



OTIF/RID/CE/GTP/2016/8

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(Prague, 22 – 24 November 2016)

Subject: Derailment of a goods train in Daillens on 25 April 2015 – investigation report

Information from Switzerland

Introduction

1. On 25 April 2015, a train containing dangerous goods derailed in Daillens in Switzerland. The Safety Investigation Service SESE issued its investigation report on this accident on 22 September 2016. We thought it would be interesting to inform the members of the OTIF working groups TECH and RID of the results of this investigation. As the accident report is only available in French, we have reproduced the summary below, with thanks to the OTIF Secretariat for the translation.
2. This document also includes some brief information on a subsequent event.

I. Derailment in Daillens

Brief outline

3. On Saturday, 25 April 2015 at 02.49, the last five wagons of freight train No. 60700 between Basel and Lausanne marshalling yard derailed on open track at kilometre post 19.0 situated in the commune of Daillens. The train was composed of 22 wagons, 14 of which contained dangerous goods.
4. A few hundred metres before the spot where the derailed wagons stopped, the 20th wagon lost some parts of the bearing from one of its bogies. When travelling over a set of points situated a little before a right-hand curve, the wagon derailed and swerved to the left-hand side of the track, the dynamic effect of which was to overturn the two wagons in front and the wagon behind, and to derail the first bogie of the last wagon in the train.

5. Wagons Nos. 18 to 21, which all contained chemical products, overturned onto their sides. When the wagons overturned, the tank of wagon No. 19, which contained 25 tons of sulphuric acid, was damaged, letting its contents leak onto the area alongside the tracks. As a result of the surge forward of the two wagons situated behind it, wagon No. 20 spun half way round on itself before overturning on the verge of the track. Its tank was damaged and leaked around 3000 litres of caustic soda.
6. Following the overturning of wagon No. 18, the coupling connecting the 17th and 18th wagons broke. Owing to the dynamic constraints produced when the wagons overturned, the first axle of wagon No. 17 derailed. The two locomotives and the first 17 wagons stopped around 600 metres after the spot where the wagons went down.

Causes

7. The direct cause of the derailment of train No. 60700 in Daillens was the loss of the front left axle box of wagon No. 20.
8. This axle box was lost as the result of a long process that started during the maintenance work on the said axle box in August 2011. During that work, the safety disk of the grooved nut that fixes the bearing to the axle journal was not correctly secured. Little by little, the grooved nut became unscrewed, which gradually caused the following deterioration:
 - crossways stress on the axle box rollers,
 - increase in lateral movements of axle 1 and appearance of S-shaped excoriations on the surface of the wheels on this axle,
 - fatigue, then cracking of the spring leaves on the primary suspension of axle 1 left.
9. Ultimately, this deterioration caused the derailment of wagon No. 20 in Daillens.
10. The results of the investigations enabled the following contributory factor to be highlighted:

The ECM certification and the IPV inspections did not detect any faults in the quality assurance system for axles of the entity in charge of maintenance for wagon No. 20.

Safety recommendations

11. Based on the irregularities noted during the investigation and in accordance with Article 44 of the law on safety investigations in the event of incidents during transport (RS 742.161), the investigation service gave the Federal Office of Transport (OFT) an intermediate report containing two safety recommendations dated 12 November 2015.
12. On 7 December 2015, the OFT informed the SESE of the progress in implementing these two safety recommendations.

Safety recommendations issued in the intermediate report

Corrective measures in the axle box mounting process

Safety deficit

13. The presence of solid foreign bodies (of mineral origin or in the form of residues of metallic particles) in the lubricant of axle box bearing can cause a blockage in the rollers, then produce rapid heating that can lead to the destruction of the bearing. The blockage of an axle bearing can cause a wagon to derail.
14. The presence of cleaning liquid in the bearing of an axle box does not represent an immediate risk of blockage, but deteriorates the quality of the lubricant. Over time, degraded lubricant can cause the running gear to heat and lead to the progressive deterioration of the bearing before it reaches the next maintenance deadline.

Safety recommendation No. 86

15. The SESE recommended to the OFT that through the certification body, it should have immediate corrective measures carried out in the process for mounting axle box bearings at the ECM accredited maintenance workshop.
16. OFT's response concerning the implementation of safety recommendation No. 86 was as follows:

"The maintenance workshop inspected by the SESE on 28 October 2015 is in possession of a certificate to carry out maintenance in accordance with European Directive (EU) No. 445/2011. In view of Article 5j paragraph 2 EBV, the certification body carried out a responsive monitoring audit on 11 and 12 November 2015. The potential improvements demonstrated by the certification body were immediately implemented by the workshop.

A second audit carried out by an expert specialising in axles on 16 November 2015 confirmed the effectiveness of the measures that had been implemented. This safety recommendation has been implemented."

Information for wagon keepers concerning potential risk with axle boxes

Safety deficit

17. The quality defects in maintaining axles boxes, such as those noted during the inspection on 28 October 2015, can affect a considerable number of axle boxes currently in service. They constitute a latent safety deficit.

Safety recommendation No. 87

18. The SESE recommended to the OFT that it should inform the owners of wagons whose axles had been maintained by the undertaking that inspected the axles on wagon 3380 7874 432-7 that the axles on these wagons may present irregularities in their bearings, so that the keepers of these wagons could carry out checks and take suitable corrective measures if need be.
19. The OFT's response concerning the implementation of safety recommendation No. 87 was as follows:

"The workshop submitted to the OFT the steps planned with regard to axle boxes that might be defective. It established the period during which there were deficiencies in maintenance and determined the number of axles concerned. In all, 1300 axles dealt

with in the period between 2 January and 28 October 2015 might be affected. According to a statement from the workshop, the random checks carried out on the axles processed during the said period did not reveal any irregularities.

After consultation with the OFT, the agents concerned and the ECMs were informed by the maintenance workshop directly. The ECMs are requested to verify the points at issue and to take the necessary measures if need be. As a result, the OFT has refrained from notifying the agents and ECMs directly. This safety recommendation has been implemented.”

Safety recommendations resulting from this report

Rail markers

Safety deficit

20. When a wagon overturns in a derailment, the presence of protruding objects at the edge of the track, such as rail markers, can cause damage to the jacket of the wagon and leakage of the contents, which can represent various hazards for people and the environment. These rail markers are no longer used today. Removing them has helped to reduce this risk to a considerable extent.

Safety recommendation No. 93

21. In order to reduce the risk of wagons being damaged in a derailment, the SESE recommends to the OFT that it should quickly remove protruding rail markers that are still in place at the edge of the tracks.

Monitoring system of the train control device

Safety deficit

22. At present, there are no provisions or standardised rules for setting a limit value for the dynamic wheel load coefficient. In addition, there is no catalogue of probable irregularities that might be the origin of such a notification.
23. When a “hot box” or “brake applied” notification is issued, the cause of the irregularity can easily be identified. In contrast, as demonstrated by the accident in question, deterioration inside an axle box can cause vibration, but may not yet cause a detectable increase in the temperature of the axle box. For a transport undertaking that has no knowledge of the elements that might cause such a defect, it is difficult to interpret the fault and prescribe suitable control measures. However, rapid intervention on an axle box that is in the course of deteriorating would considerably help reduce the risk of the box being destroyed and hence the risk of derailment in cases where the bearing has become blocked or if the box begins to become loose.

Safety recommendation No. 94

24. The SESE recommends to the OFT that it should encourage use of the system for measuring the dynamic wheel load coefficient and have a standardised technical basis established indicating the limit values for defects, and a catalogue of defects associated with such notifications, so that when transport undertakings receive such a notification, they can prescribe suitable control measures.

Bundles of trapezoidal leaf springs
Safety deficit

25. Leaf spring bundles are essential elements of a mounted axle. They are one of the guarantors of contact between the wheel and the rail. The fracture of a bundle of leaf springs causes the axle to become asymmetrical and, depending on the geometry of the track and the load conditions of the axle, can cause lifting of the wheel and lead to a derailment.
26. The values from the strength diagram obtained in an inspection on the test bench for a bundle of leaf springs may very well remain within the tolerance limits allowed, even though one or more of the springs shows signs of beginning to crack. It is not possible to detect any cracks visually in a bundle of leaf springs comprised of eight leaves mounted on top of each other. During the inspection, merely checking the strength diagram does not guarantee that the bundle of leaf springs is free from cracks, which are themselves the reason for a probable fracture in the bundle of leaf springs.

Safety recommendation No. 95

27. The SESE recommends to the OFT that it should have adaptations made to the technical specifications for the inspection of leaf springs when they are being serviced, so that in addition to checking the strength diagram, an additional check enabling any crack initiation to be detected in the springs is also prescribed.

ECM certification of workshops in charge of maintenance
Safety deficit

28. In terms of safety, wagon axles are important parts of the rolling stock.
29. The current certification system functions on the basis of economic principles which often take precedence, to the detriment of safety. As the accident in questions has shown, during the annual audits, the certification body did not carry out the entire audit itself, but for the “workshop work” part, used as a reference the technical assessment carried out by a body managed and represented within its structure by the wagon owners. Although compliant, this practice raises the question of whether independence is ensured in a certification procedure.

Safety recommendation No. 96

30. The SESE recommends to the OFT that it should seek adaptations to the ECM Regulation concerning the certification of entities in charge of maintenance, so that the certification and auditing of maintenance workshops (function “d” of the ECM system) is no longer delegated to third parties, but is placed under the responsibility of the national supervisory authorities.

II. Using salvage tank-wagons

31. The dangerous goods in the overturned wagons had to be pumped into other wagons to be taken away. For the hydrochloric acid, an SBB salvage tank-wagon was used. The salvage tank-wagon is only suitable for this substance under certain conditions and for a limited period. It is not yet known whether this was known when loading the substance at the accident spot. When moving the wagon from Daillens to Schweizerhalle via Monthey, the participants were unaware of this. This meant that the consignee company assumed that the tank-wagon was one that was suitable for the carriage of hydrochloric acid and

stabled the salvage tank-wagon on a branch line for 16 days until the internal investigations had been completed.

32. On 15.05.2015, a company employee noticed that vapour was forming over the manhole cover and alerted the fire brigade. The industrial fire brigade Regio Basel reached the site very quickly.
33. The hydrochloric acid had reacted with the high-grade steel wall of the breakdown salvage tank-wagon. This formed hydrogen and increased the pressure. The hydrochloric acid damaged the fittings and seals, whereby the excess pressure was able to escape via the manhole cover. Intervention by the fire brigade was hindered by the assumed high pressure of 2 bar, the damaged fittings (2 out of 3 were unusable) and the escaping hydrogen (> 1000 ppm). The operation was completed after 10 hours. Nobody was injured. The salvage tank-wagon was materially damaged.
34. SBB has checked its internal procedures for using chemical salvage tank-wagons and replacement tanks in accidents involving dangerous goods and has adapted them accordingly. Implementation is underway.

III. Proposal

35. Owing to time constraints, the Federal Office for Transport (OFT) has not yet taken a position on the recommendations made. We are not therefore making any specific proposals, but the following procedure is proposed to the respective working groups:
 - a) The working groups note the information above, particularly the safety recommendations that have been made.
 - b) They decide whether it is necessary to take any action.
 - c) The RID Committee of Experts' standing working group responds in particular to the following question.

Question: Responsibilities of the railway infrastructure manager

36. As the accident in Viareggio has already shown, the presence of protruding objects at the edge of the tracks, such as rail markers, can damage wagons when they overturn after a derailment.
37. This being an aspect of the infrastructure linked specifically to safety in the carriage of dangerous goods, RID could prescribe that the infrastructure manager is obliged to assess the presence on his facilities of objects that might perforate tanks in the event of an accident, and to remove them as far as is technically and financially possible.
38. Might it then be a good idea to supplement the obligations of the railway infrastructure manager listed in RID 1.4.3.6?

Reference documents

SESE investigation report of 22 September 2016 (available in French only)
http://www.sust.admin.ch/pdfs/BS//pdf/2015042501_ZB.pdf