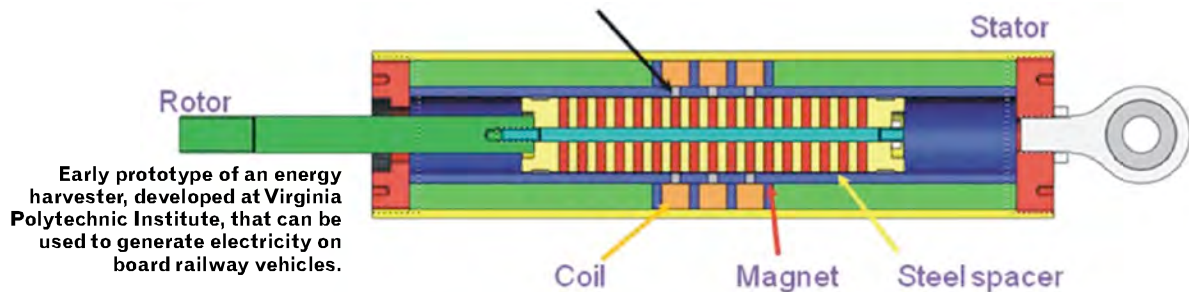


# AAR's "smart sixteen"



By David D. Davis and Semih F. Kalay (TTCI); and Christopher P.L. Barkan, Mehdi Ahmadian, and Gary Fry, Laboratory Directors, for *Railway Age*

The Association of American Railroads Affiliated Laboratory Program is a primary way in which the railroads maintain awareness of, adopt, and assimilate new technologies. This program also provides a pool of highly skilled university engineering and science experts who are familiar with railroads and who are available to solve technological problems. Additionally, the projects give practical experience to the young engineers who will design, build, and maintain the railroads in the future. This year, approximately 30 students are working on AAR technology scanning projects.

The program began in 1981 under the leadership of William J. Harris, then head of the AAR Research and Test Department. There are currently three affiliated labs. The University of Illinois is a charter member of the program and has a long history of affiliation with railroad engineering. Chris Barkan is the lab director. Texas A&M joined the program in 1992. Gary Fry is the lab director. Virginia Polytechnic Institute and State University joined the program in 2005. Mehdi Ahmadian is the lab director. A fourth lab, the University of Alberta, will be added this year. It will be our first Canadian Affiliated Laboratory.

The program is designed to provide opportunities to make major advances in railroad technology by scanning for and applying methods, materials, and hardware that has been developed for other industries. The program is guided by the Technology Scanning Committee, chaired by Norfolk Southern Vice President Engineering Tim Drake. The steering committee consists of railroad experts in applied technology, and research and development from the major North American railways. The committee also has a supplier representative.

There are 16 projects currently funded by the program. The projects focus on key areas designated by the steering committee: Sensors and Measurement Technology; Data Collection, Analysis, and Interpretation; Materials; and Advanced Technologies. The "smart sixteen" are:

- **Texas A&M:** Flywheels; Microcleanliness Requirements of Railroad Steels; Detection of Cracked Axle Journals; Bridge Pier

- Protection; Advanced Technology for Hydraulic Hazard Forecasting; and Effects of Corrosion on Fatigue Life of Steel.

- **VPI:** Ultrasonic Signature Analysis System for Isolating Defects in Rolling Stock; Vibration-Based Electromechanical Energy Harvesting Devices for Railroad Applications, Phase II; Self-Healing Bolted Joints; "Smart" RFID Tagging to Create Automatic Switch Lists; Train Integrity Detection System; and Assessment of Wheel-Rail Friction using LIDAR Sensors.

- **University of Illinois:** Machine Vision Track Inspection System; Discrete Element Modeling (DEM) of Ballast; Improved Concrete Tie Design and Performance; and Development of Short-Time Fourier Transform Technique for GPR Assessment of Ballast Fouling.

## Three examples of work in progress

In the Bridge Pier Protection project, prototype designs have been developed for protecting bridge piers from water-borne impacts. These designs, developed by Texas A&M, will deflect barges or other boats from striking bridge piers.

In Vibration-Based Electromechanical Energy Harvesting, VPI has developed efficient energy harvesters that can be used to generate electricity on board railway vehicles. The energy harvester can charge batteries or directly power on board health monitoring systems. The illustration shows a schematic of one of the early prototype designs.

In Improved Concrete Tie Design and Performance, the University of Illinois has investigated potential failure modes for concrete tie rail seat deterioration (RSD). The results of the study will be used to develop RSD-resistant concrete tie and rail seat pad designs.

The AAR Affiliated Laboratory Program is providing direct benefits to the industry well beyond its cost. Additionally, the residual benefits of providing technical expertise ready to tackle industry problems are significant. These include a significant number of engineers who have taken positions in the industry due, in part, for having worked on the program's projects. **RA**