Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

RAILWAY INVESTIGATION REPORT
R03T0047

YARD COLLISION

CANADIAN NATIONAL
TANK CAR PROX 77811
MILE 25.0, YORK SUBDIVISION
TORONTO, ONTARIO
22 JANUARY 2003

Canada

Railway Investigation Report

Yard Collision

Canadian National
Tank Car PROX 77811
Mile 25.0, York Subdivision
Toronto, Ontario
22 January 2003

Report Number R03T0047

Summary

On 04 February 2003, at approximately 1830 eastern standard time, railway inspectors conducting an inbound train inspection observed that residue tank car PROX 77811, last containing fuel oil (UN 1202), was saturated with the product on the tank shell and truck at the A-end. The product appeared to be leaking from a large crack in the tank shell. There were no injuries. In total, 630 litres of fuel oil were released.

Ce rapport est également disponible en français.

Other Factual Information

On 18 January 2003, car PROX 77811, a class 111A60W-1 tank car built in 1969, was interchanged from the Ontario Northland Railway to Canadian National (CN) in Cochrane, Ontario. The tank car arrived in Toronto, Ontario, at MacMillan Yard (see Figure 1) on 19 January 2003. During the inbound certified car inspection (CCI), a wheel tread defect was identified and the tank car was placed in bad order status. On its way to the repair track, the tank car was sent over the dual hump (see Figure 2). While passing over the revenue scale, it was determined that the tank car contained 1240 pounds (or approximately 630 litres) of fuel oil (UN 1202). Since this tank car was being used to transport a regulated product, the car was placarded. The movement of placarded rail cars must be performed in compliance with the *Transportation of Dangerous Goods Regulations*.

During the wheel change out and the subsequent mechanical inspection on 20 January 2003, no damage or leaking product was observed on the tank car. After leaving the repair facility, the tank car was humped[1] four additional times, with the last humping operation occurring over the local hump as a two-car cut with tank car PROX 46132 trailing. The cars were sent into track L3, with a predicted coupling speed of 13.5 mph (21.7 km/h). The tank car was then marshalled onto a train. The train received a No. 1 brake test during the CCI, and no defects were observed during this inspection. On 22 January 2003 at 1325 eastern standard time,[2] the train departed MacMillan Yard. Shortly thereafter, car PROX 77811 was set out into a siding approximately 1.5 miles from the yard.

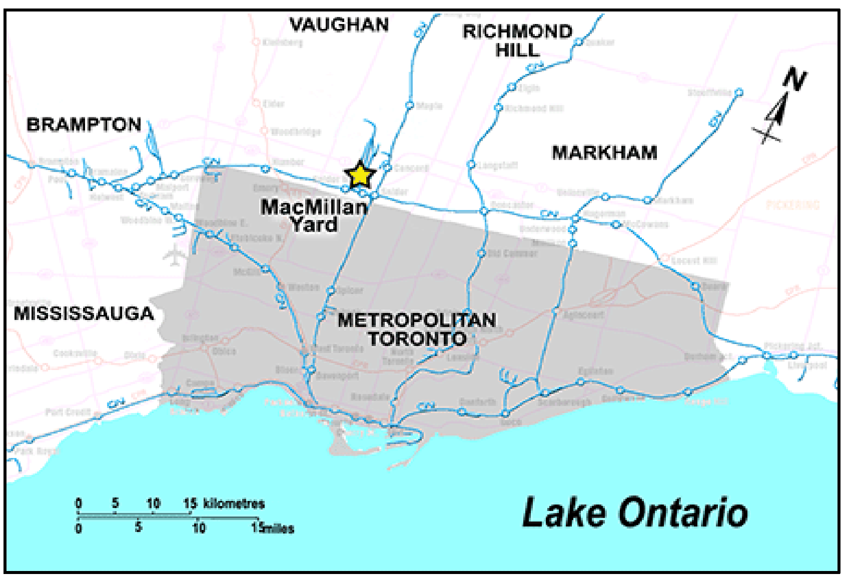

Figure 1. Location of MacMillan Yard

1 Some classification yards feature an artificial knoll, or "hump,"over which rolling stock is pushed and then released to roll, by gravity, into specific tracks (Source: Christopher F. Schulte, *Dictionary of Railway Track Terms*, 1990).

2 All times are eastern standard time (Coordinated Universal Time minus five hours).

On 04 February 2003, the tank car was moved to a fuel loading facility located approximately 2.5 miles further south (see Figure 2). After pumping approximately 3200 litres of diesel fuel into the tank car, the product was observed to be leaking from the sill area on the A-end of the car. Loading was stopped and the product was contained within a ground recovery system at the facility. The remaining product was pumped from the tank car. The car owner, Procor LP, was notified of the defect. After marking the tank car to identify the defect, the shipper released the tank car back to CN, destined for Procor's repair facility in Sarnia, Ontario.

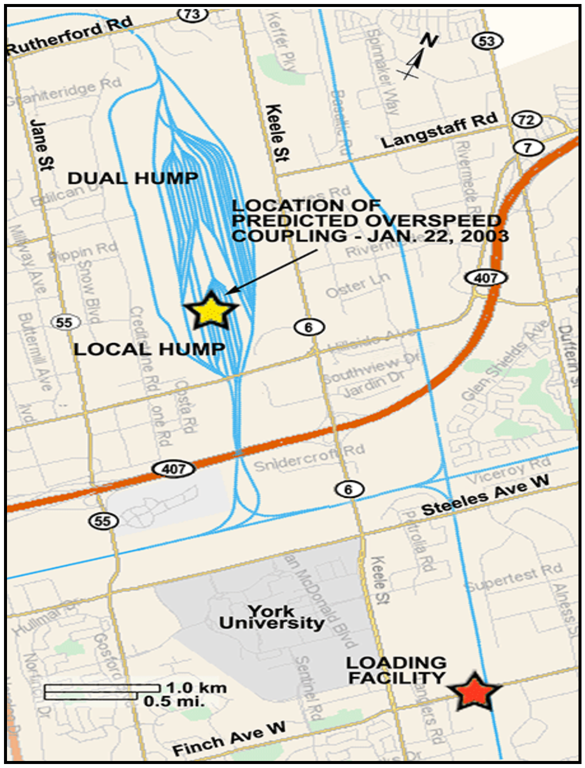

Figure 2. MacMillan Yard and surrounding area

Despite the requirement to obtain movement authority from Transport Canada (TC) for a rail car with this type of damage, the shipper did not report the damaged car to TC, nor provide CN with any special handling instructions for car PROX 77811. The shipper had not previously encountered a situation where there was damage to the tank shell that affected the structural integrity of the tank car.

Car PROX 77811 arrived back at MacMillan Yard at 1830 on 04 February 2003. During the inbound CCI, the leaked product was observed on the side of the car. The tank car was isolated and reported as a dangerous goods leaker at 1939 the same day.

Damage to Tank Car PROX 77811

A post-incident examination of the tank car determined that there was a 20-inch crack in the tank shell at the A-end of the car in the area of the stub sill (see Photo 1). In addition, there were numerous broken safety appliances at the A-end.

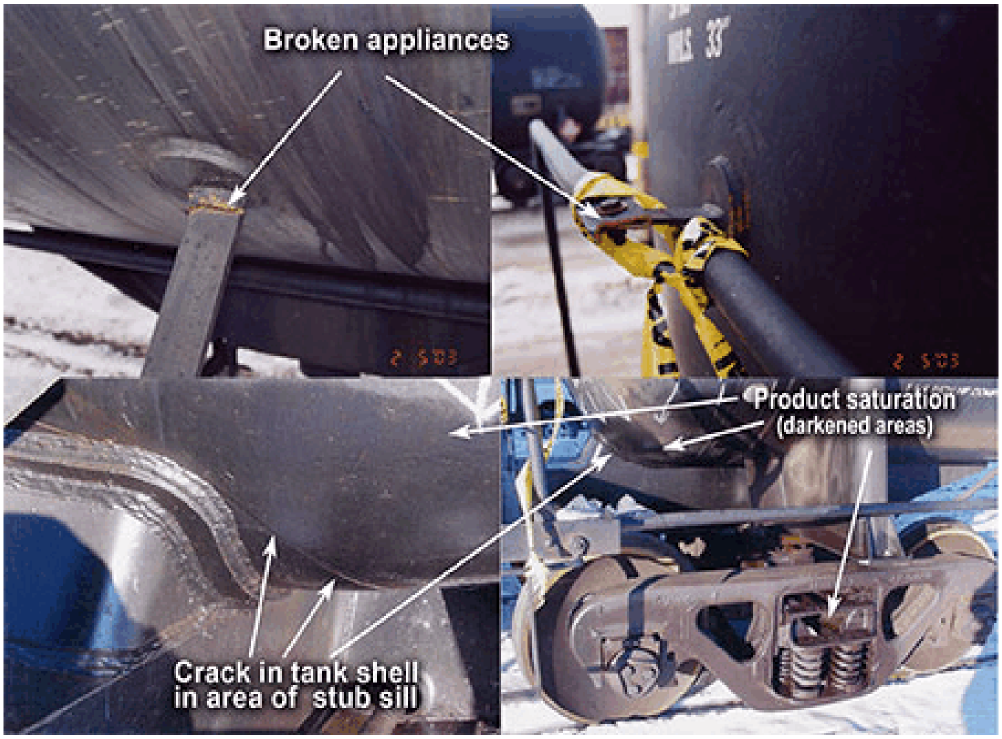

Photo 1. Damage to tank car PROX 77811 shell and appliances

A portion of the tank shell, which included the crack, was cut from the tank car and sent to the Transportation Safety Board of Canada (TSB) Engineering Laboratory for analysis. The examination (report LP 048/2003) determined that there was a pre-existing crack in the tank shell that had been present for a considerable length of time, likely initiated during welding. During the service life of the tank car, it had been subjected to normal service loads without previously failing.

Humping Operations at MacMillan Yard

MacMillan Yard is the main hub of CN’s eastern network where rail traffic is classified and redistributed. Inbound trains are routed into a receiving yard where the locomotives are removed and rail cars are inspected.

During humping operations, blocks of rail cars are pulled from the receiving yard and shoved over one of the two humps where they are sorted by destination. The dual hump has two tracks that allow eastward and westward trains to be made up simultaneously. The dual hump distributes rail cars to the “C” classification yard, which consists of 79 tracks arranged in nine groups. MacMillan Yard also has a local hump that distributes rail cars to the “L” classification yard, consisting of 54 tracks divided into six groups. The dual hump is used whenever possible to maximize productivity. The target productivity level for humping at MacMillan Yard is 125 rail cars per hour.

Humping operations are controlled by the hump process control system (HPCS), which determines routing through the yard and the speed of the rail car as it travels to the designated classification track. Rail cars are moved to the hump using remote-controlled locomotives, which operate at 1.75 mph for rail cars designated as Special Car Handling (SCH)[3] and at up to 2.5 mph for other rail cars. The rail cars are uncoupled manually as they pass over the crest of the hump. As the rail car rolls down the incline, wheel sensors collect data allowing the HPCS to calculate its rollability.[4] The rail car then passes over a revenue scale where single cars are weighed.

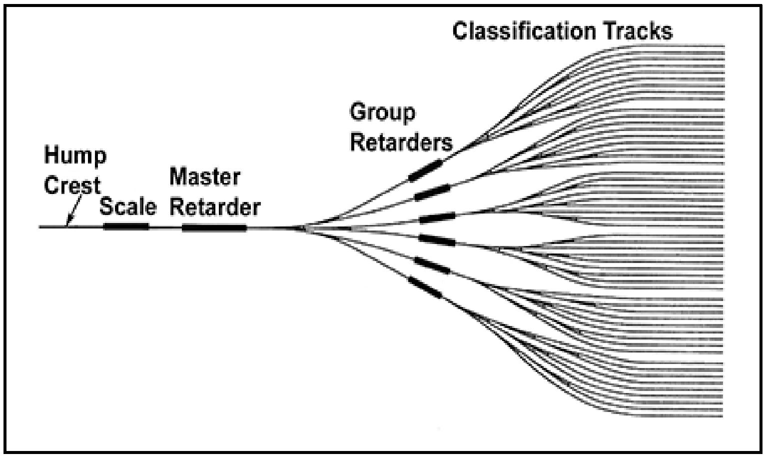

Figure 3. Diagram of hump classification tracks

Figure 3 shows the location of the various facilities for a typical hump operation. Rail car speed is initially controlled at the master retarder where braking pressure is applied on the wheels using four hydraulically operated sections. Retardation force is calculated based on rail car rollability, wind speed and direction, temperature, rail car type, and rail car weight. After exiting the master retarder, rail car speed is measured by radar and wheel sensors. Speed is further adjusted at the group retarder. Once the rail car leaves the group retarder, there are no other locations to adjust speed before it reaches the designated coupling location.

The HPCS, which cannot verify actual coupling speed, calculates the estimated coupling speed based on the last measured speed and the remaining distance to couple (DTC). DTC, which can be more than a kilometre, is the distance that a rail car has to roll in the classification track before it couples with another rail car. DTC is calculated by monitoring the change in frequency of an electric current (circuit) as the rail car rolls along the classification track. By establishing the location of the rail car and knowing the length of the track and the number of stationary rail cars already in the track, the remaining DTC can be determined. The accuracy of the DTC value can, however, be affected by conditions that lead to poor conductivity in the rail such as track contamination.

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3 SCH cars include auto racks and tank cars.

4 Rollability is calculated by measuring the time it takes a car to negotiate a fixed distance, as compared to all other rolling stock.

The HPCS is designed to handle special situations, such as the following:

- Placarded tank cars, which have a target coupling speed of 4 mph.
- If a placarded tank car is sent to an empty classification track, the target speed is reduced to 2.0 mph.
- Humping cuts of multiple SCH rail cars are not permitted. If SCH cars are included in a multi-car cut, the HPCS computer is designed to stop the rail cars at the master retarder.
- The target coupling speed for poor rolling non-SCH rail cars can be increased by 1.0 mph.
- The HPCS attempts to identify potential overspeed couplings. The HPCS will identify situations when the rail car exits the master retarder at 2.0 mph over the target exit speed (assuming all sections of the retarder are working), or when the rail car exits the group retarder at 2.0 mph over the target exit speed. Where possible, the HPCS will reroute overspeed rail cars to an empty track to dissipate speed.

Since 1992, software upgrades have been made periodically to enhance the HPCS system. During one such software upgrade in August 2002, a code identifying empty and residue tank cars as SCH was inadvertently deleted. This deleted code resulted in empty and residue tank cars being categorized and humped as regular empty rail cars. The coupling speed for these tank cars was set at 7 mph instead of 6 mph for empty and residue SCH tank cars.

Humping Records for Tank Car PROX 77811

The HPCS humping records for tank car PROX 77811 indicated the following:

- Rollability factors used for car PROX 77811 during humping operations on 22 January 2003 had been collected during a previous humping operation on 20 January 2003.
- At 0944 on 22 January 2003, car PROX 77811 and car PROX 46132 were humped together over the dual hump as a two-car cut into classification track C44. Car PROX 77811 was the leading end of the movement. The HPCS had classified these two empty tank cars as "light." The ambient air temperature was -16.1°C. With approximately 10 rail car lengths remaining until coupling, the speed was 8.7 mph. The rail cars likely coupled at a speed close to this last measured value.
- At 1132 on 22 January 2003, car PROX 77811 and car PROX 46132 were humped together over the local hump as a two-car cut into classification track L3. Car PROX 77811 was the leading end of the movement. Entry speed into the master retarder was 12.7 mph. The target exit speed at the master retarder was set at 19.63 mph. With no retarding force required, the tank cars exited the master retarder at 18.3 mph.

- Entry speed into the group retarder was 17.8 mph. The target exit speed at the group retarder was set at 17.64 mph. After applying a minimal retarding force, the tank cars exited the group retarder at 17.6 mph.

- Since track L3 is an outside track with a sharper curvature, the HPCS used a higher curve resistance factor to calculate rollability. The curve exit speed was 11.4 mph. As the tank cars continued down track L3, there was a slight increase in speed. With approximately 10 rail car lengths remaining until coupling, the speed was 13.8 mph. The predicted coupling speed of the tank cars was 13.54 mph.

Transportation of Dangerous Goods Regulations

Section 10.7 of the *Transportation of Dangerous Goods Regulations*, effective 15 August 2002, describes the requirements when regulated rail cars are coupled. These regulations do not apply to non-placarded rail cars involved in overspeed coupling incidents.

- Subsection 10.7 (1) states that railway vehicles containing dangerous goods must not be coupled at relative coupling speeds greater than 9.6 km/h (6 mph).

- Subsection 10.7 (2) states that, despite subsection (1), a single railway vehicle moving under its own momentum may be coupled at a relative coupling speed less than or equal to 12 km/h (7.5 mph) when the ambient temperature is above -25°C.

- Subsection 10.7 (3) states that, for all overspeed couplings of tank cars, as defined in subsections 10.7 (1) and 10.7 (2), the underframe and draft gears must be visually inspected before the car is moved more than 2 km from the place where the coupling occurred. A report must be sent to the owner of the tank car within 10 days after the coupling, detailing the damage that compromised the integrity of the underframe assembly or draft gear of the tank car.

- Subsection 10.7 (4) states that the owner of the tank car must not use the tank car or permit the tank car to be used to transport dangerous goods, other than the dangerous goods that were contained in the tank car at the time of the coupling, until the tank car undergoes a stub sill inspection at a tank car facility, and a visual and structural integrity inspection is done.

The coupling speeds for the *Transportation of Dangerous Goods Regulations* are based on tests conducted by the National Research Council of Canada (NRC).[5] These tests identified the maximum speed at which coupling force is still less than 1 000 000 pounds, which is the Association of American Railroad minimum longitudinal force specification for tank cars.[6]

A Permit for Equivalent Level of Safety was issued by TC to the railways on 22 November 2002. This permit (SR 6234) provides an exemption to the *Transportation of Dangerous Goods Regulations* covered in subsections 10.7 (3) and 10.7 (4). Tank cars having a gross weight of less than 65 000 kg (143 300 pounds) are permitted to couple at speeds up to 12.9 km/h (8 mph) when the ambient temperature is at or below -25°C, or 15.3 km/h (9.5 mph) when the ambient temperature is above -25°C. The coupling speeds in subsections 10.7 (1) and 10.7 (2) still apply if the tank car has a gross weight greater than 65 000 kg (143 300 pounds).

Transportation of Dangerous Goods Regulations are based on actual coupling speeds. However, because the railways do not have systems in place that are able to measure coupling speed on a continuous basis, the assessment of compliance with regulations is primarily based on scheduled audits and random checks at the hump yard. Hump yard audits are conducted by regional TC Transportation of Dangerous Goods officers on an annual basis. These audits and other random checks involve sampling hump records and taking radar measurements of actual couplings. Interviews with TC staff who are involved in monitoring hump yard compliance indicated the following:

- Regional TC inspectors have not been instructed on how to measure the railway's compliance to coupling speed regulations.

- Regional TC inspectors are unsure how the coupling regulations can be reasonably and practically complied with. However, regional inspectors are satisfied that a certain level of compliance exists.

- Regional TC inspectors are aware that CN uses "last measured speed" and "remaining DTC" to predict coupling speed.

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5 R. Dong and D. Militaru, *Dynamic Structural Characterization of Stub Sill Tank Cars Utilizing ADAMS and ANSYS Simulation Models*, Report 1: "The ADAMS System Dynamic Model – Its Validation and Application to the Characterization of Impact Forces," Centre for Surface Transportation Technology (CSTT), NRC, CSTT-RYV-TR-010, March 1997; Report 2: "ANSYS Finite Element Modelling – Its Validation and Application to the Characterization of Impact Forces," CSTT-RYV-TR-010, March 1997; "Tank Car Derailment Analysis," CSTT-RYV-CTR-25, March 1997; and J.Z. Zu and R. Dong, *Multi Tank Car Impact Tests and Analysis*, Report 3: "ADAMS Model Simulations of Tank Car Impact," CSTT-RVC-TR-033 TP 13359E, October 1998.

6 Association of American Railroads, *Manual of Standards and Recommended Practices*, "Specifications for Tank Cars," Section 6.2.3.1, Washington, D.C., January 1996.

- Regional TC inspectors believe that the last measured speed and the remaining DTC allow a reasonable prediction of actual coupling speed. However, the inspectors do not consider this approach as a satisfactory measure of compliance to actual coupling speeds.

- TC assumes that the railways are performing the required follow-up when a potential overspeed coupling occurs. However, this has not been verified during recent hump yard audits.

CN Protocol for High-Speed Couplings

Item 4.0 (b) in the Transportation of Dangerous Goods by Rail section of CN's General Operating Instructions, issued 15 August 2002, states that any impact suspected of being in excess of 6 mph, with or onto a dangerous goods car, must be promptly reported to the appropriate supervisor for further action. The supervisor will then consider the ambient air temperature and the weight of the car in determining the need for further action in compliance with the *Transportation of Dangerous Goods Regulations* and CN's Equivalent Level of Safety permit.

Instructions for handling rail cars involved in high-speed couplings at MacMillan Yard were issued by CN effective 15 August 2002. These instructions stipulate the following:

- The Hump Supervisor must notify the on-duty Transportation Officer of any rail cars involved in a high-speed coupling due to humping or flat switching.

- The Transportation Officer must then report the high-speed coupling incident to the Mechanical Department for follow-up inspection and reporting.

Overspeed Coupling of Special Car Handling Tank Cars at MacMillan Yard

The *Transportation Safety Board of Canada Regulations* require the reporting of any collisions involving rolling stock carrying dangerous goods, or dangerous goods residue. A collision is defined as "an impact, other than an impact associated with normal operating circumstances." DTC coupling speed data from MacMillan Yard indicated that there may have been as many as 473 overspeed couplings in 2002.

A Rail Safety Advisory (01/03) was sent to TC on 17 April 2003, regarding the potential overspeed occurrences. The TSB requested additional information from CN on the potential overspeed occurrences. CN responded that, since the start of 2003, four cars were inspected and the car owner was advised for home shop disposition due to suspected overspeed couplings in accordance with *Transportation of Dangerous Goods Regulations*. Furthermore, CN advised that it was taking steps to improve the consistency and the documentation of its overspeed reporting process.

CN expressed concern that DTC data values used to calibrate the HPCS and to measure distances remaining in classification tracks were being interpreted as actual coupling speeds for individual cars. A CN survey, conducted at TC's request in 2000, compared actual speeds gathered using a laser gun with values provided by the HPCS. From this survey, CN concluded that "HPCS predicted coupling speed cannot be used to constantly estimate actual coupling speed."[7] Therefore, CN stated that:

> DTC reported "coupling speeds" are not to be used in isolation to make conclusions or decisions regarding the coupling speed of individual cars. As such, CN does not have historical coupling speed information of the nature that TSB is requesting for any of its hump facilities.[8]

Analysis

The analysis will focus on the crack in the tank shell, regulatory overview of hump yard operations, and the protocol for movement authority when damaged tank cars are discovered.

A pre-crack was present in the tank shell of car PROX 77811. This pre-crack, which was likely initiated by welding, may have existed since the initial construction of the car in 1969. Despite the presence of this pre-existing crack and the many years of revenue service for this tank car, it is likely that the final fracture of this crack was caused by a high-impact load from an overspeed coupling.

When car PROX 77811 was humped into classification track L3 on 22 January 2003, the predicted coupling speed was 13.54 mph (21.72 km/h). This coupling speed is approximately 40 per cent greater than TC's maximum limit of 9.5 mph for regulated tank cars, and more than three times greater than CN's target coupling speed for SCH rail cars. NRC studies on tank car impact forces indicate that a rail car coupling at this speed would likely generate forces that exceed the structural capacity of the tank shell. Despite being involved in an overspeed coupling, tank car PROX 77811 was allowed to continue in service without a mechanical inspection, resulting in the subsequent loss of the product.

The overspeed coupling on 22 January 2003 was likely caused by a coding error in the HPCS system, which had categorized tank car PROX 77811 as a non-regulated empty rail car rather than a regulated SCH rail car. Due to this error, car PROX 77811 was released over the hump as a two-car movement with a target coupling speed of 7 mph rather than 6 mph. In addition to this coding error, rollability parameters for car PROX 77811 that were used on 22 January 2003 had been collected during a previous humping operation on 20 January 2003. Although rollability likely did not change significantly over the 48 hours, the weather conditions on January 22 could have rendered the earlier calculations inappropriate. An incorrect parameter value can affect the retarding force calculation and result in an incorrect target exit speed from the retarders.

The current *Transportation of Dangerous Goods Regulations* are based upon actual coupling speeds.

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7 *Coupling Speed Survey: CN Hump Yards*, Executive Summary, CN, 07 December 2000.

8 TSB Hump Coupling Speed Requests, CN, e-mail sent at 0916, 30 May 2004.

However, the HPCS does not directly measure coupling speed. The DTC system within the HPCS can be used to estimate coupling speed based on the last measured speed. However, if there are discrepancies in the actual and predicted rollability of the rail car, the HPCS cannot adequately adjust for these differences once it has travelled past the group retarder. Without systems to measure coupling speeds directly and to alert hump yard staff to overspeed occurrences, the railways must rely on indirect means to assess compliance. TC conducts audits and performs random checks to monitor hump yard operations. However, the absence of a clear process for measuring coupling speed compliance presents the risk that the appropriate response and investigation protocols may not be in place. This situation results in rail cars involved in overspeed couplings continuing in service.

In this occurrence, once the leak in the tank shell was discovered, the shipper notified the car owner, marked the tank car to identify the damage, and then made arrangements to send the tank car as an unrestricted movement to the owner’s repair facility. The shipper followed the reporting and response procedures that he was familiar with when encountering tank car defects. However, the shipper had never previously encountered an incident where there was damage to the tank shell that affected the structural integrity of the tank car. Therefore, the shipper was not aware of TC’s requirement for special reporting and for the need to obtain movement authority for a rail car with this type of damage.

Findings as to Causes and Contributing Factors

1. The cracked tank shell and subsequent loss of the product from car PROX 77811 was likely caused by the final fracture of a pre-existing crack in the stub sill area following a high-impact load from an overspeed coupling.

2. On the day of the occurrence, tank car PROX 77811 had been incorrectly categorized as a non-regulated empty rail car in the hump process control system (HPCS), thereby allowing it to be released from the hump as a two-car movement with a target coupling speed of 7 mph rather than 6 mph.

3. After the humping operation on 22 January 2003, when the coupling speed was estimated to be 13.54 mph, tank car PROX 77811 was not identified as being involved in an overspeed coupling, allowing it to continue in service without a mechanical inspection and resulting in the subsequent loss of the product.

Findings as to Risk

1. The absence of a clear coupling speed compliance measurement process for hump yard operations presents the risk that the appropriate response and investigation protocols may not be in place. This results in rail cars involved in overspeed couplings continuing in service.

2. Although car PROX 77811 was visually marked to identify the crack in the tank shell, the shipper was not aware of Transport Canada's requirement to report and obtain movement authority for a rail car with this type of damage and, therefore, allowed the damaged tank car to return to service as an unrestricted movement.

Safety Action Taken

Canadian National

In April 2003, Canadian National (CN) implemented software changes to the hump process control system (HPCS) to help identify rail cars involved in potential hump overspeed occurrences.

In June 2003, CN established a response protocol for handling potential overspeed couplings. This response protocol includes the activation of an alarm if a high-impact coupling involving a Special Car Handling rail car is suspected. The Hump Yard Master is required to acknowledge the alarm and then contact the Mechanical Department for a follow-up inspection.

CN continues to conduct periodic radar checks of group retarder exit speeds and actual coupling speeds. CN has also instituted a requirement that empty (residue) dangerous goods tank cars are not to be humped in multi-car cuts.

Transport Canada

In response to TSB Rail Safety Advisory 01/03, *Overspeed Coupling of Special Car Handling (SCH) Tank Cars at MacMillan Yard, Toronto*, Transport Canada (TC) expressed concern over yard humping operations. Random checks of hump yard records and the railways' humping protocols provide a level of safety, but a more comprehensive verification process is needed to ensure that railways are in compliance with the *Transportation of Dangerous Goods Regulations*. Consequently, TC has initiated the Hump Yard Control Systems Assessment Study to gain an in-depth understanding of how the speed of dangerous goods rail cars are controlled in Canadian hump yards.

The study will target:

- hump yard configurations;
- measuring and operating control systems;
- support systems;
- system control parameters;
- system control logic; and
- procedures – target and actual speeds.

Meetings regarding this matter are being held with CN and Canadian Pacific Railway (CPR) at each railway yard in Canada.

TC met with personnel from the fuel loading facility, and other larger shippers of dangerous goods, to review regulatory requirements regarding the reporting of rail cars in the event that their structural integrity is compromised.

Fuel Loading Facility

The fuel loading facility conducted a review of its written procedures and is revising content where required.

Safety Concern

Identification and Inspection of Overspeed Coupling Events

The development of new *Transportation of Dangerous Goods Regulations* is a major step towards improved safety in railway hump yard operations. The coupling speeds for the *Transportation of Dangerous Goods Regulations* are based on tests conducted by the National Research Council of Canada (NRC).[9] These tests identified the maximum speed at which coupling can occur without generating forces that exceed the Association of American Railroad minimum longitudinal force specification for tank cars.[10]

Despite safety action taken to date, including the implementation of procedures that provide a level of verification and compliance, the current system is not foolproof.

CN conducted its own survey of coupling speeds in its hump yards in 2000 and concluded that "HPCS predicted coupling speed cannot be used to constantly estimate actual coupling speed." CN has adopted a process for determining overspeeds using speed measurements at the group retarder, similar to a procedure already in place at other Class 1 railway hump yards. However, the relationship between group retarder exit velocities and actual coupling speeds has not been verified. Of the five overspeed coupling events identified by CN, three of these occurrences would not have been identified as overspeeds by this protocol. The reliance solely on the target and actual group retarder exit velocities to identify overspeed couplings is not fail-safe.

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9 R. Dong and D. Militaru, *Dynamic Structural Characterization of Stub Sill Tank Cars Utilizing ADAMS and ANSYS Simulation Models*, Report 1: "The ADAMS System Dynamic Model – Its Validation and Application to the Characterization of Impact Forces," Centre for Surface Transportation Technology (CSTT), NRC, CSTT-RYV-TR-010, March 1997; Report 2: "ANSYS Finite Element Modelling – Its Validation and Application to the Characterization of Impact Forces," CSTT-RYV-TR-010, March 1997; "Tank Car Derailment Analysis," CSTT-RYV-CTR-25, March 1997; and J.Z. Zu and R. Dong, *Multi Tank Car Impact Tests and Analysis*, Report 3: "ADAMS Model Simulations of Tank Car Impact," CSTT-RVC-TR-033 TP 13359E, October 1998.

10 Association of American Railroads, *Manual of Standards and Recommended Practices*, "Specifications for Tank Cars," Section 6.2.3.1, Washington D.C., January 1996.

Without the means in place to directly measure actual coupling speeds or the longitudinal force generated during coupling, the TSB remains concerned that current hump yard protocols will allow rail cars involved in overspeed couplings to continue in service.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 04 August 2004.