Fault Detection Equipment

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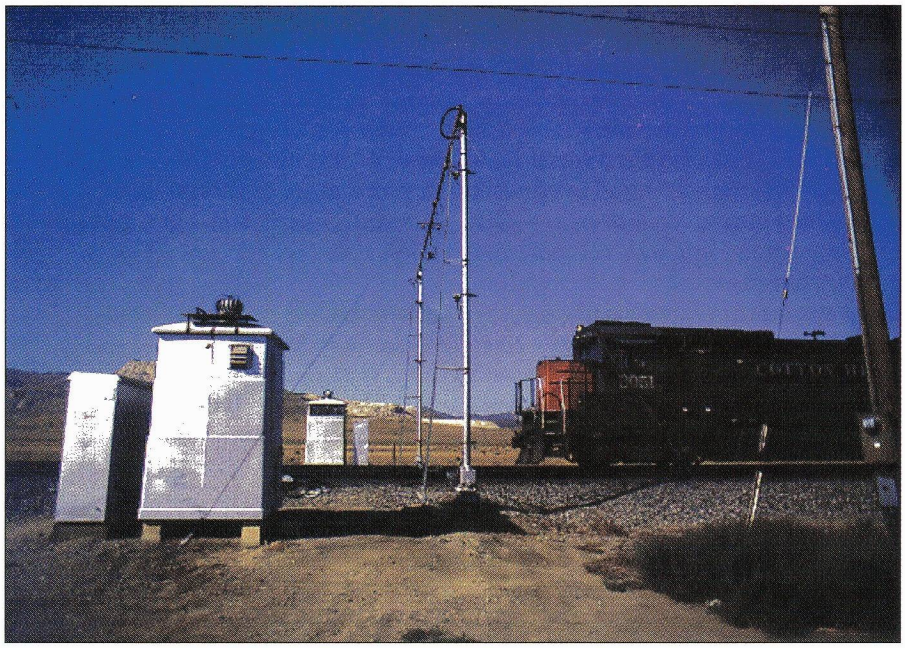

DON SIMS

In California, a Southern Pacific train passes through a multi-sensor installation.

In onboard fault detection, the question is, and always has been: Where is the line between faults (potential or actual) that are worth detecting and those that are not? Tests now being run at the Association of American Railroads Transportation Technology Center may provide new insights.

The question also gets new attention with more trains being equipped with the communications capability associated with electronically controlled pneumatic (ECP) brake systems. This capability is greater than what was ever available before but not infinite, so fault detection choices become a matter for decisions as to what's more important and what's less so.

For some, there's immediate opportunity seen for providing onboard monitoring of roller-bearing condition. This has been a particular target of General Railway Signal for a long time and under different tech arrangements. Other suppliers see similar opportunity here.

But would the industry be making a bad bargain, technologically and economically?

OEMs and reconditioners are already turning out product with ever-better quality and reliability performance. Suppliers of wayside detection units continue to refine the heat-based system while work continues on development of better acoustic systems—which may in the long run turn out to be the most effective weapon against bearing failure since the goal is to produce an acoustic system that will detect and diagnose potential failures far enough in advance that preventive measures can be taken.

The theory is that a bearing that's failing will throw off different sound patterns that will give a clue to trouble ahead. R&D now is aimed at refining the theory to indicate what kind of trouble, and when it may develop.

Then, of course, there are the numbers games, two of them:

- One truck equals four bearings and four monitoring devices. Can railroads realistically expect to get four miniature electronic/acoustic/heat-sensitive devices that will be as reliable and trouble-free as the bearings they're checking on?
- Is any improvement in the performance of new onboard devices likely to justify the cost, no matter how benefits are measured and keeping in mind (1) the potential dollar costs of a single major derailment and (2) the intangible social costs of the perception that a railroad's operation is unsafe?

Damage control

From an economic perspective, actually the best payback on onboard monitoring devices may have little to do directly with safety. One scenario: A railroad has a substantial movement of motor vehicles and damage is being reported. Impact and other types of recorders could pinpoint the where, the how, the when, and presumably the why of the damage. Instead of pointing fingers, all parties to the movement could set about fixing whatever went wrong, thus preserving the routing and proving the carrier's dedication to improving the service.

A similar scenario could be written for a railroad with a sizable stake in moving perishables, carload or intermodal. Here, the main goal is to prevent trouble from happening, a secondary goal to find out, if something went wrong, what happened and what must be done to ensure that it doesn't happen again.

In the case of a specialized product, the story line is different but still critical. Say that a single drumfull of product is all that's needed to support production on a particular job. Once that volume is sucked out and sent on its way, the railcar goes back to sleep until the next time part of its cargo is needed. The point is, the railcar has to adopt the motto of the DOT's Coast Guard—semper paratus, always ready—or the whole concept of railcar as

storage site breaks down. And this means monitoring of how many cars to be sure they're ready to perform.

ECP PIGGYBACKING

If, as has been estimated, only about one-third of communications capacity will remain after ECP and distributed power needs are met, then the competition will be fierce to see what functions get what's left.

With a radio-based system, there might be additional communications capacity, but railroads are concerned about security of transmissions and about radio message clutter in congested areas. These are some of the questions UP, BNSF, GE Harris, and the Federal Railroad Administration are addressing in tests in the Portland terminal area—which has congestion, although certainly not like the congestion found at the mid-continent and other principal gateways.

Either wired or RF-based, a new communications system based on braking and train separation/control requirements would be a big step up from what exists today. Perhaps best of all, since AAR, the carriers, and the vendors all seem committed to an open-architecture concept, much of the hardware should be easily—and relatively inexpensively—obtainable, off the shelf.

With ECP brakes, which allow the locomotive engineer to apply brakes to each car of an entire train simultaneously (using either wired or wireless communications), fault detection in the train line is a potential add-on benefit.

Since both wired and wireless ECP systems will require an onboard receiving/transmitting device, many in the industry believe that trainline and wheel-and-axle fault detection equipment can be operated in conjunction.

AAR has adopted the LonWorks system protocol, which is specifically designed for control network applications where frequent messages need to be transmitted.

MONITORING

RAILCAR PERFORMANCE

AAR is also developing what it calls a "Vehicle Defect" detector system aimed primarily at detecting poor performing trucks, which it says are "a safety and economic liability" to the industry. Poor-performing trucks increase fuel consumption, increase track maintenance costs, and reduce the life of rail and track components.

AAR's system looks at curve performance, wheel-on-rail forces, impact loads, and truck skewing and tracking. A railcar truck detector and a companion wayside detector have been developed, and during January 1996 a prototype system was installed on Norfolk Southern in unit coal train territory to establish a database. Wayside data, says AAR, can be tailored for a railroad's specific needs. In tests involving 3,000 train passes, trucks with an undesirable low rail contact position and warped side frames were detected in significant numbers.

Locations for the defective truck detectors are selected based on track conditions sufficient to "exercise" railcar trucks.

The NS site has detectors on both sides of a six-degree curve. The sensors and data collection equipment are located at the remote sites, and the data are transmitted via phone line to a central location. Urgent event information can be transmitted to any required facility.