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LEILA bogie, rail freight traffic, telematics, goods wagon, diagnostics

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TELEMATICS APPLICATION ON THE NEW LEILA BOGIE FOR FREIGHT WAGONS

The new developed LEILA Bogie for goods wagons represents a chance to attain the political goal of increasing the low quota of European and national rail freight traffic. The Berlin University of Technology is a partner in this research project. The main objective is the development of a light-weight and low-noise bogie for freight wagons as a serviceable, profitable and reliable product.

APLIKACJE TELEMATYCZNE NA NOWYM WÓZKU LEILA DLA WAGONÓW TOWAROWYCH

Nowy zaprojektowany wózek LEILA dla wagonów towarowych przedstawia sobą szansę uzyskania politycznego celu zwiększenia niskiego odsetka europejskiego i krajowego ruchu towarowego na kolei. Politechnika w Berlinie stanowi w tym projekcie badawczym jednostkę partnerską. Głównym celem jest opracowanie lekkiego i cichego wózka dla wagonów towarowych jako produktu serwisowalnego, zyskownego i niezawodnego.

1. INTRODUCTION

The objective of a more competitive European rail freight traffic to increase the quota at the modal split is connected to a higher quality and safety level and the consideration of environmental aspects. One reason of the low velocities is shown in Figure 1. The Berlin University of Technology supervised a chemical tank wagon travelling between Germany and Finland for a period of 13 month. The vehicle was equipped with a telematics system. Two-thirds of the transport time for one round trip, the tank wagon was standing either on the track, in railroad shunting stations or during loading and unloading process.

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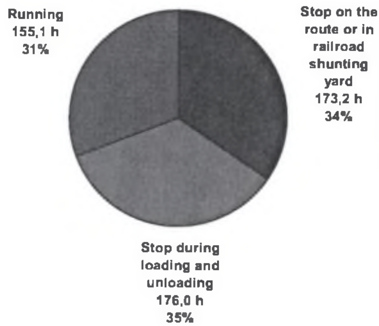

Fig.1. Breakdown of runs and stops of a typical example of cross-border rail freight traffic [1]

A rail freight traffic boom could be achieved by more transparency using a continuous supply of information. This provides an opportunity to optimise logistics and to lower Life Cycle Costs. An application of telematics systems provides a basis for more transparency in cross-frontier rail freight traffic. The advantages give the opportunity to increase the efficiency of European rail freight traffic. Using integrated onboard diagnostics modules in the telematics and alarm system could noticeably enhance the safety. The environmental impact is another important aspect for the acceptance of a mode of transportation.

The following example shows the current barriers caused by cross-frontier freight traffic.

2. A TOPICAL EXAMPLE FOR THE EUROPEAN RAIL FREIGHT TRAFFIC

A few possible difficulties, which can occur in current European rail freight traffic, were exposed at an initiative of RAILION with the name "Asien – Europa-Express" last May. An accompanied goods train should travel from Istanbul to Cologne in the space of four days. From Turkey to Germany the route passed through the countries of Bulgaria, Romania, Hungary and Austria (Corridor IV). The traction of this goods train consisted of an electric four-system locomotive and of a diesel engine. Furthermore, nine goods wagons and three railway passenger cars (as cabooses) belonged to the train. The main goal was to show the current problems in European rail freight traffic. One of the future objectives, travelling preferably without changing the locomotive, was unrealisable. The transport speed was repeatedly decreased due to differences regarding the traction power supply, the quality of rail track, the axle load and the operating system.

Fig.2. The “Asien – Europa-Express” [5]

For example, some important stopovers and other events were:

- Two goods wagons were uncoupled at the border of Turkey and Bulgaria, because the allowed axle load of 17.5 tons in Romania was exceeded (stop of ca. 4.5 hours).
- The train had to pass through Bulgaria partly with the diesel-traction and the allowed track speed of 25 kph.
- There were switching moves of two goods wagons at the frontier of Bulgaria to Romania, because the last car needed a hand brake in Romania. The brake shoes on two wagons were worn and the brakes on two others were overheated (2 hours stop).
- The start in Romania took place with diesel traction and two more coupled goods wagons.
- Stop on the border of Romania-Hungary: 3.5 hours.
- Many long stops in Hungary were the reason for a delay of two hours, in spite of the relative high track speed.
- Stop at the border of Hungary-Austria: over 2.5 hours.
- The journey through Austria could be continued rapidly, but there was a long unscheduled stop at the frontier to Germany.
- Accommodation and a delay of 50 minutes in Darmstadt–Kranichstein.
- The total journey time of the “Asien—Europa—Express” amounted approx. 80 hours, assumed a transport time of 10 hours from Passau to Cologne.

RAILION numeralises the avoidable loss of time at 10 hours.
The results of the brake calculation of the different railways shows different values between 40 and 90 %.

Fig.3. Route of the "Asien- Europa-Express" [5]

3. THE NEW LEILA BOGIE

A new type of bogie for goods wagons represents one key to achieve the aims, which are mentioned under point 1, and to reduce the environmental impact. The LEILA Bogie (in German: "LEIcht und LaermArm" means light and low-noise) features some improvements compared with conventional bogies of freight wagons. The properties of the new bogie are a low weight, the reduced noise, an increased reliability and the less wear. In addition, the bogie is prepared for application of diagnostics and telematics modules. The design includes full compatibility to current wagon bodies and to the train integration.

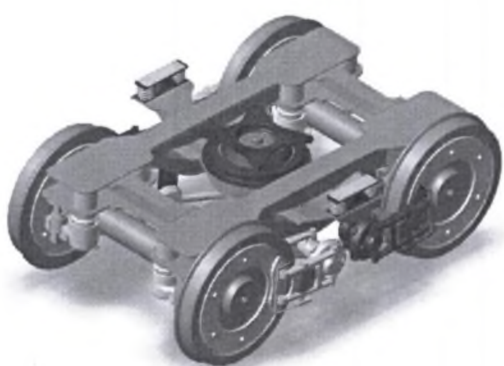

Fig.4. LEILA Bogie

3.1. LOW WEIGHT

The payload per wagon can be enhanced by about 1.6 tons due to the weight reduction as opposed to usual bogies (e.g. Y25). As a result of the design with inside bearings and a cross anchor, the dynamic characteristics can be improved. This means higher velocities and an increased derailment safety.

3.2. NOISE REDUCTION

Potentials to the reduction of noise emission are available in the inside primary suspension of the wheel sets, consisting of rubber springs and the wheel disc brakes, which act as absorbers. This potential for the noise reduction is evaluated up to 18 dB(A).

3.3. DIAGNOSTICS AND TELEMATICS

Several components of the bogie (e. g. inside bearings) need to be monitored by sensor modules. These can be included in a telematics system. As a result, there are even more potentials to increase profitability and for a higher level of rail freight traffic safety. Further costs can be reduced succeeding to change the periodic maintenance into a maintenance depending on the condition of the wagons with LEILA bogies. By means of integrated conditional diagnostics in telematics systems in combination with appropriate alarm concept, the online-monitoring of the bogies and the goods can considerably enhance the safety.

3.4. OPTIMISING OPERATION

The knowledge of the technical and operating condition of the bogies and the whole wagon by automatic diagnostics and monitoring are a basis for automated operation. The level of automation can be a decisive factor for the quality of rail freight traffic. A well-known quality deficiency are the low velocities, shown in the example of "Asien - Europa-Express". The complete automation of the functional break tests allows a considerable faster train composition with only one person (locomotive driver), which could substantially reduce recently long stopovers at the railroad shunting yards. Referring to the safety, the failure rate caused by human actions can be reduced as well.

4. SUMMARY

The LEILA Bogie offers an important advancement on the way to technical improvement of rail freight traffic. The new bogie design of goods wagons in combination with a telematics and information systems can enable an increased efficiency and competitiveness compared with the truck transport, if the barriers in the cross-border European rail freight traffic could be solved and equal basic conditions for all means of transportation would be provided.

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