Qadi has authored/coauthored more than 430 publications and has delivered more than 400 presentations including several keynote lectures. He received numerous awards including the National Science Foundation Presidential Young Investigator Award, the quadrennial 2002 International Geosynthetic Society Award, and recently the 2007 ASCE James Laurel Prize for advancing transportation engineering. He is currently the TRB Preservation and Maintenance Section Chair and the Editor-in-Chief of the International Journal of Pavement Engineering.*

Long-lasting and durable flexible pavements are designed to be structurally and functionally sound and to provide more than 30 years of service without major rehabilitations. Although flexible pavement design has gradually evolved from empirical methods to mechanistic-empirical approaches that consider traffic variation, environment, emerging pavement structural configurations, and evolving pavement construction materials, these design improvements have not completely addressed many of the pavement distresses.

Mechanistic-empirical design of long-lasting flexible pavements must consider accurate tire-pavement interaction, material properties, numerical modeling, and full-scale testing. However, current (including recently introduced) flexible pavement design criteria only account for circular loading, inflation pressure equivalent to contact stress, elastic materials, and stationary loading. Unfortunately, these assumptions are inconsistent with realistic loading conditions and may result in erroneous pavement response calculation, design, and pavement performance prediction.

The reality of the tire-pavement contact area is that truck tires produce highly non-uniform vertical contact stresses as well as surface transverse and longitudinal tangential stresses. The effect of these stresses is mainly at the surface and shallow depths and is manifested by surface deterioration. This presentation introduces a three-dimensional (3D) finite element (FE) model that incorporates hot-mix asphalt (HMA) linear viscoelastic characteristics, and utilizes measured 3D contact stresses, continuous moving load, and implicit dynamic analysis. The model was then successfully validated with the responses from instruments installed in in-situ pavements as well as sections tested by Accelerated Pavement Testing (APT) facilities. The effects of vehicle accelerating/braking on HMA performance; especially at layers' interfaces will be also discussed.

