UTC Project Information

Project Title	Investigating Merits of Bio-Rejuvenation to Extend Pavement Service Life
University	North Carolina A&T State University
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Funding Source(s) and Amounts Provided (by each agency or organization)	$92,887 USDOT $46,443 NCA&T
Total Project Cost	$139,329
Agency ID or Contract Number	DTRT13-G-UTC44
Start and End Dates	January 31, 2017 to January 30, 2018
Brief Description of Research Project	The overall goal of this project is to extend pavement service life by applying timely preventive and corrective low cost maintenance approach. As a step toward this goal, the specific objective of the project is to use bio-rejuvenation as a means of restoring aged asphalt pavement properties. We mainly start counting pavement age after pavement placement and compaction is done, however, it should be noted that aging also occurs during plant mixing which promotes chemical imbalance within asphalt colloidal structure. The research hypothesis is that by applying bio-rejuvenator at periodic intervals during pavement life, one can restore the chemical balance of asphalt (asphaltene/maltene ratio) which is critical to maintain an adequately ductile pavement. This in turn would ensure pavement proper release of stress to prevent stress accumulation. It should be noted that when the pavement surface appears weathered and crusted, it has already lost its ductility and compliance capacity, this in turn would reduce pavement ability to release stress giving rise to stress accumulation due to traffic and environmental loading. When the stress level exceeds pavements' ultimate strength, cracks initiate and continue to propagate compromising pavement integrity and performance.

This proposal builds on our prior project which focused on evaluating adhesive and cohesive failure mechanisms in bituminous crack sealants especially when exposed to water. The study results showed that excessive surface weathering which is further accelerated by water exposure can promote premature cracking compromising sealants performance even if the sealants' bulk is intact. Similar phenomenon occurs on pavement surface as bitumen loose its volatile compounds and its maltenes compounds gradually converts to asphaltene as aging progresses making asphalt more brittle. Therefore, in this project we will examine the merits of application of a bio-rejuvenator as a pavement maintenance and preventive approach to restore properties of bituminous materials (asphalt binder and crack sealant) exposed to surface drying and oxidation for specified time. The premise of the project is that spraying bio-rejuvenator (following a moving infrared heat source) on the surface of oxidized bituminous materials could be a viable preventive maintenance method to extend pavement service life. The project will further determine the technical feasibility and deployment practicality of this method by measuring extent of restoring oxidized asphalt properties as well as the level of skid resistance measured twelve hours after rejuvenator's application.

Describe Implementation of Research Outcomes (or why not implemented)

N/A

Place Any Photos Here

Impacts/Benefits of Implementation (actual, not anticipated)

Deliverables in this project are expected to be as follows:

1. Understanding rejuvenation mechanisms in bituminous materials,
2. Determining appropriate indicators (micro and macro-level indicators) to evaluate the extent of rejuvenation in bituminous materials,
3. Conducting a comparative laboratory and field evaluation for several bituminous materials before and after rejuvenating to examine effectiveness of rejuvenation as well as the extent of skid resistance loss, and
4. Evaluating merits of rejuvenating pavement surface to extend its service life

Web Links

<www.chpp.egr.msu.edu>

- Reports
- Project website