Winter conditions and composite brake blocks
Annex

VR Group, Finland

26.04.2016

Tanja Lähdetluoma

Director, European Affairs

Overview

- Composite brake blocks cause safety problems in Northern Europe
- Multiple near-miss situations and feedback from train drivers of braking problems after raw timber trains, consisting only of composite brake block equipped wagons, began operating.
- Incidents caused by prolonged braking distances due to accumulation of ice and snow

Actions taken

- Analysis of incident reports
- Analysis of weather conditions
- Analysis of information from train data recorder (”black box”)
- Feedback survey with train drivers
- Investigation of different technical solutions

No solution found to eliminate winter braking problems.

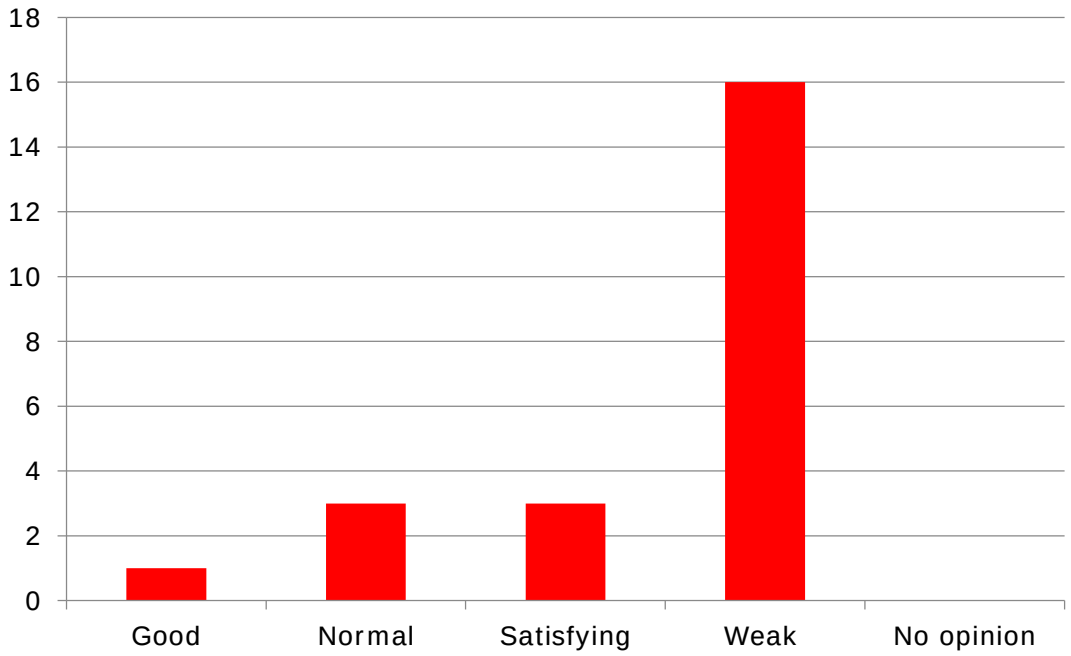
Incident reports

Date	Weather condition (if reported)	Incident Description	Braking details
25.2.2016	Temperature - 7 °C, little bit of powder snow.	Braking power very poor, no imminent danger	From low speed, the speed did not decrease on a gentle downward slope.
15.2.2016	Temperature -2 °C, rail tracks have been cleared of snow, moderate amount of powder snow.	Longer stopping distance than normal, no imminent danger	The stopping distance was approximately 2km at speed 60 kph (on a downward slope)
2.2.2016	-	Coupling difficulties during shunting works	Despite of full braking, the empty train did not stay in standstill when locomotive was being coupled
2.2.2016	-	Unpermitted passing of STOP-signal	The braking was initiated on the pre-signal, but due to poor braking perfomance, the train passed the STOP-signal.
26.1.2016	-	The train stopped on a hill due to poor adhesion and did not stay in standstill	The train did not stay in standstill on Hanhikoski hill despite of service braking. It rolled backwards approx. 150m after emergency braking.
22.1.2016	Temperature -15 °. Powder snow.	Poor braking performance on line	The distance to STOP-signal 1000 m and speed 40 kph when braking was initiated. The braking power appeared only 450 m before the STOP-signal. The train stopped 130 m before the STOP-signal
19.12.2015	Temperature 0 °C and snow.	The train did not stop in shunting works	The standstill train started rolling shunting works on a small downhill. The train stopped only after 200 meters of emergency braking.
29.1.2015	Snow on the rail tracks.	The train stopped on hill and did not stay in standstill	Train moved backwards 200m despite of emergency braking
20.1.2015	-	The train stopped on hill and did not stay in standstill	Train moved backwards 200m despite of emergency braking
16.1.2015	Temperature -20 °C and snow.	Too long stopping distance in shunting works	The stopping distance was 200m at speed 10 kph
13.1.2015	Temperature -22 °C .	Too long stopping distance in shunting works	The stopping distance was 400m at speed 20 kph
5.1.2015	-	Unpermitted passing of STOP-signal	The stopping distance was 300m at speed 35 kph

Feedback from train drivers

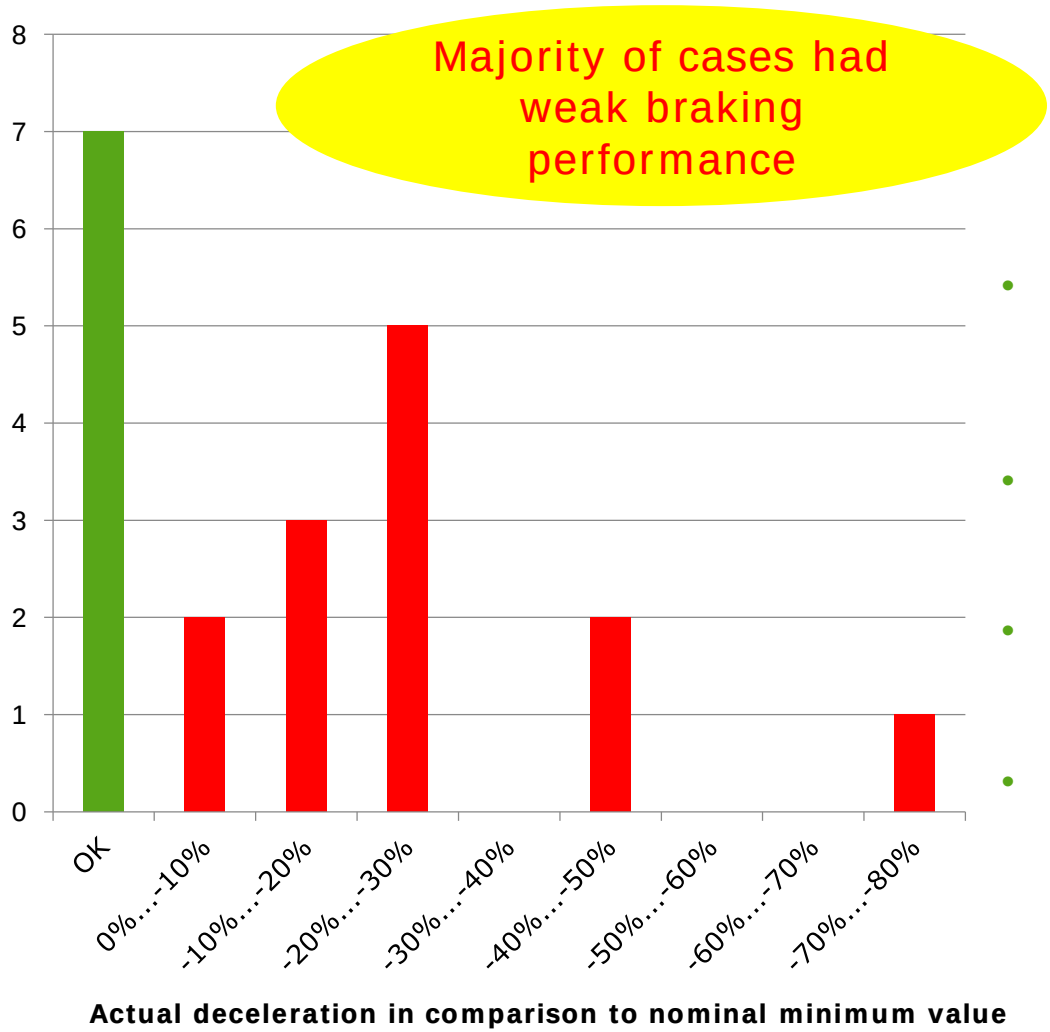
- Train drivers were invited to evaluate the braking performance of composite brake block equipped freight trains
- Feedback was collected with an electronic survey. The replies were collected between 10.2. – 6.4.2016.
- 23 replies from drivers of raw timber trains. The feedback included replies from both drivers performing commercial traffic and drivers performing shunting works
- 16 out of 23 train drivers evaluated braking perfromance of composite brake block equipped trains to be low

Assesment of braking performance



Majority of the train drivers considered the braking performance of composite brake blocks weak.

Analysis of train data recorder information of raw timber wagons



- Analysis of data collected from locomotives' data recorder in February 2016
- The data is from raw timber trains equipped with composite brake blocks. Data sample of 20 cases. Only data with over 5 second continuous braking were analyzed.

  Actual decelerations of the trains vs. nominal decelereations (according to ATC system values). The nominal values indicate the maximum allowed braking distance from specific speed.
- A track gradients and the charasteristic pressure of the brake pipe have been compensated in the calculations as a mitigating factor. This means the actual braking performance may be even less than indicated in the graph.
- Less than nominal decelerations are shown in the red piles, which indicate prolonged braking distances. Less than -40% would indicate a very low braking capability.
- 13 out of 20 cases in the sample material had prolonged braking distances, which means in these cases the braking performance is less than allowed
- 7 out of 20 cases in the sample material had normal braking distances. This variety in the results also indicates that the braking perfomance cannot be anticipated by the driver and the risk of sudden loss of brakes emerges.

Investigation of different technical solutions

- VR started operating raw timber trains equipped with only composite brake block wagons in commercial traffic in 2014. Earlier we had operated only with mixed train compositions: part of wagons were equipped with composite brake blocks, part were equipped with cast-iron blocks. The brake performance problems had not appeared earlier with mixed compositions.

- Based on the incident reports, it has been analyzed that specific locomotive or vehicle units do not have a correlation with the incident reports (reports include different locomotive and wagon units). The driver's age or work experience did not have a correlation either.

- Based on experiences of the first winter (2014-2015) we have tried to solve the problem technically and operationally. The raw timber train consists of a locomotive and 22 freight wagons
  - The brake type of the raw timber train was changed from G to P to provide more impulsive braking to remove ice and snow from the braking system.
  - During winter 2015-2016 we have tested a raw timber train composition so that the first and the last wagon is replaced with wagon with cast-iron blocks.
  - These measures have unfortunately been ineffective and have not provided a solution the problem.

- The technical solution to provide better braking performance is to increase the number of vehicles with cast-iron blocks significantly or to replace the composite brake blocks completely with cast-iron blocks.