Investigation Body for Railway Accidents and Incidents

Bulletin of General Information

Derailment of a Lineas freight train

Aubange - 19th May 2017

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Rev 0.3 - 31st July 2017

1. GENERAL INFORMATIONS

Nature of the accident

Derailment of a freight train on regular track.

Type of investigation

Significant accident with safety investigation.

Date and time of the accident

22th May at ± 03:03am.

Place of the accident

Line 165, in Aubange

Train

Freight train from LINEAS
Derailed wagon : Type Sggmrs - Vehicule n° 3368495200729
Registered in Germany
Manufacturing Year : 2003
Owner : VTG Deutschland GMBH
Keeper : VTG Schweiz GmbH

Victims

No

Damages

Important damages to the infrastructure on a distance of ±14 km
Important damages to the 2 last wagons (not laying down on its flank)
Wheel fracture of the wagon n° 3368495200729
Interruption of traffic

Recommendations

The Joint Network Secretariat Panel (JNS Panel) decided on 12 June 2017 to launch the Urgent Procedure, as a response to request 01/2017 raised by NSA Italy due to several incidents on wheels BA314 / ZDB29 and BA004.

A Task Force was created. To fulfil its mission, the Task Force involves several experts (in design, manufacturing and maintenance of wheels and running gear of freight wagons, composite brake blocks within freight operations,...).
Mandate of the Task Force was to deliver as soon as possible and in any case not later than 31 July 2017 an action plan addressing the mitigation measures having short term impact.

The Agreement of the Task Force on short term mitigation measures is in annex of this bulletin.

We recommend to all belgian concerned actors to take into account the proposed solutions in annex : introduction of additional measures in operation, wagon and off vehicule wheelset maintenance.

All belgian concerned actors are also invited to report to the belgian NSA any detected single cracks on the wheel tread and/or any indication of thermal overload of the wheel (burnt paint, excessive wheel deformation) - see criteria in the annex.

2. DETAILS

Last revision of the wagon 3368 4952 072
From 27 October till 25 November 2015
EM Workshop Euro Maintenance Rail in Duisburg

Wheelset type
The wheelset with the number 028 104.
The axle was produced in 2001 by Bonatrans.
The wheels were also produced by Bonatrans in 2006.
Wheel & wheelset type ZDB29 (wording Bonotrans) R1A (wording VTG/AAE)
Massa per wheel : 25 T
Brake bloc type : LL
Brake type : KE GP-A
Place of the axle on the wagon : 3-3' (3)

This wheelset 028 104 had the last big overhaul (IS 2) in EM Kaiserslautern at 29.10.2015
Diameter of the broken wheel in 2015 : 859 mm
Reprofiling performed in 2015 from 868.2 to 859.4 mm
Owner : AAE

Facts

The train leaves the station of Virton (Belgium), destination Mortara (Italy).
After several kilometers, the right wheel of the second bogie of the vehicule n° 3368495200729 breaks (before last wagon).
The train continues its traject on a distance of ±14 kilometers till Aubange where the the two last wagons (of same type) derail on switches, after damages the track on this distance.
The train driver stops the train after detecting a light air leak. At the same time, he receives a GSM R alarm from the signalisation cabine.

Direct Cause

According to first elements in our possession, the derailment has most probably been caused by the fracture of the wheel.

On-going Safety investigation

Four pieces of the broken wheel were found back during the on-site investigation : these pieces and other wheelsets are transfered to a laboratory to perform several tests and analyses.

Joint Network Secretariat
Urgent Procedure Task Force
Broken wheels

Agreement of the TF on short term mitigation measures

28th July 2017

Task Force Broken wheels – Proposal Short Term measures
Summary

Incidents on wheels BA 314 / ZDB29 (with a slope under the wheel flange) and BA004 in some application show that the actual maintenance plan
and operational schemes have to be better kept under control the affected wheelsets.

Solution:
Introduction of additional measures in operation, wagon maintenance and off vehicle wheelset maintenance.

Operation and wagon maintenance
- Visual inspection of the wheels before departure
- Inspection of the wheels during change of brake blocks
- Visual inspection of the wheels in workshops (complementary to EVIC)
- Elimination of the marking for thermostable wheels (removal of white stripes on axle box)

Off vehicle wheelset maintenance
- Intensified measures after findings in operation and wagon maintenance
- Stronger criteria for residual stress measurements

Task Force Broken wheels – Proposal Short Term measures

Operation and wagon maintenance – to be implemented generally and immediately

Measure	Visual inspection of the wheels before departure	Inspection of the wheels during change of brake blocks (in and outside of workshop)	Information to the Workshops	Visual inspection of the wheels in workshops (complementary to EVIC)	
who	**All** RU	**All** affected ECM in case of order repairs (not valid for GCU repairs)	**All** affected ECM	In case of GCU repairs: **All** ECM and RU	In case of ordered repairs: **All affected** ECM
Scope	• wagons with composite brake blocks • all wheel types (even wheels with white stripe) • limited to visible parts of the wheel	• wagons with all kind of brake blocks • wheel design BA 314 / ZDB29 (with a slope under the wheel flange) and BA004 • limited to visible parts of the wheel	• Information to the Workshops on ECM's instructions • wheel design BA 314 / ZDB29 (with a slope under the wheel flange) and BA004	• Systematic for all wheel types	• wheel designs BA 314 / ZDB29 (with a slope under the wheel flange) and BA004
Criteria	Visual inspection: • single cracks on the wheel tread (see pictures given in page 8) • Cracks in rim and web (Annex 9 GCU) • any indication of thermal overload of the wheel (Annex 9 GCU)	Visual inspection: • single cracks on the wheel tread * • Cracks in rim and web • any indication of thermal overload of the wheel** Sound checks of the wheel (outside of workshops, while brakes are released)	• Order visual inspection during change of brake blocks • White stripe suppression • Implement measures in "off vehicle Wheelset maintenance" • Individual relevant measures (e.g. maintenance plan, equipment, mileage)	Visual inspection: • single cracks on the wheel tread * • Cracks in rim and web • any indication of thermal overload of the wheel**	Visual inspection: • single cracks on the wheel tread * • Cracks in rim and web • any indication of thermal overload of the wheel** • **White stripe suppression**
Measures on findings:	• dispatch wagon to workshop • Off vehicle wheelset maintenance **(ECM)**	• dispatch wagon to workshop • Off vehicle wheelset maintenance **(ECM)**	• E.g. Maintenance plan review, braking equipment adaptation	• Off vehicle wheelset maintenance **(ECM)**	• Off vehicle wheelset maintenance **(ECM)**

* single cracks on the wheel tread ("isolated transverse cracking" cf. EN 15313 §C.2.6 and 6.2.3.4) – Criteria: see slide 8

** any indication of thermal overload of the wheel (burnt paint, excessive wheel deformation, cf. EN 15313 §C.3.2.2 and 6.2.4.3) – Criteria: see slides 9 and 10

Task Force Broken wheels – Proposal Short Term measures

Off vehicle wheelset maintenance - to be implemented generally and immediately

Measure	Elimination of the identification for thermostable wheels	Intensified measures after findings in operation and wagon maintenance	Stronger criteria for residual stress measurements	NDT of the web
who	**All** affected ECM	**All** affected ECM	**All** affected ECM	**All** affected ECM
Scope	• wheel designs BA 314 / ZDB29 (with a slope under the wheel flange) and BA004	• wheel designs BA 314 / ZDB29 (with a slope under the wheel flange) and BA004	• wheel designs BA 314 / ZDB29 (with a slope under the wheel flange) and BA004	• wheel designs BA 314 / ZDB29 (with a slope under the wheel flange)
Measure (see also boundary conditions)	• remove white stripe marking on bearing box cover	• Reprofiling • Residual stress measurement • NDT of the tread	• First check and after signs of thermal overload • Generally reduced limit 300 MPa instead of 400 MPa	• All steps in off vehicle wheelset maintenance: NDT of the web

Task Force Broken wheels – Proposal Short Term measures

Definition, Implementation and follow up

Definition "Affected ECM":

- ECM which uses the defined wheel types and may be faced with similar defects (broken wheels and cracks in rim and web) which has to be checked by every ECM under its own responsibility based on a documented risk analysis

Implementation:

- Urgent procedure TF on broken wheels prepares the documentation for the publication/dissemination (letter and presentation) after endorsement by the JNS panel
- Publication of documentation on the ERA website
- Additional dissemination of documentation by the representative bodies (CER, EIM, ERFA, UIP, EPTTOLA, UNIFE, NB-Rail AISBL, UIRR, UITP, ALE, ETF, FEDECRAIL) and official organisations (OTIF, NIBs, NSAs) and ECM certification bodies and UIC
- ECMs must produce an auditable programme concerning application of short term measures based on a risk analysis
- The short term mitigation measures at this stage are covering conventional wagons and wagons for the transport of dangerous goods
- The short term measures are proposed by the task force as mandatory

Task Force Broken wheels – Proposal Short Term measures

Definition, Implementation and follow up

Follow up:

- The phenomenon needs to be further investigated after summer break in a smaller technical working group and regular JNS procedure:

✓ Sound check
✓ Usage of thermo sensitive paint on all wheels
✓ Circumstances (technical and operational, changes in-service conditions) and causes for the increase of broken wheels
✓ mid- and long-term measures (derived from the analyses of circumstances and cause)

Reminders:

- Relevant UIC guidelines are mandatory
- Each relevant defect (broken wheels and cracks in rim and web) detected during the application of short term measures must be sent to the relevant NSA and must lead to an update of the relevant Safety Alert

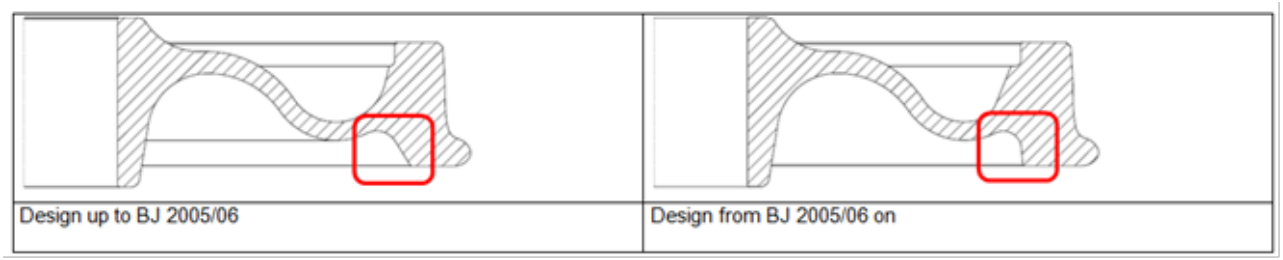
Open Point:

- Wheel issues have been reported by TF members which happened already years ago and neither an EU-wide information nor a JNS procedure had been initiated.

Task Force Broken wheels – Proposal Short Term measures
Additional information about BA 314/ ZDB 29

The wheel types BA 314 / ZDB 29 were produced in two versions.
The new version (build after 2006) was up to now **not** affected by relevant failures and can therefore be excluded from the special measures for wheel types BA 004 and ZDB 29 / BA 314.

Definition:
Wheelset type 314 / ZDB 29 with a slope under the wheel flange (probably produced until 2005/2006)

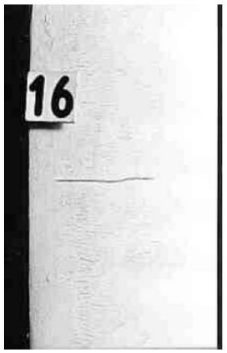


ZDB 29 Designs

Task Force Broken wheels – Proposal Short Term measures

Reference “single cracks on the wheel tread”

Description: The tread exhibits cracks at an angle of approximately 90° to the circumference of the wheel and have a typical length of 30mm or more. Transverse cracks generally develop at the surface in either straight or slightly crooked lines and can penetrate radially (usually of thermal origin in these cases) or branch out in a circumferential direction (usually of mechanical origin in this case). They occur individually and can be distributed at several points around the circumference. [EN 15313, §C.2.6]



Transverse crack revealed by magnetic particle testing [EN 15313, §C.2.6]

Example for single cracks on the wheel tread by visual inspection

Task Force Broken wheels – Proposal Short Term measures

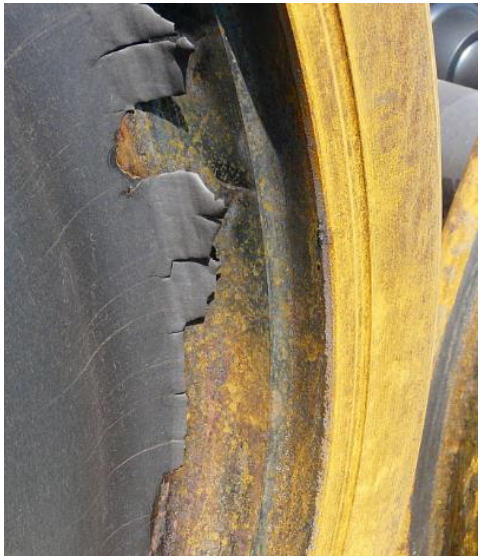
Reference “Thermal overload of the wheel”

Description: This type of defect occurs only in tread-braked wheels. When suitable coatings are used, the paint becomes clearly burnt in the rib/web transition radius when the temperature exceeds approximately 300 °C. The paint in this area then becomes cracked and peeling. The brake blocks are often melted to some extent. Build-up of metal and characteristic colouring can be seen on the tread. The rim may also become a bluish colour.

If the problem is not detected immediately the rim/web transition can gradually assume a rusty appearance with shades between greyish-brown and brown covering the whole circumference. [EN 15313, §C.3.2.2]

Overheating affecting the wheel rim/web transition [EN 15313, §C.3.2.2]

Old and fresh burnt paint



Task Force Broken wheels – Proposal Short Term measures

Reference “Thermal overload of the wheel”

colouring on the tread

Metal build up on the tread

Melted brake block

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http://www.mobilit.belgium.be