



Translation of an excerpt of the investigation report

“Vehicle fire, 09/07/2020, Hausach station – Haslach station”

status as of 31/03/2022, version 1.0.

Note:

In accordance with Article 3 of Implementing Regulation (EU) 2020/572, points 1, 5 and 6 of Annex I of an investigation report shall be written in a second official European language. This translation should be available no later than three months after the delivery of the report.

The following English translation is a corresponding excerpt of the investigation report. The German language version is authoritative.

Excerpt translation:

1 Summary

The first section contains a brief description of the event, as well as information on the consequences, primary causes and safety recommendations provided in the individual case.

1.1 Brief description of the event

On 09/07/2020 at around 11:04 a.m., the overhead-line observation coach running as NbZ 19964 came to a standstill on the track between the Hausach and Haslach stations due to a vehicle fire. As the event progressed, the burning vehicle started moving independently and rolled downhill without a driver for around 22 km.

1.2 Consequences

No people were injured during the event. An intentional derailment at Gengenbach station was used to stop the moving vehicle. The vehicle suffered a total loss. There was isolated damage to the infrastructure in the area of the derailment. Before the derailment, the burning vehicle caused several lineside fires along its route.

1.3 Causes

Due to a leaky hydraulic motor, components in the underfloor area of the overhead-line observation coach caught fire. Due to the exposure to fire, the function of the brake systems was considerably impaired, meaning that after the driver had left the overhead-line observation coach the vehicle rolled away in an uncontrolled manner.

1.4 Safety recommendations

The following safety recommendation is issued in accordance with section 6 of the Eisenbahn-Unfalluntersuchungsverordnung (EUV, German railway accident investigation regulation) and Article 26(2) of Directive (EU) 2016/798:

It is recommended that risk-minimizing measures to prevent an uncontrolled course of events should be developed for vehicle of the 711.1 series and these should be implemented in an action plan. In this case, particular consideration should be given to measures relating to the outbreak and detection of fires, as well as the optimisation of the brake system.

5 Conclusions

The following section contains a summary of the causal, contributing and systemic factors identified. In addition, there are two further sub-sections to provide information on measures already taken and additional observations.

5.1 Summary and conclusion

In summary, it can be determined that the fire event was caused by a release of hydraulic oil on hydraulic fan motor 3 of the traction motor cooling system for traction motor 2, triggered by a seal that was not functioning in line with the specifications. The situation was facilitated by the spatial proximity of hydraulic fan motor 3 to the turbocharger of traction motor 2, which resulted in the ignition of the aerosol. Due to the escape of the pressurised air current induced by the fan, the fire then intensified underneath the vehicle, without being noticed by the train crew, and spread to the area of the operating motor and rear traction motor 1. The absence of a fire alarm system allowed the fire to intensify unnoticed.

The cause of the vehicle rolling away in an uncontrolled manner was an impairment of the electrical system in the central cable duct. As a result, an automatic train stop was indeed initially triggered, which alerted the crew to the presence of a fault. However, the cause and the extent of the fault remained unclear. Facilitated by the spread of the fire, which had already advanced significantly without being noticed, after the vehicle came to a standstill the effect of the automatic train stop was quickly cancelled again due to the deflagration of a brake hose on bogie 1 caused by the fire. In addition, it was no longer possible to activate the parking brake because the electrical push button in driver's cab 2 was no longer working. As the brake cylinder of the spring-loaded brake was exposed to air independently of the missing brake cylinder pressure, its mechanical holding function was not activated. The stated factors resulted in the overhead-line observation coach unintentionally rolling away after the automatic train stop

In accordance with Ril 915.0107 section 2 paragraph 1, on inclines the brakes must be applied so that the permitted speed is kept as even as possible. The reasons for the driver's striking

sawtooth-like driving are not known. In the opinion of the fire assessor, this driving on the incline could have provided favourable conditions for the fire event due to numerous load changes in the hydraulic circuit, but could not have caused the fire.

It was necessary to leave the vehicle after the automatic train stop to examine the situation in more detail and for personal protection. At this point, neither of the personnel were aware of the significance of the effects of the fire, in particular to the power supply and the brake system of the overhead-line observation coach. Accordingly, they would not have expected that the activated compressed-air brake would release again so quickly after the automatic train stop. In addition, it is highly likely that the driver was not aware that the spring-loaded brake was no longer applied/could no longer be applied in spite of the push button being pressed. In this respect, there was also no reason to inspect the condition of the spring-loaded brake on the brake indicator on the frame. In addition to this, it was no longer possible to manually activate the spring-loaded brake directly on the impulse valve due to the brake equipment cabinet being inaccessible in the workshop area (smoke development inside). The wheel chocks stored there were also no longer accessible.

After the unintentional rolling away, the employee, who had jumped up again, activated the emergency brake device. However, operating the emergency brake lever had no effect because at this point the compressed air system was already depressurised. Operating the additional brake (direct brake) also had no effect, because this used the same (burst and de-aerated) brake cylinder compressed air system via a control valve in the area of the bogie. Due to the failure of the power supply to driver's cab 2, any other electrically-operated devices no longer worked.

Result:

Analysis of the fire event has provided clear indications that the fire was caused by a technical fault. A more detailed investigation of the structure and functionality of the brake system of the overhead-line observation coach showed that the development and spread of the fire caused the failure of the electrical system and several components of the brake system. The actions of the personnel involved had no influence on either the occurrence of the fire or the unintentional rolling away of the overhead-line observation coach.

5.2 Measures taken since the occurrence

The present event was the second fire with a similar cause in vehicle of this series. As a result, further corrective measures to sustainably reduce the risk of similar fire incidents with corresponding consequences in the short and medium term were announced in order to ensure safe rail operations. On the part of the keeper DB Netz AG machinery fleet, in line with the recommendations from the fire assessor, repeated regular tightness tests were carried out on the hydraulics components of the vehicle in question every 30 days. This immediate measure will apply until structural changes have been implemented. The drivers were provided with information and instructions for similar cases as operational first measures, which in particular included the feature of the indicator lamp for "spring-loaded brake applied". The drivers were obligated to check the application status of the spring-loaded brake externally on the brake indicator when leaving the vehicle.

According to the recommendations of the fire assessor from TÜV Süd [Technical Inspection Agency] and the findings of the EBA [German Federal Railway Authority], a number of possible improvement measures were specified that would be suitable to ensure the safe operation of

this vehicle series in future. In this case, the focus was on measures to reduce the risk of a fire occurring by removing known error sources as well as reducing the risk of unintentional consequences of a fire spreading without being noticed by detecting fire incidents as early as possible.

Topics related to fire:

- replacement of hydraulic motors for the traction motor fans
- retrofitting an early fire detection system

In relation to the conceptual design of the early fire detection system, the preparation of a fire risk analysis was initiated. This is intended to ensure that possible sources of ignition and fire loads are given sufficient consideration when designing the early fire detection system.

Further measures were initiated in relation to the systemic defects identified in the brake system during the investigation of the event:

- altered activation of the spring-loaded brake
- pneumatic decoupling of the compressed-air brakes on both bogies (brake cylinder pressure)

The EBA is supervising and monitoring the implementation of the measures as part of the vehicle supervision and hazard prevention.

In relation to the brakes, the company Knorr-Bremse worked with the manufacturer GBM to develop a modification option that appears to be suitable to improve the identified problems when activating the spring-loaded brake and to minimise the failure scenario in the event of leaks in the brake cylinder pressure circuit. Tests are currently being conducted to see whether the measure meets the current requirements for brake systems of the Technical Specifications for Interoperability “vehicle – Locomotives and Passenger Carriages” (TSI LOC&PAS).

5.3 Additional observations

The investigations conducted did not provide any contribution on this point.

6 Safety recommendations

The following safety recommendations are made in accordance with section 6 of the EUV and Article 26(2) of Directive (EU) 2016/798:

No.	Addressee and safety recommendation	Relates to company
2/2022	National safety authority: It is recommended that risk-minimizing measures to prevent an uncontrolled course of events should be developed for vehicles of the 711.1 series and these should be implemented in an action plan. In this case, particular consideration should be given to measures relating to the outbreak and detection of fires, as well as the optimisation of the brake system.	Keeper/railway undertaking