



# TRANSPORTATION INNOVATION SERIES

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Office of the Assistant Secretary for Research and Technology*

## Advanced On-Board Condition Monitoring System for Freight Railcar Applications

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USDOT Headquarters West Building Conference Center – Rooms 8-9-10



The railroad industry utilizes wayside detection systems to monitor the temperature of freight railcar bearings in service. The wayside hot-box detector (HBD) is a device that sits on the side of the tracks and uses a non-contact infrared sensor to determine the temperature of the train bearings as they roll over the detector. However, several laboratory and field studies conducted to assess the

accuracy and reliability of these devices have concluded that the temperature measurements of these wayside detection systems are inconsistent and are affected by several factors. The class of the railroad bearing and its position on the axle relative to the position of the wayside detector can considerably affect the temperature measurement. Furthermore, environmental factors can also affect these temperature readings. The abovementioned factors can lead to measured temperatures that are significantly different

than the actual operating temperatures of the bearings. In some cases, temperature readings collected by wayside detection systems did not indicate potential problems with some bearings, which led to costly catastrophic derailments. Attempts by certain railroads to optimize the use of the temperature data acquired by these wayside detection systems has led to the removal of many bearings that were not problematic (about 40% of bearings removed were non-verified), resulting in costly delays and inefficiencies.

Motivated by the need to develop a reliable and accurate bearing condition monitoring system, the University Transportation Center for Railway Safety (UTCRS) research team at the University of Texas Rio Grande Valley (UTRGV) has been developing an advanced on-board condition monitoring system that can accurately and reliably detect the onset of bearing failure. A prototype on-board condition monitoring system that effectively utilizes both temperature and vibration signatures has been successfully developed and validated both through extensive laboratory testing at UTRGV, and field testing at the Transportation Technology Center, Inc. (TTCI) in Pueblo, CO.

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