National Transportation Safety Board

Washington, D.C. 20594

Railroad Accident Brief

Accident No.:	DCA-07-FR-003
Location:	Baxter, California
Date:	November 9, 2006
Time:	11:00 a.m., Pacific standard time
Owner/Operator:	Harsco Track Technologies
Railroad:	Union Pacific Railroad
Property Damage:	$3.33 million
Fatalities:	2
Injuries:	0
Type of Accident:	Uncontrolled movement

The Accident

About 11:00 a.m.[1] on November 9, 2006, a Harsco Track Technologies (Harsco) rail grinder[2] was moving on the Union Pacific Railroad (UP) when it derailed near Baxter, California. The rail grinder consisted of 2 modified locomotives and 11 specialized rail cars. Ten of the cars derailed. One UP conductor-pilot, one Harsco subcontractor cook, and eight Harsco employees, including one supervisor, were on board at the time of the accident. Two of the Harsco employees were killed. A fire broke out in the wreckage following the derailment. Monetary damage to the equipment and track was estimated to be $3.33 million.

The grinder was being sent from Sparks, Nevada, to Tehachapi, California, a distance of about 300 miles. No grinding was intended between these locations, so the grinder was configured to move in transit. The grinder had been assembled in 1995 and had operated ever since. The locomotives[3] and the rail cars had pneumatic and mechanical brake systems. Both locomotives had dynamic brakes; however, neither dynamic brake was functioning. The compressors on the locomotives were connected to a common brake pipe that was set at 90 pounds per square inch (psi).

[1] All times in this brief are Pacific standard time.

[2] A *rail grinder* is a maintenance-of-way vehicle that is used to restore the profile and remove irregularities from the rail.

[3] The forward, or A-end, locomotive was a model GP-38, and the trailing, or B-end, locomotive was a model F-40.

A Harsco employee operated the vehicle from the forward, or A-end, locomotive. Both the operator and the supervisor said that before the accident trip they had tested the air brakes on the locomotive units and cars and had also conducted a general inspection of the equipment. The operator said an air brake leakage test had not been done before this trip or any other trip, because one was not required. The operator and supervisor stated everything had appeared to be in order, and the conductor log shows the rail grinder departed Sparks about 7:00 a.m. The conductor-pilot was not required to participate in the equipment inspection or air brake test and did not do so. The operator, supervisor, and conductor-pilot were in the A-end locomotive after the departure. Both locomotives had event recorders, but they were inoperative.[4] According to the records, the recorders had not been serviced in 10 years. Consequently, the investigators reconstructed the events from witness interviews and readouts from wayside equipment detectors.

Because the grade from Sparks was ascending, the air brakes were not needed until after the grinder reached the Donner Pass summit, which was about 40 miles away; and until that point, speed was successfully controlled through throttle modulation. As the grinder completed the ascent to Donner Pass, about 9:30 a.m., the supervisor left the locomotive and went back to the cars. The operator said that about that time he took an initial 10-psi reduction from the air brake system in preparation for the descent. At 10:02 a.m., as speed increased beyond the authorized 25 mph for that portion of the track, the operator made incremental air brake applications, which reduced the speed. A short while later, the speed began to increase again. The operator then made a full service brake application of 26 psi, at which time the speed decreased to about 25 mph and then held steady. Next the operator called the supervisor and asked him to return to the locomotive, which he did.

About 10:35 a.m., the grade decreased, and, the crew estimated, the grinder's speed slowed to 12 or 13 mph. At that time, the operator and the conductor-pilot discussed whether they were at an appropriate place to release the air brakes in order to recharge them. After consulting the supervisor, they decided they were. While the grinder was still moving, the operator released the air brakes for recharging. Shortly thereafter, the grade became steeper, and the grinder began to accelerate again. Neither the operator nor the conductor-pilot had ever been over the territory before, and neither they nor the supervisor were aware of the UP operating requirement that after any air brake reduction of 18 psi or more, the train must be fully stopped and the air brakes recharged.[5]

[4] As discussed later, grinders are not required to have event recorders.

[5] UP Air Brake and Train Handling Rule 31.6.3 states that "if the amount of brake pipe reduction exceeds 18 pounds to maintain speed at any location, stop the train immediately, using the emergency position. Then do the following: 1. Inspect the air brakes. If they are suitable for safe operation, recharge the brake pipe fully before proceeding. 2. If the train cannot be held with a fully applied independent brake, apply enough hand brakes to hold the train." Similarly, the Roseville Area Timetable in effect at the time specified that "if the use of full dynamic brakes and an 18-pound brake pipe reduction will not control the train at the allowable speed, the train must be STOPPED and sufficient hand brakes set to prevent movement. The train must not proceed until additional dynamic braking is obtained, tonnage is reduced, or retainers on all cars are placed in operative position."

After the grinder began accelerating, the operator reapplied the air brakes in full service without apparent effect. He then placed the air brakes in emergency, again without apparent effect. The supervisor relieved the operator at that time and took over the controls. He radioed the other Harsco employees to set hand brakes throughout the train and to brace for a derailment. He reversed the direction of the locomotive's traction motors and instructed the operator of the trailing locomotive to apply independent brakes, but the grinder continued to accelerate. At 10:47 a.m., the speed was announced at 40 mph as the grinder passed a wayside equipment detector. The conductor-pilot entered the speed in his log at the time. The speed continued to increase, and at 11:02 a.m., at an estimated speed of between 49 and 53 mph, the grinder entered an 8° curve and derailed.

As the A-end locomotive came to a stop, a fire broke out in the derailed equipment. (See figure 1.) The conductor-pilot looked behind him and saw smoke and derailed equipment. He attempted to contact the dispatcher by radio, but all power had been lost on the A-end locomotive. He reached the dispatcher with his personal cell phone and told him about the derailment and asked for emergency assistance. Upon realizing that the adjacent main track was blocked by derailed equipment, the conductor-pilot told the dispatcher and then walked down the track and placed a red flag between the rails to warn any approaching train. Soon thereafter, a California Highway Patrol helicopter and various emergency service personnel began to arrive. The two employees killed in the derailment were found in the rear portion of the wreckage.

Figure 1. Grinder after derailment.

Postaccident Observations and Tests

Brakes

A general assessment was made of the grinder's brake system at the accident site following the accident. The piston travel at all locations on both locomotives (which ranged from 7 to 8 1/4 inches) far exceeded normal piston travel, and the brake shoes did not show indications of having been overheated. Some (but not all) of the wheels, brake shoes, and brake beams from the cars displayed clear evidence of recent overheating.

Both locomotives and three cars were then transported to a UP facility and tested. The remaining cars were too badly damaged to transport to the testing location. The initial testing consisted of placing the air brakes in emergency and attempting to force the brake shoes away from the wheels with a pry bar. At all locations on the locomotives, the brake shoes either did not touch the wheels when in emergency or could be pulled back by hand or easily pried back with a small bar, indicating that there was little or no brake shoe force on the wheels when the brakes were applied. Of the three cars, two failed individual single car tests of the braking system. Both cars failed the emergency portion of the tests. Of the two, one also failed the service portion of the test; the other could not have a service test because of brake pipe leakage. Neither car had been capable of providing effective braking. The third car passed a single car brake leakage test, and the car's brake shoes showed signs of significant overheating.

Brake shoe force was measured at all locations on both locomotives, using a calibrated brake shoe force measurement device. The initial measurements ranged from 0 to 100 psi. After the readings were taken, manual adjustments were made to decrease the piston travel, and new brake shoes were applied. Measurements taken after these adjustments ranged around 10,000 psi.

Based on the postaccident condition of the brake system components, the results of the postaccident air brake testing, and the other evidence, investigators decided that the air brake system on the grinder most likely had been incapable of providing adequate braking before the accident trip and that the poor condition of the braking system components should have been apparent from a visual inspection or brake test. Further, investigators decided that the attempted recharging of the air brakes while the grinder was descending would not have been successful because there had not been enough time to fully recharge the brake system before the brakes were needed again. Thus, the limited braking ability of the grinder would have been even further compromised by this operational mistake.

Event Recorders

Both locomotive units had Quantum event recorders. The event recorders were sent to the National Transportation Safety Board's Vehicle Recorder Division. However, neither recorder had recorded anything. Records inside the devices indicated that they had not been serviced since 1996.

Federal Railroad Administration Oversight of Grinders

Overview

Eighteen rail grinders operate in the United States, 7 operated by Harsco and 11 operated by Loram, another rail maintenance company. As discussed in more detail below, according to the Federal Railroad Administration (FRA), grinders are not trains, and their power units are not locomotives. Accordingly, grinders are exempt from many regulatory requirements applicable to trains and locomotives. In particular, grinders are not covered by Title 49 *Code of Federal Regulations* (CFR) Part 229, "Railroad Locomotive Safety Standards," which includes detailed inspection and record-keeping requirements, as well as brake piston travel standards (229.55) and the requirement for a working event recorder (229.135). Nor are grinders covered by 49 CFR Part 232, "Brake System Safety Standards for Freight and Other Non-Passenger Trains and Equipment; End-of-Train Devices," which includes regulatory requirements for predeparture air brake tests.

However, after the accident, the FRA provided training to its inspectors and issued guidance documents clarifying that rail grinders are covered by statutory provisions relating to trains and locomotives and must, therefore, be in a condition that allows safe operation. As a result of the accident, the FRA has conducted safety inspections of all grinders and followup inspections to ensure that identified defects were corrected.

Statutory and Regulatory Requirements Applicable to Grinders

FRA officials acknowledge that before the accident, the FRA provided little oversight of rail grinding equipment and that the nature of the FRA's regulatory and enforcement authority was poorly understood. On January 26, 2007,[6] the FRA issued Safety Advisory 2007-02, which explains the proper application of existing statutory and regulatory requirements concerning self-propelled specialized maintenance equipment, such as grinders. The safety advisory recommends that owners, operators, and railroads ensure that either the operator or pilot involved in moving such equipment be qualified on the territory over which the equipment will be traveling and thoroughly inspect the equipment at the earliest opportunity to ensure it is safe to operate and complies with all regulatory and statutory requirements. The safety advisory notes that there has been uncertainty among some in the regulated community as to the proper application of the agency's regulations to such equipment and that the document is intended to clarify the application of those requirements.

According to the safety advisory, whether a piece of equipment qualifies as a locomotive under a specific regulation depends on how the equipment is being used and the specific purpose of the regulation. In particular, the definitions of "locomotive" in 49 CFR Parts 229 and 232 exempt specialized maintenance equipment, such as rail grinders. However, the safety advisory states that when such equipment is used as a traditional locomotive, for example, for hauling freight, outside its typical maintenance-of-way function, it is considered a locomotive and, thus, subject to 49 CFR Part 229.

[6] See *Federal Register*, vol. 72, no. 17 (January 26, 2007), p. 3907.

Regarding the question of whether the operator of the equipment must be a certified locomotive engineer, the safety advisory states:

> most specialized maintenance equipment is unique in both its design and operation, and that to require a certified LE [locomotive engineer] to operate such equipment when it is moved from one work site to another would be operationally restrictive and potentially unsafe since in most instances, an LE certified under Part 240 will not be familiar with the specific operation of specialized maintenance equipment. Thus, safety is better served by permitting an individual familiar with the specific piece of equipment to operate it from one work site to another with the aid of a pilot, where appropriate. Although Federal regulations do not specifically address the territorial qualifications of either the operator or any pilot that may be utilized when operating a dual purpose vehicle … FRA believes that safe railroading dictates that such individuals should be qualified and familiar with the territory over which the equipment will be operated. Thus, FRA strongly recommends and encourages the use of individuals that are qualified on the territory over which the equipment will be operated when such equipment is traveling to and from a work site.[7]

Finally, the safety advisory explains that even if a maintenance-of-way unit does not qualify as a locomotive under regulatory definitions, it may nonetheless qualify as one under statutory provisions requiring that locomotives be "safe to operate" (49 *United States Code* [U.S.C.] 20701) and have operative power brakes (U.S.C. 20302). Further, the FRA has stated that in enforcing these statutory requirements, the safety requirements and rationale of regulatory provisions can be utilized in determining whether the equipment at issue is safe to operate.

On May 1, 2007, the Director of the FRA's Office of Safety Assurance and Compliance issued a technical bulletin further clarifying the proper application of regulatory and statutory requirements to grinders. The guidance, intended for FRA inspectors, explicitly states that the power unit of a grinder is a locomotive under section 20702 of the FRA's statute, but not under 49 CFR Part 229.

The technical bulletin reiterates that an FRA inspector can use regulatory provisions, including those in 49 CFR Part 229, in determining whether a power unit is safe to operate and emphasizes that any resulting notation of violation should cite only the statute and not the regulation. The bulletin further states that a grinder is a train under section 20302 of the statute but not under 49 CFR Part 232 and that section 20303 requires all vehicles on a grinder to have operative brakes unless the vehicles are being moved for repair. The bulletin states that the FRA expects railroads and operators to have an inspection regimen that ensures that crews operating the equipment are aware of whether the brakes comply with the applicable statutory requirements.

FRA Inspections After Accident

As a result of the accident, the FRA has increased its focus on the safety of grinders by implementing an inspection program for grinders and by developing new training for inspectors. According to the FRA, 400 defects have been cited and addressed as a result of its inspections. In December 2006, the FRA began inspecting grinders and by January 22, 2007, had inspected all

[7] The FRA reiterated this position in its May 1, 2007, technical bulletin, which is discussed below.

seven Harsco grinders. According to the FRA, Harsco has since addressed all noncompliant items noted on those units. Similar inspection and followup activities have been conducted on all 11 Loram units. Beginning in September 2007, the FRA began to reinspect grinders randomly to verify that defects had been corrected. The FRA stated that Harsco and Loram had notably improved their understanding of and compliance with federal safety standards.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the November 9, 2006, derailment of the Harsco Track Technologies rail grinder was the failure of the braking system due to ineffective preaccident maintenance, inspections, and testing and the inappropriate brake recharging technique used by the A-end operator. A contributing factor was the failure of the Federal Railroad Administration to provide adequate safety oversight of rail grinders.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

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