AAR’s TECHNOLOGY DRIVEN TRAIN INSPECTION

Mechanical Association Railcar Technical Services
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Technology Driven Train Inspection

**Overall Objective:**

Enhance the quality & efficiency of the train inspection process through technology.
Leverage emerging technology to achieve an equivalent (at a minimum) or enhanced level of railroad safety
Technologies

- Wayside Detectors
- Machine Vision
  - FactIS™ (Fully Automated Car Train Inspection System)
  - University of Illinois
Final product will involve multiple detector systems in concert with AAR’s ATSI (Advanced Technology Safety Initiative)
Current Automation Technologies

- **Systems Used For Many Years:**
  - Hot Bearing Detectors (HBD)
  - Wheel Impact Load Detectors (WILD)
  - Dragging Equipment Detectors (DED)
  - Hot Wheel Detector (HWD)
  - Cold Wheel Detector (CWD)

- **Recently Deployed Technologies (past 6-8 yrs):**
  - Truck Performance Detector (TPD)
  - Acoustic Bearing Detector (ABD)
  - Truck Hunting Detector (THD)
Class IA Brake Test Demo
Sample Test Results

Brakes applied on consist, one car w/inoperative brakes
Technology Development Needs:

- Complete development of laser ultrasonic-based wheel & axle crack inspection systems
- Integrate existing detectors as ATSI progresses (WILD™, TPD, TADS, etc.)
- Develop performance-based inspection modules:
  - Brake Condition Monitoring
  - Truck Performance
- Develop FactIS™ Safety Appliance Module using Univ. of Illinois research results
- Develop Car Features Database
- Develop FactIS™ carbody / underframe module
Technology Development Status: Short-term, 2006

- Test/evaluate Class IA/1,000-mile brake inspection system
- Develop/test coupler and draft systems module
- Evaluate viability of performance–based truck inspection using truck hunting & wheel set geometry modules with TPD
- Continue development of laser/ultrasonic-based wheel & axle crack inspection systems
- Continue University of Illinois efforts for developing a car safety appliance database
Technology Development Status:
Long-term Planned for 2007 and Beyond

- Complete development of laser ultrasonic-based wheel & axle crack inspection systems
- Complete University of Illinois efforts for developing a car safety appliance database
- Develop FactIS™ Safety Appliance Module
- Continue efforts with FRA for rule changes to allow performance-based inspections
- Develop performance-based inspection modules:
  - Brake Condition Monitoring
  - Truck Performance
- Develop Car Features Database
- Develop FactIS™ car body / underframe module
- Integrate existing detectors as ATSI progresses (WILD, TPD, TADS, etc.)
TDTI Task Force Direction

Final product will require acceptance & approval of performance-based regulations by FRA which achieve an equivalent or enhanced level of safety; e.g.:

- TPDs for truck suspension performance
- WILD™

And some regulatory modification; e.g.:

- 232.205c(4): 100% Operative Brake Requirement (potential USC Section 20303 statutory issue)
- 232.15: Movement of Defective Equipment
TTDI Task Force Direction

Final product will require substantial funding: $15 million?

- Inspection of safety appliances will be expensive, long lead time item
- Possible funding sources:
  - AAR research program
  - FRA research funding
  - Government security funding

Go/No Go decision milestones will be developed and defined
**TDTI TF – Parts 215, 231, & 232 Review**

**Administrative/Procedural Issues**

- Current set of inspection criteria assumes a human inspector; some criteria are not meaningful for automated inspection.
  
  - 49 CFR 232.203 governs training and testing requirements of ‘qualified persons’ required for testing of brakes.

  - 49 CFR 232.207(b)(2) requires that the inspector take ‘positions on each side of each car’ to inspect the brake system.
Regulatory Modifications: General Approach

- Networked vehicle health monitoring systems provide not just an equivalent level of safety but an enhanced level of safety.
- U.S. operations should enjoy same operational flexibility as Canadian RR (NAFTA harmonization issue); ultimately Mexican SCT regulations as well.
- Industry approach: in lieu of current FRA requirements NOT an overlay system.
- Safety Regulation Working Committee to determine nature of modifications or “relief” (e.g., waiver, new rules, revisions to existing regulations) on an item-by-item basis.
Regulatory modifications or relief will be requested as the technologies mature, are proven, and implemented.

- **This will be a gradual, iterative process**
  - Waivers
  - Requests for Rulemaking
An iterative approach:

- Builds comfort level & acclimation to new inspection paradigms
- Recognizes interdependency of Power Brake Regulations (Part 232), Freight Car Safety Standards (Part 215) and Safety Appliance Standards (Part 231)
- Consistent with FRA’s new “Railroad System Oversight” Approach
TDTI TASK FORCE: Regulatory Interface

- 1/17/06: AAR & TTCI introduced TDTI to FRA Associate Administrator, Office of Safety, and Office of Railroad Development
- 3/15/06: FRA office of Safety & Office of RRD Overview & FactIS® Demonstration
- 5/2/06: Roy Allen send Shared Funding Estimate to FRA Office of RRD
- 7/13/06: Day-Long Overview and FactIS® Demonstration to FRA Office of Safety (Associate Administrator, 2 Directors, 8 Regional Administrators) + Associate Administrator for Finance, HR & Administration + Office of Chief Counsel
- 7/26/06: Presentation to FRA & Transport Canada Joint Meeting
- 8/3/06: Presentation to FRA MP&E Staff & Regional Specialists’ Annual Conference (UP followed with equipment performance monitoring via wayside detection in practice)
49 CFR MAPPING

- BRAKE PIPE LEAKAGE < 5 PSI or AFM < OR = 60 CFM: LOCOMOTIVE CONTROLS: NO CHANGE

- INSPECT FROM POSITION ON EACH SIDE of CAR: HOT/COLD WHEEL DETECTOR; TECHNOLOGY; PERFORMANCE-BASED

- BRAKES SHALL APPLY on EACH CAR: CAR: HOT/COLD WHEEL DETECTOR; TECHNOLOGY; PERFORMANCE-BASED
49 CFR MAPPING

- BRAKE RIGGING PROPERLY SECURED & DOES NOT BIND OR FOUL: DRAGGING EQUIPMENT DETECTORS (PARTIALLY); **PERFORMANCE-BASED**

- ALL PARTS PROPERLY SECURED: DRAGGING EQUIPMENT DETECTORS (PARTIAL); **PERFORMANCE-BASED**

- VERIFY BRAKES RELEASE on EACH CAR: HOT/COLD WHEEL DETECTOR; TECHNOLOGY & **PERFORMANCE-BASED**
Technology-Driven Train Inspection

Validated ‘Whole’ Car Health Query/Report
Provided from InteRRIS®

Car Feature Database

Railroad Car Health Query

OK/Not OK

WILD™
TPD
OILD
Hot Wheel
Integrated Detectors
HBD
Brake Shoe Condition
Other Future Detection Systems

Hunting
TADS
WPMS
Cold Wheel
Cracked Axle
Machine Vision (FactIS™)