

KANSAS DOT RESEARCH PROJECTS QUARTERLY PROGRESS REPORT

Lead Agency (University or Contractor): _____ Kansas DOT _____

INSTRUCTIONS:

Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

KDOT Project Number RE-0617-01	Transportation Pooled Fund Program - Report Period: <input checked="" type="checkbox"/> Quarter 13 (January 1 – March 31, 2016) <input type="checkbox"/> Quarter 14 (April 1 – June 30, 2015) <input type="checkbox"/> Quarter (July 1 – September 30, 2015) <input type="checkbox"/> Quarter (October 4 – December 31, 2015)	
Project Title: Real-Time Quality Control Monitoring and Characterization of Aggregate Materials in Highway Construction using Laser Induced Breakdown Spectroscopy		
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Project Investigator: Warren Chesner Phone: 516-431-4031 E-mail: wchesner@chesnerengineering.com		
Lead Agency Project ID: RE-0617-01	Other Project ID (i.e., contract)	Project Start Date: June 1, 2013
Original Project End Date: May 31, 2016	Current Project End Date: May 31, 2016	Number of Extensions: 0

Project schedule status:

- On schedule
 On revised schedule
 Ahead of schedule
 Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Total Percentage of Work Completed
\$975,000	\$792,639.50	81.3%

Quarterly Project Statistics:

Total Project Expenses This Quarter	Total Amount of Funds Expended This Quarter	Percentage of Work Complete This Quarter
\$975,000	\$68,065.85	7.0%

Project Description:

The primary objectives of this research effort is to calibrate laser-spectral models to develop the means to monitor aggregate materials from participating State agencies, and to demonstrate the use of the technology in actual field applications. The overall objective is to transition the technology from a lab-based application to a field based system. Testing of aggregates and the calibration models developed in the NCHRP 150 research effort were accomplished using a laboratory-based laser-optical system. The proposed pooled fund work plan is designed to transition the technology from the laboratory to the field through the calibration, deployment and demonstration of the technology at selected field demonstration site(s). As part of the NCHRP 168 project, a field prototype sampling and laser targeting system field prototype, referred to as the SLT system (Sampling and Laser Targeting System), is under development for use in the pooled funding effort. The SLT system is a bulk sampling and laser-targeting system that is designed to analyze a diverted portion of the bulk material by passing target aggregate material passed a laser that is strategically located to provide for continuous or semi-continuous monitoring of the bulk aggregate stream. Diversion of samples of the bulk material into the SLT system is designed to remove the aggregate from the bulk stream during material transport, such as conveying. This material diversion provides the means to minimize interferences that would be encountered in an in-line monitoring system, without diminishing the effectiveness of the laser monitoring system to obtain large quantities of data necessary to properly characterize the targeted material. It also provides the means to ensure safe operation of the laser by enclosing the entire system in a separate sealed housing disconnected from the main bulk material conveying system, thereby ensuring a contained and safe operation. The SLT can be deployed in a laboratory environment as well where buckets of samples are periodically introduced for analysis or in a continuous or semi-continuous field operation where materials are diverted from a conveying operation to the SLT for analysis.

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

During this period, modification to the Sampling Laser Targeting System (SLT) were initiated to develop the hardware and software modifications and new laser firing and data modeling procedures to address this issue of "particle shape heterogeneity". Due to particle shape heterogeneity a preponderance of laser shots (over 90%) do not direct the energy emissions from the laser ablation process directly back to the focusing lens that further directs the light to the optical fiber, which transmits the light to the spectrometer for wavelength analysis. This means that many more laser shots will be needed and a data screening procedure established to screen out the poor intensity shots from the analysis. Design modifications underway will enable the SLT to handle 5000 and 10,000 laser shots per sample. (Formerly, 150 shots were fired per sample; and these 150 shots were averaged into one sample). In the current data management configuration each laser shot is handle like an individual sample. This is being accomplished by increasing the laser repetition rate from 1 Hz up to 5 and 10 Hz. A 5Hz laser shooting 300 shots per minute can achieve a 5000 shot run in 17 minutes; and a 10 Hz laser can achieve 5000 shots in 8.5 minutes. The physical system mods, including the data processing software and hardware (new computer) for a multi-thousand shot sample run have been completed. Work is continuing this coming quarter on the data analysis and modeling software to manage the large incoming spectral data base that must be managed.

Anticipated work next quarter:

SLT modeling software modifications will continue and shakedown on the system initiated. Work will be initiated on a Final report.

Significant Results:

Data models are providing predictive results that follow anticipated trends. These findings were based on averaging the results of at least 1500 laser shots per sample. Assessments undertaken indicate too many low intensity shots are included in such an analysis. New laser firing and data modeling procedures are needed to utilize single shot scanning.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, with recommended solutions to those problems).

Discussions were initiated with participating States and KDOT to expand the TPF 5(278) by initiating plans for Phase II of the laser scanning demo. Phase II would provide the time and resources needed to address the technical and data management issues uncovered in Phase I and to expand participation of additional States and samples.