

# Composite Brake Blocks in Finland

## Identified Hazards and Risk Management

Position Paper



DOCUMENT HISTORY

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**1 INTRODUCTION**

VR Group Ltd (VR) has been using C333 sintered K-type brake blocks in Snps and Snpss timber wagons, which are manufactured in two series between 2007 and 2014. Total amount of these wagons is 370 pcs. The brake block configuration is 2\*Bgu.

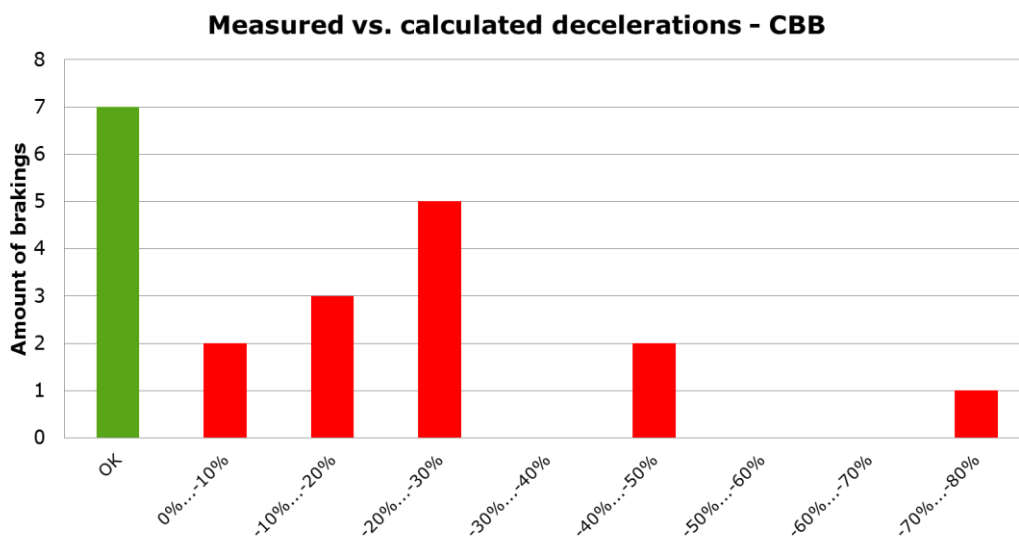
Between years 2007-2013 the wagons were used in mixed trains which consisted of Snps/Snpss wagons and Sp wagons with cast iron brake blocks. In 2014 VR decided to form trains consisted of only Snps/Snpss wagons. Quickly after starting the new operational concept, the train drivers began to report reduced braking performance of timber wagons. The reports related mainly to low speed braking in shunting work. Drivers reported of abnormal accumulation of ice between blocks and wheels.

VR has managed to keep the risk in control and no accidents have occurred from sudden loss of braking performance, but there have been serious incidents with a risk of collision, including signal passed at danger (SPAD). Further actions are needed to lower the risk.

**2 IDENTIFIED HAZARDS**

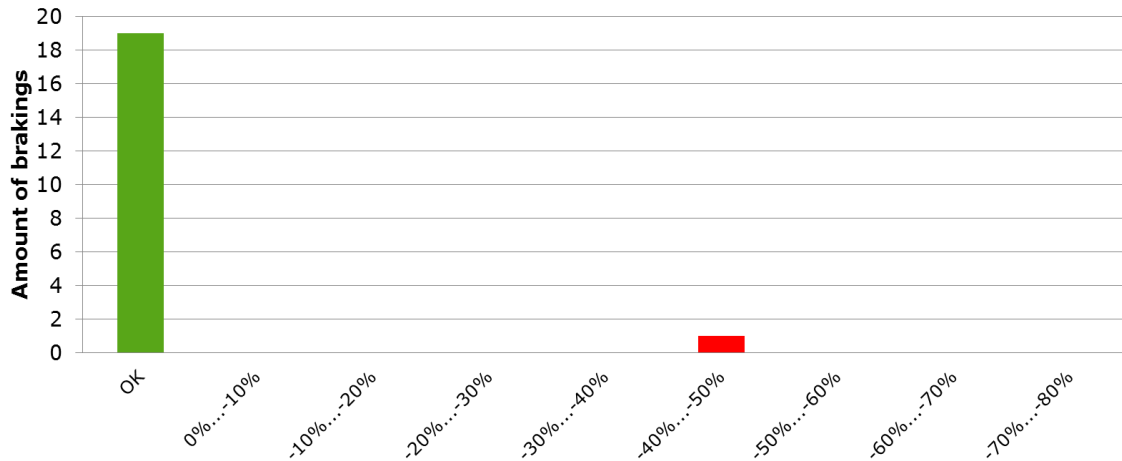
Composite brake blocks in Snps/Snpss wagons are causing sudden loss of braking performance, because of abnormal accumulation of ice between blocks and wheels. After the investigation of accumulating snow and ice it was seen that even a thin layer of snow and ice can lead to loss of braking performance. When compared to other types of wagons and brake blocks in Finland, the ice or snow layer may be built up very quickly, and this often comes as a surprise to the driver. Cold air merely doesn't cause the problem, it also needs blowing powdered snow. The worst conditions for snow and ice formation is in temperature 0...-5 °C with flying snow. The braking performance can be lost both in unloaded and in loaded conditions.

To get better understanding of the problem the deceleration data was collected and analysed from the train data recorders. The analysis includes data only from line operation. The statistics are indicative. Analysis revealed that the braking power with composite brake blocks varies a lot and it is unpredictable (diagram 1).



**Diagram 1:** Measured vs. calculated deceleration data from train data recorder (trains in operation), composite brake blocks (data from winter 2015-2016)

**Measured vs. calculated decelerations  
 - cast iron blocks**



**Diagram 2:** Measured vs. calculated deceleration data from train data recorder (trains in operation), cast iron brake blocks (data from winter 2016-2017)

VR replaced the Snps/Snpss wagons with old cast iron block wagons in operation between track section Kemijärvi – Kemi in winter 2016-2017. A comparable data was collected from those trains (diagram 2). The braking performance with cast iron blocks is much better and more predictable.

VR has made a safety alert on composite brake blocks on 12<sup>th</sup> of October 2016 and Finnish Transport Safety Agency on 1<sup>st</sup> of July 2016.

**3 RISK MANAGEMENT AND FURTHER ACTIONS**

To keep the risk in control VR has implemented several mitigating actions during the past few years and the problem has not caused accidents. However, several serious incidents with a risk of collision have occurred and it is necessary to implement more effective measures immediately. The most effective way to ensure sufficient braking performance even in harsh winter conditions is to remove composite brake blocks from the Snps/Snpss wagons and replace them with cast iron blocks. VR has already started this process, and at least 150 wagons will be refitted with cast iron blocks as soon as possible.

In addition, we have agreed to participate in further testing of composite brake blocks during the winter 2017-2018 in Northern Finland. The tests will be done in co-operation with Finnish Transport Safety Agency.

**4 SUMMARY**

Composite brake blocks do not ensure sufficient braking performance in Finnish winter conditions. The brake blocks have caused several serious incidents with a risk of collision. Fortunately, no accidents have occurred. The most effective way to ensure sufficient braking performance even in harsh winter conditions is to remove composite brake blocks and replace them with cast iron blocks. The mandatory use of composite brake blocks is a major problem for VR, and the company cannot take the risk of using unpredictable braking blocks in train operation during the winter time. Finland needs to have a permanent specific case in NOI TSI or WAG TSI for not to use composite brake blocks.