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Spacing Study of Hot Bearing Detectors

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Summary

Transportation Technology Center, Inc. (TTCI) and University of Illinois at Urbana-Champaign (UIUC) conducted research using modeling and simulation to determine the optimal spacing between hot bearing detectors (HBD) based on relevant test data of HBD systems currently in place. For this simulation study, the collected HBD sensor readings from revenue service were used to simulate potential HBD spacing to alert potential bearing failures. Tradeoffs between the cost of sensor deployment and penalty of low prediction accuracy (potential hazards) were systematically studied to determine the best sensor deployment spacing. The simulation study showed there is no statistical difference between the detection rates at 7.5 miles to 15 miles, making 15 miles the ideal for sensor spacing. For greater than 15-mile spacing, there is a reduction in the detection rate for the HBD system.

The current spacing distance between revenue service HBD has at least a 99.5 percent (99.39% to 99.62%, 95% CI) successful detection rate. This detection rate is based on 14,069 bearings with Why Made Code 50 removals versus 68 Federal Railroad Administration (FRA) reported derailments.

To determine if decreasing spacing between sensors would prevent bearing failures, the researchers reviewed the failures that actually occurred and were not detected by the current sensor network. A summary of a subset of 27 of the FRA reported bearing journal burn off incidents from 2012 to 2016 showed the median distance to derailment from the previous HBD is 9.2 miles. These incidents were those that could be located on track charts and had detectors mapped on those track charts. A simplified assumption would be to state that if the distance between detectors were less than 9.2 miles, then 50 percent of these incidents would have been avoided. However, as the simulation demonstrated, there is no statistical advantage in a sensor spacing of 9.2 miles as compared to 15 miles.

This work was conducted as part of an ongoing Association of American Railroads' Strategic Research Initiative to evaluate the root causes of in-service bearing failures.

Please contact **Dustin Clasby (719) 584-0515** with questions or concerns
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