QUANTIFYING THE COSTS AND BENEFITS OF PAVEMENT RETEXTURING AS A PAVEMENT PRESERVATION TOOL

ANNUAL REPORT FOR FY 2009

ODOT SPR ITEM NUMBER 2213

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October 12, 2009

Problem Statement: *To develop a Pavement Preservation Toolbox for ODOT maintenance engineers that furnishes technical, engineering, and financial information on the FHWA-approved pavement preservation treatments.*

With the decline in the condition of the nation's transportation infrastructure, pavement preservation has become an essential component to every state Department of Transportation's (DOT) program. Oklahoma's annual construction budget is far less than many other states in the region and as a result, preserving the state's infrastructure is doubly important in this state. Unfortunately, true pavement maintenance/preservation research has been limited to investigatory material science across the US, which while valuable, does not usually provide the technical and more importantly, financial information that pavement managers need to make informed decisions. In fact, the majority of the research is done by the commercial entities that manufacture and sell the various pavement preservation products, leaving DOTs with no choice but to experiment with different means and methods by trial and error.

This research project builds on research done in Australia and New Zealand (Austroads 2005) by conducting a long-term study of various methods to restore pavement skid resistance by retexturing the existing surface with either a surface treatment, chemical treatment, or a mechanical process and furnish the Oklahoma Department of Transportation (ODOT) with the technical engineering data for each treatment coupled with an economic analysis of the costs and benefits associated with each treatment. When complete, it will furnish ODOT pavement managers the required information to make rational engineering decisions based on physical and financial data for the use of potential pavement preservation tools, evaluated under the same conditions over the same period by an impartial investigator.

The essence of the project is the establishment a series of test sections on State Highway 77H (Sooner Road) between Norman and Oklahoma City. Each test section is ¼ mile (400 meters) long and one lane wide. Each section is retextured with a different type of pavement preservation process. Surface treatments will consist of three types of chip seals, two types of open graded friction courses, a permeable friction course, two types of tire rubber modified surface sealers and a thin hot-mix overlay. The chemical treatments will consist of two types of conditioners and crack seals, and finally, the mechanical treatments will involve two types of shotblasting and mechanical planing with a conditioner. Additionally, the shotblasting treatments will be applied to both asphalt and concrete surfaces. Finally, the treatment selection mirrors the Federal Highway Administration's table for preservation projects that qualify for federal funding.

Surface friction and pavement macrotexture have been measured on each test section before the treatments and continue on a monthly basis for two years after application. Thus, changes in both skid resistance and pavement macrotexture will be recorded over time, and each treatment's performance can then be compared to all other treatments in the same traffic, environment, and time period. The project's major output will be a pavement surface texture maintenance guide that can be used by ODOT pavement managers to restore surface texture and skid resistance to various types of pavements

throughout the state. This will constitute a surface retexturing "toolbox" that contains both the technical engineering information as well as the economic analysis of each treatment's efficacy. The idea is not to identify the "best" method but rather to quantify the benefits of all the treatments in a manner that then allows a pavement engineer to select the right pavement preservation "tool" for the specific issue that they need to address and satisfy the fundamental definition of pavement preservation: "put the right treatment, on the right road, at the right time" (Galehouse et al 2003**)**

Objectives. The objectives of this study are as follows:

- To furnish ODOT with the technical engineering data for each treatment coupled with an economic analysis of the costs and benefits associated with each treatment.
- To develop the required information to allow ODOT pavement managers to make rational engineering design decisions based on both physical and financial data for a suite of potential pavement preservation tools which were evaluated under the same conditions over the same period of time by an impartial research team.
- To compare and correlate different surface texture test methods and furnish ODOT with definitive recommendations for the proper use of macro and microtexture data in their pavement management/pavement preservation program.

Proposed Activities for FY 10

The tasks necessary to complete stated objectives are as follows:

- Task 1: Complete literature review
- Task 2: Complete no scheduled activity in FY 10
- Task 3: Complete no scheduled activity in FY 10
- Task 4: Continue testing protocol on 15 test sections.
- Task 5: Reduction of field data for those test sections that have 12 monthly observations
- Task 6: Complete life cycle cost analysis model for each treatment. Populate life cycle cost analysis model with ODOT data. Conduct cost index analysis and final life cycle cost analysis.
- Task 7: Write final report.

Compilation of Completed and Work in Progress for FY09

- Task 1: Literature review is 95% complete. Continue to collect cost data for life cycle cost analysis.
- Task 2: All test sites were marked and characterized. This task is 100% complete
- Task 3: All test sites were installed. This task is 100% complete
- Task 4: Test section testing conducted each month in accordance with the approved protocol. Ongoing for life of project on monthly basis.
- Task 5: Data reduction protocol validated by external resource. This task is 30% complete.

- Task 6: Life cycle cost model built for pavement preservation treatment. Survey issued to ODOT Divisions for input data to populate LCC model.
- Task 7: No scheduled progress in FY09

Overview of Work Done

September 2009:
Task 1: 95% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 100% complete (15 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 30% - Protocol found to be valid without need to refine.
Task 6: 25% Survey issued to ODOT Divisions for input data to populate LCC model
Task 7: No scheduled progress in this period

August 2009:
Task 1: 95% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 95% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 20% - Protocol found to be valid without need to refine.
Task 6: 25% Life cycle cost analysis model spreadsheet completed without input data
Task 7: No scheduled progress in this period

July 2009:
Task 1: 95% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 95% complete (14 of 15 TS complete) Installed microsurfacing test section .
Task 4: Ongoing for life of project on monthly basis.
Task 5: 15% - Initial analysis protocol is developed and was tested this month with first year's data.
Task 6: 10% Life cycle cost analysis model spreadsheet in development
Task 7: No scheduled progress in this period

June 2009:
Task 1: 90% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 95% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 10% - Initial analysis protocol being developed
Task 6: 10% Life cycle cost analysis model spreadsheet in development
Task 7: No scheduled progress in this period

May 2009:
Task 1: 90% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 95% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 10% - Initial analysis protocol being developed
Task 6: 10% Life cycle cost analysis model spreadsheet in development
Task 7: No scheduled progress in this period

April 2009:
Task 1: 88% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 88% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 10% - Initial analysis protocol being developed
Task 6: 10% Life cycle cost analysis model spreadsheet in development
Task 7: No scheduled progress in this period

March 2009:
Task 1: 86% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 88% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 5% - Initial analysis protocol being developed
Task 6: 5% Life cycle cost analysis model spreadsheet in development
Task 7: No scheduled progress in this period

February 2009:
Task 1: 86% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 88% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 5% - Initial analysis protocol being developed
Task 6: 5% Life cycle cost analysis model spreadsheet in development
Task 7: No scheduled progress in this period

January 2009:
Task 1: 82% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 88% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 3% - Initial analysis protocol being developed
Task 6: 2% Life cycle cost analysis model spreadsheet in development
Task 7: No scheduled progress in this period

December 2008:
Task 1: 80% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 88% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: 3% - Initial analysis protocol being developed
Task 6: 2% Life cycle cost analysis model spreadsheet in development
Task 7: No scheduled progress in this period

November 2008:
Task 1: 70% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 88% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: No scheduled progress in this period
Task 6: No scheduled progress in this period
Task 7: No scheduled progress in this period

October 2008:
Task 1: 60% complete. Continue to collect cost data for life cycle cost analysis.
Task 2: 100% complete
Task 3: 88% complete (14 of 15 TS complete)
Task 4: Ongoing for life of project on monthly basis.
Task 5: No scheduled progress in this period
Task 6: No scheduled progress in this period
Task 7: No scheduled progress in this period