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Keynote

APT and Future of Mobility

Population growth and rapid urbanization have caused an increase in e-commerce, economy, and mobility of goods and people that surpasses the capacity of the existing infrastructure due to the limited expansion of the transportation network as well as limited capital investment in mobility. Additionally, mobility options influence employment opportunities, safe travel, and economic prosperity. The current mobility challenges demand innovative solutions and collaborative efforts to meet the overarching goal of efficient, sustainable, resilient, and safe mobility. The future of mobility must be holistically planned, including the future of pavement engineering. The relationship between pavement advanced modeling and field prediction as well as accelerated pavement testing (APT) will be discussed.

The rapid change in pavement materials and loading patterns necessitates the introduction and adoption of new continuous monitoring of pavement behavior. Measuring pavement responses under various loading and environmental conditions has never been as crucial to predict pavement performance. The use of wireless instruments and new loading mechanisms would make APT appealing. New instruments and their corresponding installation will be discussed. The new testing approaches, including live and controlled loading, will be presented along with their advantages and disadvantages. New loading mechanisms for APT such as acceleration and deceleration will be presented along with the control of yaw angel.

With the introduction of connected and autonomous trucks, truck platoons are expected to be more feasible and prevalent. The reported benefits of truck platooning include regularizing traffic, reducing congestion, increasing highway safety, and decreasing fuel consumption and emissions. Truck platoons may, however, decrease pavement longevity because it would cause channelized load application and hinder the healing properties of asphalt concrete. A centralized control strategy that converts the pavement-related challenges of truck platooning into opportunities will be presented and the role of APT for the validation of new platoon-control approaches will be discussed. The new strategy leverages the auto-pilot technologies in connected and autonomous trucks by optimizing the lateral position of each platoon or group of platoons.

Finally, the transportation sector is responsible for approximately 29% of total energy consumption in the U.S. and 14% of global greenhouse gas emissions. While most of these environmental impacts are emitted from vehicles, infrastructure also plays a large role in the environmental footprint of the transportation sector, with direct implications on the vehicles traversing it. Thus, the pursuit of a sustainable pavement system requires a life-cycle approach, where APT can play a role in optimizing the stages with respect to its engineering durability and environmental impacts.

The bottom line is APT must have a new direction to guide the future of pavement engineering to meet the mobility sector's rapid changes.