How the "Railreader Maintenance Support" ensures a high level of safety and availability in railway networks

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ABSTRACT

This paper describes a service concept based on an cost efficient RFID identification technology and an software solution for the accurate allocation of measurements from wayside train monitoring systems to specific wagons which supports the train and wagon operator to keep the technical shape of their wagons at a high level. Thus the wearing of the network lines can held low and track closures for maintenance work can be minimized. The described system (**"Railreader-Maintenance Support"**) generates added value of the measurements by exactly allocate them to a specific wagon or its parts as axles, bogies, wheels, etc.

An upcoming maintenance need can be early recognized and countermeasures being taken by the train or wagon operator in time. The so maintained wagons are generally staying in a better shape and therefore introduce less wearing to the infrastructure itself. This leads to increased safety, less track maintenance effort and ensures higher availability of track resources and more revenues for all parties concerned.

Keywords: RFID, Wayside Monitoring, Railway Operations, Safety

1. INTRODUCTION

The "health" of transport assets, specifically a railway vehicle (goods as well as passenger coaches) is mandatory to the efficiency of the all over transport process. When in a good shape, unplanned stops of trains can be minimized or even avoided and also the wearing of the tracks will be less than expected and specified thus increasing service intervals and raising the availability of the railway network. But therefore accurate and actual information about the technical status of the vehicles, their load balances and other relevant information is needed. Wayside train monitoring systems (WTMS) are generally in use for ensuring the safety of the train operations by acquiring various technical data as axle temperatures, axle load and other parameter. These measurements are today only used for check if they are within safety relevant limits. After that they are discarded.

But using these measurements also as input of long term analyses and data aggregation algorithms much more added value can be raised from the measurement effort. As the WTMS systems are not designed for allocation of measurements to specific wagons rather then only to a "train axle", this allocation needs to be done by an new developed concept because the electronic "train/wagon"-list, which is accompanying each train's travel is not sufficient as neither the sequence of the wagons is trustworthy nor information about the running orientation of a specific wagon is available. But exactly this is needed for the exact allocation of measurements and therefore for the reliability of further results.

To make use of the added value potential of WMTS data, (a) a proper and reliable identification method must be established which is useable also at all driven line speeds and working in an crossborder / crossnetwork-wide manner, and (b) a data collection, storage and analyzing framework has to be established which can report the results and forecasts as well as generate alert - avisos for the dispatcher. If a train operator travels more than one infrastructure, a independent entity is needed to collect and handle the information and measurements received by various data sources and several infrastructures. This entity is also responsible to filter the results in a proper manner so that only that information is available to the specific parties concerned, which is specifically dedicated to them, e.g. the measurements from a specific infrastructure may only be available to that specific infrastructure operator and not to another one. Same is valid for train operators handling wagons from different wagon owners.

The wearing of a transport infrastructure (street, railway) is much dependent of the technical shape of the transport vehicles traveling the network. As better this technical shape is, as less the wearing of the infrastructure will be, thus raising the all over availability of transport network and assets and reducing cost of operations e.g. by reducing the maintenance costs, track closing times, and even size of fleet! For that, it is mandatory to know all the time the technical "health"-status of the transport assets. The wayside train monitoring systems

measures axle weights, load distribution, temperature of axle bearing, noise and other physical data when the asset is passing by at full line speed. At the moment the measurement has eventually to be correlated to an electronic or printed wagon list to allocate the data to a specific asset. This procedure is unreliable, cumbersome and time and cost intensive.

Identification technology: RFID

The identification of the specific railway vehicle is done using RFID technology. This "Rail-reader"-system –developed for usage in the field of all kind of railway transport - is able to identify an asset immediately when passing by an radio frequency device (RFID) mounted onto the asset and ensures a proper identification of all kind of passing assets at all driven (line) speeds up to 230km/h an more with a reliability of 99.96%. It is cost-efficient and effective and therefore an appropriate solution! The onboard RFID-transponder transmits the vehicle (wagon) number and further technical data like number of axles, load limit, dimensions and weights to a wayside located receiving station which is immediately preparing a report. In this way it is possible to allocate measured data to specific assets (wagons) or even to specific axles thus paving the way for the above mentioned goals. These stations are installed at strategic locations within the (railway) infrastructure network. Mostly near a technical train inspection system (Hotbox, wheel check, etc.) but also on e.g. switches to terminals or at border crossing stations. A few seconds after the train has passed, the wayside system delivers a complete report including the trains axle and wagon schemata and – if equipped – all identified vehicles/wagons with their running orientation and wagon specific axle numbering.

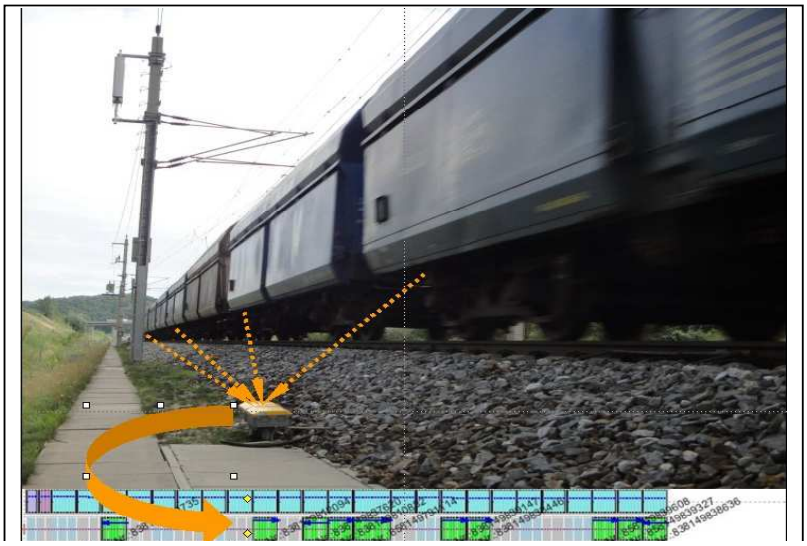

Figure 1 – example of an RFID AVI system used in railway transport

Data aggregation & Output

Combining identification data with measurements paves the way

The identification report is now to be combined with any measurement reports by allocation of the measurements to the specific wagons. The data is sent to the central server and pushed into a database of all measurements and allocations. This opens the option for several important outputs for each actor within the transport process:

- for the entity in charge of maintenance (ECM) checking the vehicles technical health and acting pro active in case of upcoming service demands
- for the commercial department and the dispatch in comparing the weight listed in the transport order and the actual weight measured wayside for correct invoicing
- the infrastructure manager identifying "sick" wagons in an early stage and keeping stops for checking procedures short and moreover stimulate the wagon operators to keep the wagons in a good shape. Therefore the wearing of the tracks is minimized and the availability raised as well as services effort lowered.

Cost efficiency

Easy roll-out, minimal total cost of ownership, maximum flexibility

The solution is structured as a "service" being offered to the concerned parties. Therefore the roll-out can be done smooth and without impact to the actual operations. The field components needs no translation of information stored in the transponder to actual wagon data by looking up databases etc. Therefore also no further costs for operation and maintenance of back office IT is needed. The technology used ensures a reliability of 99.96% at speeds up to 200 km/h+. Vehicles equipped are located within the train set, others are recognised and marked.

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