

Railroads appraise hotbo

With derailments due to overheated journals holding at a fairly high level during the last decade, and the mileage between setouts for hotboxes starting to drop, rail officers are again asking mechanical and signal and communications departments to review their practices regarding journal maintenance and hotbox detector operations.

Several railroads are known to be conducting re-evaluations concerning the placement of hotbox detectors. A rule of thumb has been used by many railroads for the location of hotbox detectors, namely to locate detectors 25 to 30 miles apart along line-of-road, and in approaches to yards they should be about 15 to 20 miles out. For trains leaving yards, the 25-30-mile distance is considered proper. The reasoning, borne out by experience of many roads, is that if a journal is going to overheat it will do so in about 30 miles.

The yard entrance spacing of 15 to 20 miles is a compromise from the early days of hotbox detectors that could only scan in one direction. Now with bi-directional scanning, the outbound detector can scan inbound trains. Some roads still find close inbound detector locations desirable because they usually enable trains to pull into the yard for attention to an overheated journal, rather than stop out on line-of-road and set out the car with the overheated journal.

Locating Detectors

There are two general schools of thought with respect to locating hotbox detectors: (1) place detectors where the largest number of hotboxes occur; (2) cover all major lines with heavy traffic densities and all major yards. Actually, many railroads started out with the first principle. However, as they found that they were just putting out fires in specific areas, and possibly not catching the majority of hotboxes, they soon became convinced that a system-wide program of hotbox detection would be necessary.

Some roads, and the number is growing, make an economic analysis of the traffic handled in the territory under consideration for hotbox detector installations. Factors to be taken into account include number of trains, type of traffic handled, value of this traffic including revenue derived from it, past

history of derailments in the territory and the causes, geography of the line including availability of set-off locations, etc. It may be a case of balancing costs of detection equipment and operation against the costs of derailments and/or set-offs. This economic analysis approach will probably gain favor because of the availability of computer-oriented research procedures for readily making such studies.

Some railroads, when they are not yet convinced of the system-wide approach, or are just trying to protect the most likely locations for overheated journals, often will spot a line-of-road detector midway between major yards which are bracketed with hotbox detectors. In this manner, they get yard coverage and a semblance of line-of-road coverage. At least they get spot checks along the line, although admittedly not the solid coverage they would get with the 25- to 30-mile spacings for line-of-road detector installations.

Time for Review

By the end of this year, there will be about 1,500 hotbox detectors in service on U.S. and Canadian railroads. The number of detectors and the 13 years' experience with them, certainly should provide a wealth of material for exploring the hotbox detector situation. What is the situation? Namely, that despite increased usage of these detectors, the derailments and incidence of hotboxes continues at a high rate. And rail officers will be the first group to agree that the detector is not the cause. In fact, some will admit privately that without hotbox detectors the derailment and overheated journal incidences would be far higher than they are today.

Inspection practices with regard to journals, maintenance and inspection of hotbox detectors, location of detectors, and operating practices with regard to stopping trains—all are under review. There have been considerable improvements in detector and communications and recording equipment—solid state devices, even integrated circuits, and better surge protection units—that promise that technology in the detection of overheated journals is advancing rapidly. Although these improvements are and have been coming into detectors—often available as sub-assembly replacements—monthly inspection and maintenance routines for

hotbox detectors are desirable.

On the mechanical side, that is, concern for the journals, is receiving attention. AAR's Mechanical Division General Committee has recommended that railroads repack unstabilized, unsealed journal boxes at 24-month intervals.

Fred Houser, editor, *Railway Locomotives & Cars*, commented on the inspection situation in June, 1969. He said: "Quite a few journals have certainly burned off in the past 18 months as the performance of solid bearings deteriorated virtually without let up. . . . Every railroad had a responsibility for doing its fair share of free oiling of journal boxes and for inspecting boxes so that defective lubricators might be replaced immediately, rather than waiting for some arbitrary repack date. . . . Helpful as these shortened servicing intervals may be, it would appear doubtful that journal performance will increase significantly until all roads do a proper job of routinely oiling solid-bearing boxes in their yards and until everyone is doing a conscientious job of replacing lubricators which become defective between the specified repack periods."

Higher train speeds plus greater acceleration due to higher horsepower locomotives lead some to believe that these two factors can cause a journal to heat up to the danger point in less than 30 miles. Some roads have had derailments between detectors, where the first detector indicated that all journals were normal, yet less than 30 miles distance to the next hotbox detector, a derailment occurred due to an overheated journal. One solution appears to be the closer spacing of detectors. However, some rail officers after taking a hard look at car inspection practices and the operating department's determination to eliminate delays, are asking these questions: Could the same problem be solved by more and careful attention to inspection practices? In the hurry to get trains out of yards, are they being given the proper inspections, or is it just a quick check of the worst journals?

Most railroads report that seasonal variations require different settings of gain on the amplifier equipment to provide pen-graph deflection that is readable. Some detectors operate on a differential between scans on both ends of the same axle. There may be a

Detectors

problem if both journals on the same axle are hot. One railroad, working with a manufacturer, has developed an electronic scheme for producing a tall pip on both recording tracks if both journals are overheated. In this case, the differential would be small, but the absolute value for either journal would be high.

Some railroads are finding that the locations picked for their first detector installations are no longer correct. One road has moved several detectors because a study revealed that they are missing overheated journals. In some territories, it is a case of running freight trains at higher speeds than when the detectors were installed several years ago. Other important factors include type of traffic, tonnage and types of bearings on the cars. All of which means that a re-evaluation of hotbox detector location and spacing is essential as methods of train operation change.

Statistical Analysis

A possible solution to many of these problems is a statistical approach. With the aid of the digital computer, considerable data concerning hotboxes, such as where they occur, where the car is set off, kind of car, weight, loaded or empty, type of journal, date of last inspection, type of inspection, how far traveled since last inspection, etc., might be developed into meaningful information.

One approach for catching journals on-line before they overheat or burn off is to make use of on-line computing. A cost-benefit analysis could be made to determine economic feasibility. Without discussing the economics, it does appear technically possible to telemeter all hotbox detector data into a computer for instantaneous analysis. Comparisons would be made on each journal with the detector report of a previous scan. Hotboxes could be flagged immediately, and journals just beginning to heat up could be flagged for attention at the proper time.

Some railroads are concerned with efficiency of hotbox detectors, but it is incorrect to talk about hotbox detector efficiency. Unfortunately, it is impossible for a man to physically check an overheated journal when it is passing a hotbox detector. Hence, it is possible for such a journal, say in cold weather, to be sufficiently cool

Where to locate hotbox detectors

Detectors should be located where (1) there is tangent track; (2) a brake application is not being made; (3) they are accessible for maintenance; (4) a tie to existing communications is feasible; (5) there is a power source; (6) the roadbed is stable; (7) sunlight will not be a problem; (8) trains can be stopped without interference; (9) there are existing tracks that can be used for set-offs; and (10) the set-offs are accessible for car repair forces.

Generally speaking, most railroads agree that the hotbox detector scanners should be located on tangent track. Scanners should not be located where trains are normally in the braking mode. Heat generated from braking may cause a hotbox scanner to give a false indication.

A stable roadbed should be provided. Generally, scanners are mounted on separate steel or concrete foundations so that train vibration will not be transmitted to the electronic equipment in the scanner. Some roads mount scanners on long ties. A new type of hotbox detector has been developed that clamps to the base of the rail and is positioned along side the rail so as to view the rear of the journal box. However, the relative positioning of the scanner with respect to the track must be maintained. Most roads have installed wood blocks or steel plates on each side of the scanner to prevent dragging equipment from damaging it.

For some railroads, where tracks run in an east-west direction, there may be a problem of sunlight at early morning or late afternoon falling upon the scanner. Normally, the scanner shutter is open only for the brief instant of time when the journal box is in the correct viewing position. Some roads have installed pipe extensions on the front of the scanner to keep out sunlight.

Relative to scanner location is the point at which the train will stop if an overheated journal is detected. The train should not stop so that it blocks a yard entrance. Sitting on the approach circuits or actually in an interlocking should be avoided. Also, the train should not be stopped so that it blocks highway-railroad grade crossings.

At this train-stopping location after the crew has been alerted about a hot journal, there must be communications available. They should be able to contact the dispatcher. He may inform them of the specific journal in trouble. Or, they may read a digital readout device in a wayside instrument house. In either case, they will have to contact the dispatcher to tell him what action they have taken.

Thus, it is apparent that some braking distance calculations must be made for each hotbox detector location. Accordingly, it is important to know the speed limits in the territory as well as the type of traffic, including tonnage of trains.

by the time the train stops for the crew to report no overheated journal. Hence, efficiency as the ratio of hotboxes found to the number indicated hot, will drop. Also, impinging on ef-

iciency are such factors as the threshold alarm setting of the detector, the skill of the person inspecting the indicated hot journal, and train handling in stopping.