UTC Spotlight
University Transportation Centers Program
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This monthly report from the University Transportation Centers Program highlights some of the recent accomplishments and products from one of the University Transportation Centers (UTCs) managed by the U.S. Department of Transportation's Research and Innovative Technology Administration.

Marshall University Refines Technique to Measure Railroad Track Wear and Deformation

A refined technique for taking measurements of railroad tracks has been developed by Marshall University researchers for use in busy railroad yards, where physical access to rails is limited and dangerous. The new technique, in which locomotives are retrofitted with high accuracy Global Positioning System (GPS) equipment, integrates state-of-the-art data collection and processing software that can actually collect data as locomotives maneuver cars in rail yards. Used in lieu of traditional track-surveying methods, this advanced system has the potential to realize significant safety and accuracy benefits.

The new technique has been successfully tested at five major rail yards in the eastern United States as well as on a locomotive pulling a train nearly 100 miles through parts of Kentucky and Ohio. The measurements from the locomotive proved accurate enough to assess track wear and deformation and are compatible with industry mapping standards when paired with high resolution video recording equipment.

Rail yards are often constructed on natural or manmade slopes where gravity is used to propel cars to various sorting tracks. These slopes must be monitored to maintain the proper grade in order to prevent rail cars from rolling too far or not far enough.

The advantages of a locomotive based surveying technique in the rail yard include:

- Equipment portability with minimal set up time and the ability to operate during inclement weather or at night.
- Ability to measure the track while it is loaded with the weight from the locomotive. None of this is possible with traditional methods (persons on foot or aerial surveys from helicopters).
- The ability to collect thousands of data points while the locomotive conducts normal operations improves accuracy, saves time, and eliminates the need for tracks to be cleared and shut down before measurements are taken. A typical yard can be surveyed in less than a week while conventional foot surveys can take several weeks. The constant presence of cars blocks aerial surveys.

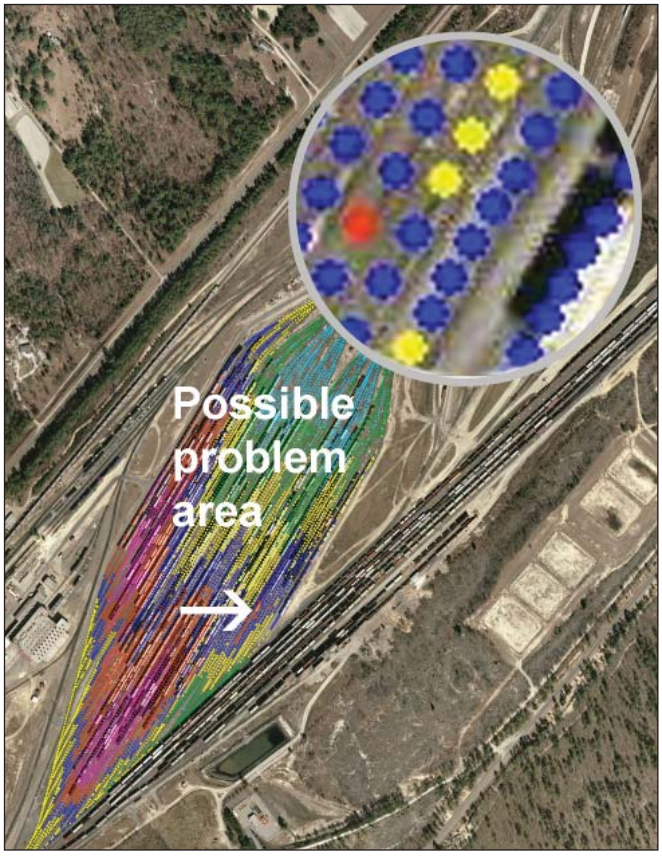
One reason mainline tracks must be surveyed is so that precise (computer based) maps can be produced that will facilitate the implementation of freight and passenger rail safety technologies as well as operational enhancement

Rick Haye courtesy of CSX

technologies, such as Positive Train Control, Computer Based Train Management, Next Generation of Dispatch, and similar advances.

Because the locomotive based surveying technique causes minimal interruptions to operations, it has the potential for wide applications in the industry. For example, tracks can be surveyed before and after construction to ensure they are placed precisely and remain true, and multiple surveys can be used to monitor track changes over time. Such checks would be helpful in areas where track safety is impacted from heavy use, extreme temperature fluctuations, or precipitation. Data accuracy is precise enough to help identify, characterize, and target maintenance requirements, especially when this information is available to track inspectors as they conduct visual track safety inspections.

This photo shows a recently surveyed rail yard. The length is nearly one mile with over 50 separate parallel tracks. The photo also shows the typical number of railcars present in an operating rail yard.



This photo shows the data collected and color coded with each color representing about one foot change in ground elevation. The data shown are available almost in real time, giving yard engineers nearly immediate feedback on where slope problems exist. Nonuniform bands of color, such as the interrupted blue band (see inset), point out problem spots.

About This Project

DOT invests in the future of transportation through its University Transportation Centers Program, which awards grants to universities across the United States to advance the state-of-the-art in transportation research and to develop the next generation of transportation professionals. The DOT grant supporting this research was awarded to the Rahall Transportation Institute (RTI), a National University Transportation Center at Marshall University in Huntington, WV, where Bob Plymale (plybob@njrati.org) is the Director. The principal investigator for this project, which was partially funded by the DOT Federal Railroad Administration, is Richard Begley, Ph.D. (Begley@Marshall.edu), who is Director of Research for RTI and also a Professor in Engineering at Marshall University. His team at RTI includes: Anthony Szwilski, Ph.D., PE, Professor of Engineering at Marshall University, Mr. Ron Wing, RTI Senior Technical Consultant for Railroad Research and Technology Transfer, and RTI Research Associates, Alejandro Sanchez-Badillo, MS, Pete Dailey, MS, and Zhibin Sheng*, MS. *Currently with Sperry Rail Service, Danbury CT.