Period Covered: Through April 30, 2005 (Quarterly Report)

ALDOT Progress Report
for the

State Planning and Research Program

PROJECT TITLE: NCAT Pavement Test Study		
PROJECT MANAGER: Mr. Raymond Powell (334) 844-6857	**SPR Project No:** TPF-5(072) ALDOT Research Project No. 930-595	**Project is:** ____ PLANNING __X__ RESEARCH & DEVELOPMENT
Annual Budget	**Multi Year Project** Total Budget for Project 3,698,238.00 Total Cost to Date for Project 2,844,248.71	

Project Overview

The Pavement Test Track is an accelerated performance test facility managed by the National Center for Asphalt Technology (NCAT) at Auburn University. The project is funded and directed by a 10 state (+ FHWA) research co-ops such that each sponsoring entity provides local hot-mix asphalt for placement on the Track. Forty-five different 200 ft sections have been built around the 1.7-mile oval to facilitate field performance comparisons in an identical climate where traffic conditions are precisely monitored. The primary objectives of the project are to identify mixtures with lower life cycle costs and investigate mechanistic pavement response. The Track was originally constructed in 2000, with many sections replaced in the summer of 2003 after the first cycle of truck traffic had been completed. All 2000 sections survived, but half were replaced to facilitate new research in the 2003 experiment. The application of 10 million ESALs to the surface of the 2000 Track was successfully completed on December 17, 2002. Induced rutting on the 2000 Track was relatively minor, ranging from 0.5 mm to 7.3 mm with an overall average of 2.4 mm. Practical models have been developed that utilize output from various types of laboratory performance tests to predict these subtle differences in field performance over time as a function of traffic and temperature. Reconstruction activities at the Pavement Test Track were completed in September of 2003. The 2003 experiment required milling and inlaying 14 sections with new rutting study mixes, deep removal of 8 sections to facilitate a small (instrumented) structural experiment, and continuing traffic on the remaining sections to extend the original 2000 experiment over a second application of design traffic (i.e., another 10 million ESALs). The reconstruction project was again funded via a multi-state research co-op, with pooled fund management and construction contract administration provided by the Alabama Department of Transportation.

Instrumentation

Multidepth temperature thermister probes and subgrade moisture TDRs were installed in all 45 sections on the 2003 Track. Paired with data from an onsite automated weather station, this data is used to precisely characterize the performance environment (i.e., the temperature history) of each experimental section. Additionally, the 8 sections that make up the structural experiment have high-speed instrumentation arrays consisting of strain gauges, pressure plates, and compression sensors. This data is used to measure the pavements' response to passing loads, which is useful in validating pavement analysis and design methodologies that are mechanistically based. Response instrumentation provides vital information in the analysis of the structural experiment. Although surface performance characterization (e.g., crack mapping, rutting, etc.) is used to satisfy the short term objective of refining layer coefficients in existing empirical pavement thickness design, stresses and strains at the bottom of the HMA are needed to satisfy the long term objectives of validating mechanistic pavement design and preparing for a comprehensive experiment in 2006. As seen in Figure 1, measured pavement response has been successfully compared to predicted pavement response using conventional elastic layer analysis. In this method, layer properties were determined via monthly testing with a falling weight deflectometer (FWD).

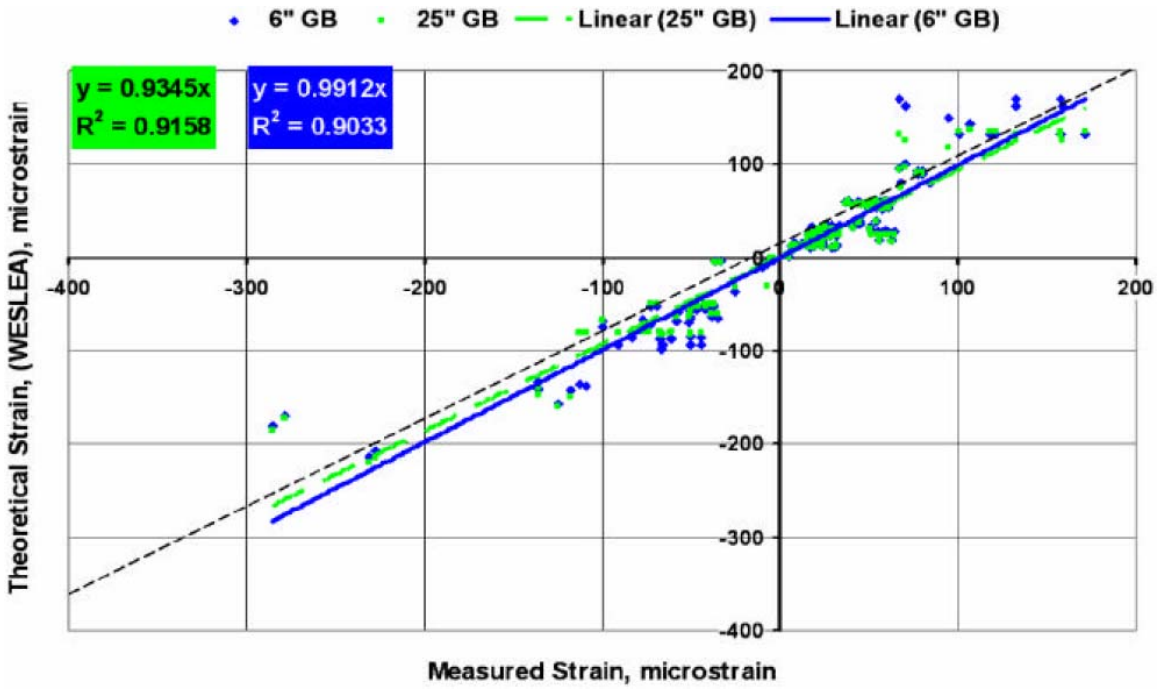

Figure 1 – Comparing measured and predicted strains at the bottom of the HMA base

Trucking

This type of research is known as accelerated performance testing because a design lifetime of truck traffic (typically 10 to 15 years) is applied within a condensed 2-year period. The project historically runs in three-year cycles, where year one is dominated by experimental pavement construction and years two and three are dominated by fleet operations. A fleet of 5 tractors pulling heavy triple trailers (with a legal single box trailer periodically run as a control) will run over 1.5 million miles in order to induce a lifetime of damage to experimental pavements.

As an example of the effort necessary to support an operation of this nature, Figure 2 is provided to illustrate that iterative improvements were employed to maximize tire life (consequentially reduced by the high-scrub nature of unidirectional oval testing).

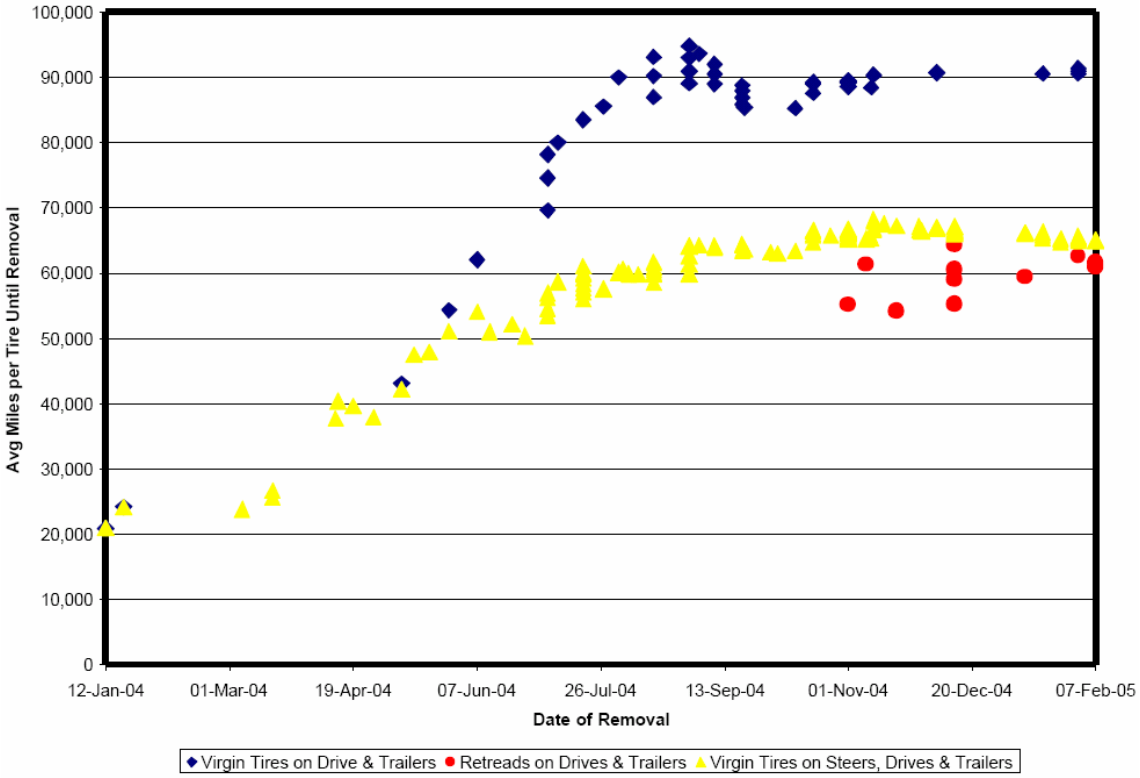

Figure 2 - Virgin versus Retreaded Trailer/Drive Tire Life and Virgin Steer Tire Life

At this time, the cost for fleet operations is almost completely supported by experimental pavement studies; however, it is possible that the cost to operate the fleet can be reduced or eliminated by making the facility available to the trucking industry for the purpose of conducting component research (e.g., tire wear, engine performance, axle durability, etc.). In order to facilitate this secondary mission, NCAT has installed dataloggers in all five trucks that produce a continuous record of vehicle performance via connection to the onboard OEM computer network. Gyroscopes, accelerometers and precision GPS instrumentation generate supplemental data that is being used to quantify the effect of pavement type and smoothness on an array of vehicle performance parameters (including rolling resistance and fuel economy.) Track personnel now interact with research partners in the trucking industry on a regular basis. As of the end of March, 6,301,547 ESALs have been safely applied to the surface of experimental sections.

Field Performance

Every Monday, trucking is suspended so that vehicle maintenance can be performed and pavement performance can be quantified. An inertial profiler equipped with a full lane width dual scanning laser "rutbar" is run weekly around the entire Track in order to determine individual wheelpath roughness, right wheelpath macrotexture and individual wheelpath rutting for every experimental section. Additionally, 3 random locations were selected within each section in a stratified manner to serve as the fixed test location for nondestructive wheelpath densities. Transverse profiles are measured along these same locations each week so that rutting may be calculated using a contact method. Every month, wet ribbed surface friction testing, falling weight deflectometer testing, and structural high speed response data is collected, along with videologging to provide a permanent visual record of surface performance. Every quarter, cores are cut from the wheelpath of every section so that densification of each layer can be considered. Average rut depths for all 45 test sections are provided in Figure 3. Rutting ranges from a low of less than 1 mm to a high of 7 mm, with an overall average of about 3 ½ mm. Little change in rutting was noted in the cooler Winter months, but rising temperatures in the next quarter will once again cause rutting rates to increase.

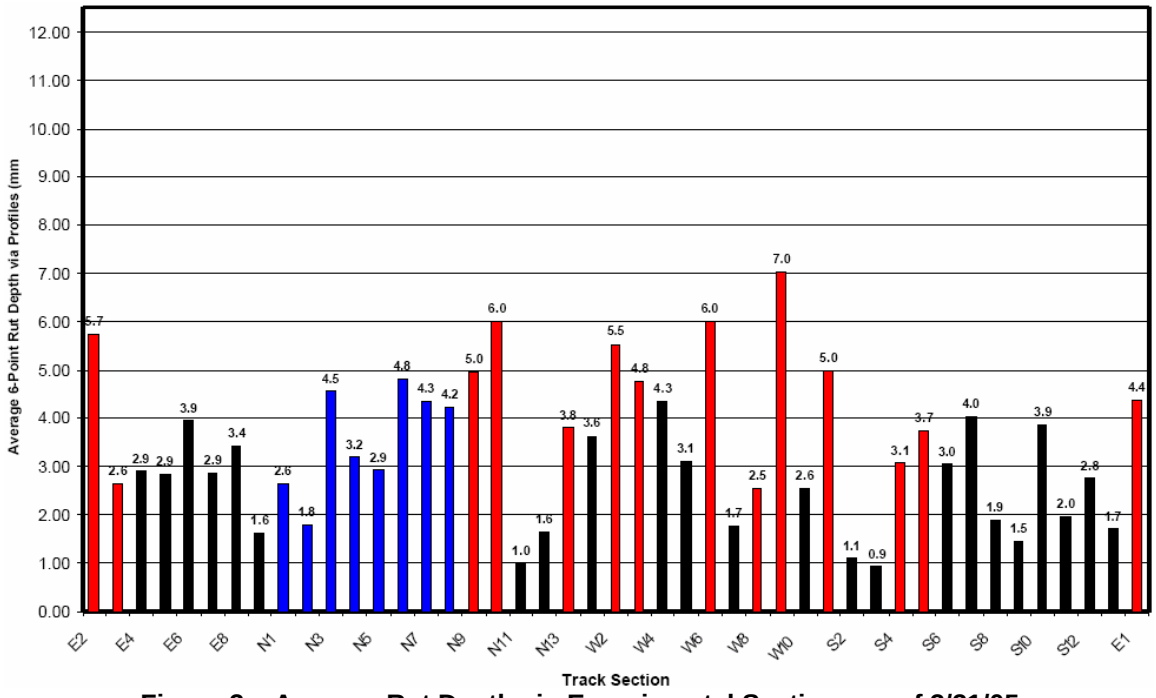

Figure 3 – Average Rut Depths in Experimental Sections as of 3/31/05

Laboratory Performance

To facilitate lab to field performance correlations, simulative laboratory testing is being conducted on samples made before construction (to encompass the design verification perspective), during construction (to encompass the QC perspective) and after construction (to provide the QA perspective). Confined cyclic loading, unconfined static creep testing and dynamic modulus testing are being conducted post-construction to encompass the fundamental approach. Hundreds of pounds of mix were sampled and saved during production of each experimental section to facilitate other research projects that can be enhanced by being plugged into Track research.

Communication

Dissemination of results is an important aspect of the work performed at the Pavement Test Track. A meeting of the sponsor advisory group is hosted at the Track every 6 months in order to provide research sponsors with the opportunity to visually inspect the condition of their test sections and review preliminary findings. The next meeting of this group is scheduled to run from 1:00 PM on May 9th until noon on May 10th of 2005. The final sponsor meeting will coincide with a conference that has been scheduled near the end of traffic on November 15th and 16th, 2005.

Planning for 2006

A meeting was held with ALDOT's front office on March 25, 2005 in order to initiate project development for the 2006 NCAT Pavement Test Track. The Department has decided to again host the pooled fund and administer a reconstruction project by including the Track in a first quarter letting in 2006. Track personnel were given permission to work directly with the 4th Division to develop the plans and specifications.

PROBLEMS ENCOUNTERED OR ANTICIPATED:

No significant problems were encountered during the last quarter or are anticipated in the next quarter.

STATUS AND COMPLETION DATE

Percentage of work completed to date for total project 76.9

Project is: 100.0 percent
X on schedule _____ behind schedule, explain:

Expected Completion Date: 2/29/2006