TIP Project Brief – 090029/10H014

Civil Infrastructure
Automated Nondestructive Evaluation and Rehabilitation System (ANDERS)for Bridge Decks

Develop a mobile integrated system for nondestructive evaluation and repair of bridge decks, including human-operated and robotic systems that merge novel imaging and NDE techniques together with innovative intervention approaches to arrest deterioration processes.

Sponsor: Rutgers, The State University of New Jersey
Piscataway, NJ

- Project Performance Period: 2/1/2010 - 1/31/2015
- Total project (est.): $17,923 K
- Requested TIP funds: $8,810 K

This university-industry joint venture led by Rutgers' Center for Advanced Infrastructure and Transportation (CAIT) is developing a suite of technologies that together will provide a comprehensive solution to bridge deck maintenance—from monitoring and assessment to remediation—as well as overall bridge inspection. The other members in the joint venture include Drexel University, PD-LD, Inc., Mala GeoSciences USA, Inc., and Pennoni Associates, Inc. The goal is to develop the Automated Nondestructive Evaluation and Rehabilitation System (ANDERS) for bridge decks, which will use a combination of human-operated and robotic vehicles that allow rapid, comprehensive application across a large number of bridge types. The basic ANDERS technologies, however, could be applied to many other infrastructure maintenance problems as well. ANDERS will be composed of four systems that merge novel imaging and nondestructive evaluation (NDE) techniques with innovative intervention approaches to arrest deterioration processes in bridges. The planned system focuses on identification and mitigation of bridge deck deterioration, which bridge engineers and owners have identified as one of their most acute problems. Between 50 and 85 percent of bridge maintenance funds are spent on repair or replacement of bridge decks. To assess deck conditions ANDERS will use two complementary nondestructive evaluation systems. A Multi-Modal Nondestructive Evaluation (MM-NDE) System will combine ground-penetrating radar, impact echo, and ultrasonic probes to identify and characterize localized deterioration. In tandem, a Global Structural Assessment (GSA) System will use modal analysis (i.e., observation of how a structure vibrates in response to a mechanical stimulus) to assess global structural characteristics, identify any appreciable effects of deterioration on the bridge structure as a whole, and shed light on how local deterioration effects global performance of the structure. Output from these two methods will be merged using an automated analysis system that will construct and calibrate mathematical simulation models to assess overall structural vulnerability and capacity. Based on the outcome of these assessments, a Nondestructive Rehabilitation (NDR) System will use robotic repair equipment to deposit specially formulated repair materials to fill and bond hairline crevasses and repair delamination. Developing and testing the NDR repair materials is also part of this project. If successful, the ANDERS project will provide unique tools that enable the sustainable management of repairs to our nation's aging bridges. ANDERS will provide much more detailed and comprehensive detection of early onset deterioration and result in both time and cost savings compared to traditional approaches. ANDERS will incorporate comprehensive condition and structural assessment at all stages of deterioration, integrated assessment, and prudent rehabilitation that will be rapid, cost-effective, and implementable at all stages of deterioration.

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Active Project Members

- Drexel University (Philadelphia, PA)
  [Original, Active JV Member]
- Mala GeoScience USA, Inc. (Charleston, SC)
  [Original, Active JV Member]
- PD-LD, Inc. (Pennington, NJ)
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- Pennoni Associates Inc. (Philadelphia, PA)
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