VERMONT
AGENCY OF TRANSPORTATION

applied pavement
TECHNOLOGY

More information about the VTrans Research Program, including additional Fact Sheets,
can be found at: http://vtrans.vermont.gov/planning/ research

FACT SHEET
Pavement Deterioration Models for Pavement Management

Introduction

The Vermont Agency of Transportation (VTrans) owns and maintains 3,100 centerline miles of paved public roads. VTrans annually collects pavement condition data on this network such as smoothness, rutting, and cracking. These data are stored in a pavement management system (PMS) database that uses pavement deterioration models to predict future pavement conditions. These predictions support Transportation Asset Management Plan (TAMP) related activities including reporting performance, setting condition targets, life-cycle planning, and financial planning. During this research effort, the pavement performance models in the Deighton Total Infrastructure Management System (dTIMS) will be updated using historical pavement performance data. This process will determine whether revisions to existing models are needed to better reflect deterioration trends. Additionally, new pavement deterioration models for bonded wearing course pavements and National Performance Measures
(NPM) will be developed.

Model Form	Equation	R^2
Linear	$-1.904504E\text{-}009 + 1.6740 * x$	0.8362
Quadratic	$-1.882023E\text{-}010 + .07461 * x + .14711 * x^2$	0.9791
Cubic	$3.449848E\text{-}012 - .7959 * x + .3465 * x^2 - .010303 * x^3$	0.9862
Power	$-2.826787E\text{-}010 + .19828 * x^{\wedge}(1.8965)$	0.9801
Exponential	$8.0427 - 8.0427 * exp^{\wedge}(-.3421 * x)$	-0.0836
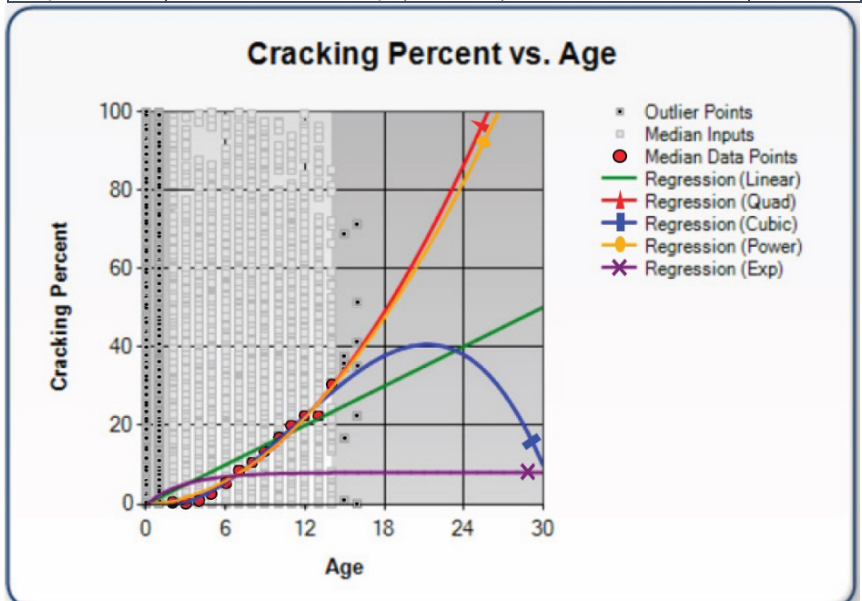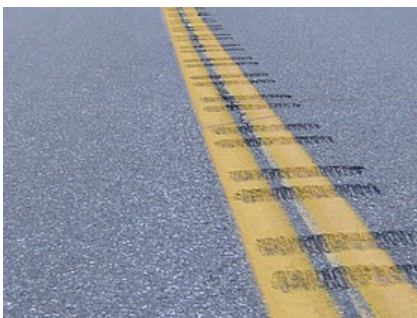
Methodology

More than 20 years of Vermont historical pavement condition data will be analyzed to identify pavement performance trends and establish updated prediction models. Models will be based on existing VTrans model formats and family groupings such as asphalt over concrete, thin pavement on strong bases, or thin pavement on weak bases. For each model to be delivered, the research team will review historical performance, identify outliers, and identify statistical indicators which are expected to provide the best approach for performance prediction. Values such as mean, median, and percentile will be observed to support identifying model coefficients which most reasonably predict future performance.

Next Steps

Proposed revisions to existing pavement performance models and proposed new models for bonded wearing course pavements and NPMs will be presented to relevant VTrans personnel during a virtual agency review meeting. During that time, the research team will review each proposed model revision using a live review of data plots that show existing and proposed models against historical data in the APTech pavement performance modeling (PPM) tool. The team will discuss fitness statistics such as coefficient of determination values, for existing and proposed models to determine the final set of coefficients. Based on VTrans feedback provided during agency review, the research team will compile all findings and documentation into a final report and provide a summary table with the final model coefficients. VTrans staff will be responsible for entering new and revised model coefficients into the PMS.

Potential Impacts and VTrans Benefits

This review of pavement deterioration models will ensure that the VTrans' PMS analysis provides reliable forecasts that increase confidence in future funding needs analyses. Results from these improved analyses will be used to ensure pavement resurfacing and maintenance programs will use available funds productively to achieve long-term performance targets. Having accurate life-cycle planning tools will minimize waste within the pavement resurfacing and maintenance program by achieving long-term performance targets at the lowest practicable cost, which makes funding available for other programs such as bridges, capacity, or safety. The project results are expected to improve pavement construction and maintenance program activities that will lead to increased reliability in planning future investment programs.