NTSB | National Transportation Safety Board

Date: June 6, 2024

To: Patrick Warren, Director, RPH

Through: Zach Zagata Branch Chief, RPH-140

From: Brett Johnson/Joey Rhine, IIC, RPH-130

Subject: **Accident Investigation Closeout Memo**
RRD23FR011
Train Derailment
Norfolk Southern Railway
New Castle, Pennsylvania
May 10, 2023

Accident Summary

On May 10, 2023, at 10:57 p.m. local time, the northbound Norfolk Southern Railway (NS) general merchandise freight train 14M10 derailed nine mixed-freight railcars on the Youngstown Line beginning at milepost YG 76.56 and came to rest across a rail bridge in the vicinity of milepost YG 74.9 in New Castle, Pennsylvania.[1] Train 14M10 was composed of one head-end locomotive, 144 loaded railcars, 69 empty railcars, and two distributed power locomotives positioned in the middle of the train. The train weighed 19,993 tons and was 12,724 feet long. Train 14M10 was traveling about 28 mph at the time of the derailment, less than the maximum authorized timetable speed of 40 mph. The derailed equipment included one hazardous material tank car, which was not breached, containing paraffin. There were no reported fatalities or injuries. NS estimated damages to equipment and track infrastructure to be about $6.1 million. At the time of the accident, visibility conditions were dark and clear; the weather was 52°F with no precipitation.

Investigation

Train 14M10 departed Conway Yard on the Youngstown Line at 6:36 p.m. The Vale hot bearing detector (HBD) at milepost YG 91.9 was the first HBD that train 14M10 encountered after departing Conway Yard. Information collected from

[1] All times in this memo are local time.

the Vale HBD data logs indicate that the head end of train 14M10 traversed the YG 91.9 HBD at 10:13 p.m. The Vale HBD recorded a temperature of 253°F above ambient for the eastside bearing on axle 671 (an axle on the 164th railcar). Data logs also showed that the Vale HBD broadcasted a critical hot wheel bearing alarm radio message for railcar 164 at 10:17 p.m. The Vale HBD rebroadcasted the alarm message at 10:19 p.m. Train 14M10 stopped 38 minutes later, due to an undesired emergency brake application. After stopping, the crew of train 14M10 performed a walking visual inspection of the train and, subsequently found railcars 164 through 172 derailed.

National Transportation Safety Board (NTSB) investigators found that the 671st axle east wheel bearing (L1 bearing) sustained a catastrophic internal failure, resulting in subsequent overheating and self-destruction. As the bearing disintegrated, its load bearing ability degraded causing the eventual separation of the L1 bearing and journal from the axle, thus causing the railcar's truck frame to eventually contact the ground. The investigation into the derailment of train 14M10 identified issues involving with the crew's operating performance, miswiring of the Vale HBD, and NS automatic train control (ATC) desk procedures as follows:

- The crew did not observe NS HBD operating rules and procedures:
    - The crew of train 14M10 did not receive the automated defective bearing alarm radio broadcast nor the post-train inspection results radio broadcast from the Vale HBD, after traversing it.
    - Per NS operating rules, if no post-train inspection results radio broadcast message was received by a train traversing a HBD (in this case from the Vale HBD), the crew of train14M10 was to "contact the Help Desk and may proceed, in accordance with existing authority, at a speed not to exceed 30 mph to the next detector…."
        - The NTSB investigation found that the crew of 14M10 did not attempt to contact the train dispatcher or the Help Desk after traversing the Vale HBD and not receiving a subsequent post-train inspection radio broadcast.
    - Because the crew of train14M10 did not contact the Help Desk per NS operating rules, when not receiving any broadcasts from the Vale HBD, the opportunity for an ATC help desk technician in Atlanta to remotely review the Vale HBD train inspection results data logs, did not occur.
        - If properly notified, an ATC help desk technician could have accessed the Vale HBD though remote digital connectivity, reviewed the 14M10 train inspection data log and then made recommendations to prevent a potential derailment. Regardless of the direction train 14M10 was traveling, the log contained important information about the overheating 671st axle data and the alarms

broadcasted by the Vale HBD and would have been useful in evaluating the condition of Train 14M10's bearings.

- Postaccident on-scene testing by NTSB investigators showed that the HBD's transducers were attached incorrectly and were reporting reversed train travel directions (that is, a northbound train would be reported as southbound) to the ATC help desk. The software that alerts ATC help desk technicians about train defects was not capable of recognizing the Vale HBD train 14M10 alarm data due to conflicting software logic (pertaining to train 14M10's reported direction). Thus, the opportunity for a technician to promptly receive and review the alarm data for train 14M10 did not occur.
    - During a review of signal data logs, NTSB investigators found that signal maintainers had performed maintenance on the Youngstown Line between Conway Yard and New Castle, Pennsylvania, on May 8, 2023. Maintenance activity included detaching and reattaching track-mounted components of the Vale HBD.
        - The subsequent investigation into the signal maintainers had miswiring of the track mounted hardware revealed that NS did not provide signal maintainers with site-specific wayside detector circuit plans and did not require maintenance and inspection records to be filed on this equipment.
        - Without accurate electrical circuit plans for the Vale HBD, the signal maintainers did not have wiring schematics for reference to support proper reinstallation of that hardware after the track maintenance was complete.
        - On-the-job training and discussions with the HBD manufacturer were the only forms of hot bearing detector maintenance training provided by NS for signal maintainers.
    - Under NTSB investigators' direction, signal maintainers corrected the transducers' positions. In subsequent tests, NS technicians at the ATC help desk in Atlanta confirmed that they had received usable HBD data once the correction was made at Vale HBD.
- NTSB determined that there is a lack of federal regulations for HBD testing, inspections, maintenance, site specific circuit plans management, detector parameter settings, employee training and operational procedures. With the implementation of federal wayside detection regulations, nationwide expectations by railroads and shippers would be commonly understood and would lead to reliable, consistent, and safer operation of trains.

NS Postaccident Actions

In a party submission dated January 25, 2024, concerning the train 14M10 derailment, NS detailed measures that have been implemented from investigative findings. Key excerpts specific to the investigation are noted and cited below:[2]

- "Norfolk Southern revised Maintenance Standard-404 (Hot Bearing Detector Maintenance Standard) on May 19, 2023, to require additional testing after any HBD inspection, test, or repair. Maintainers must verify the proper direction of train movements prior to leaving a site by either running a test train to test the transducer, or by observing a real train move over a detector."
- "In August 2023, Norfolk Southern added new, additional data sources to the WDS system's train matching logic, making it less AEI [Automatic Equipment Identification] dependent and increasing train matching success. As a result of these initiatives, the train matching logic can now match detector data with train movement data from three independent sources: the Thoroughbred Yard Enterprise System (TYES), Norfolk Southern's centralized railcar inventory and movement reporting system; locomotive GPS location data; and AEI scanner data."

Conclusion

The aforementioned postaccident actions implemented by NS address the issues identified in this investigation. In addition to these measures, NTSB investigation RRD23MR005 (East Palestine, Ohio) is focusing on the needed regulatory measures concerning wayside detectors and wheel bearing performance. Therefore, no additional recommendations are warranted, and staff recommends that this investigation be closed.

I concur:

[redacted]

Patrick Warren
Director
Office of Railroad, Pipeline and Hazardous Materials Investigations

[2] All excerpts are directly from Norfolk Southern Party Submission dated January 25, 2024. For further context and clarification of subjects, refer to the document.