Roughness, Texture, & Deflection

One of the primary ways to distinguish asphalt pavements is by their smoothness. It’s proven that pavement smoothness is a key factor in driver satisfaction and properly constructed asphalt pavements provide a smooth, more comfortable ride for drivers and passengers alike, while reducing wear-and-tear on vehicles. A smooth roadway also ensures greater fuel economy for drivers and less maintenance over time for the road owner, saving both drivers and owners money.

Three factors are commonly considered when engineers look at the interactions between a pavement and a vehicle that affect drivability: roughness, texture, and deflection. A vehicle’s interactions with the pavement, the environment, and internal mechanical factors all combine to create rolling resistance. To overcome this resistance, energy must be consumed, which lowers the overall fuel economy of a vehicle.

Roughness (also referred to as smoothness) describes imperfections in a pavement surface, measured using the International Roughness Index (IRI), that affect perceived ride quality. Roughness is felt in the seat of the pants and through the steering wheel while driving. Pavement smoothness has the greatest impact on whether a driver views a road as good or bad.

Texture, not to be confused with roughness, is a more specific measurement that quantifies imperfections and indentations in a pavement surface. Microtexture is related to the shape and characteristics of the aggregate (or rocks) used in the pavement, while macrotexture is more a factor of mix design and pavement construction techniques. Megatexture is a serious defect in a surface, such as a deteriorating surface.

Finally, deflection is a function of the material used to build the pavement. Vehicles can cause a pavement to flex; the heavier the vehicle, primarily on hot days and when moving at slow speeds, the more the pavement bends. Deflection is directly proportional to a pavement’s stiffness.

Based on current research, pavement engineers agree that a pavement’s smoothness and megatexture have the greatest influence on fuel economy. The macro- and microtexture of a well-maintained pavement are a smaller contributing factor, while deflection is an unquantified minor factor.