

# Load Monitoring For Railfreight Payloads

All freight transport sectors, including logistics, have to face economic pressures. There is strong international competition among companies. Furthermore, companies have to face steadily changing legal frameworks and regulations, increasing basic costs and high maintenance costs. The best way to cope with these challenges is to „improve efficiency“, this being a frequently used term. It is in fact a very crucial factor contributing towards success and often concrete measures have to be involved.

## The Big Challenge: Optimum Load Capacity

For logistics and forwarding companies, there are two crucial factors to achieve a profitable business case: reliable delivery and low maintenance costs. But how does one manage to do this? It is essential to automate demanding and complex processes and to get an optimum load capacity.

This also is crucial for train drivers, since they are responsible for the load - and for overloading, too. Thus, the loading staff plays safe and leaves a margin so that the official load capacity is not exceeded. The load capacity is therefore not the optimum one possible, and as a result, the carrier has to face increasing costs.

## Optimum Load Capacity: Big Individual Benefits And Also General Environmental And Economic Benefits

In addition to individual advantages, there is a general economic benefit. In many central European areas, the rail transport of timber is economically viable for distances of over 200 km. The advantages of rail transport are well known. Road transport leads to road infrastructure damage and in the long run to higher costs in road infrastructure maintenance. There is an **environmental aspect**, too. Less road traffic means less CO<sub>2</sub> emissions. This is a win-win situation for rail. Our environment benefits from less CO<sub>2</sub> emissions, and the national economies benefit from a further contribution to global climate agreements.

## Getting Down To Specifics: How Do We Achieve An „Effective Increase In Efficiency“?

A perfect way of doing this is to ensure that an optimum load is always carried. In the case of timber, scrap metal or bulk payloads, the ideal is a loading weight monitoring system. Such a monitoring system provides numerous **benefits**:

- Optimum load capacity is ensured.
- The loading staff are assisted locally thanks to an on-site visualisation method. This is a great back-up for transports with „difficult“ material loads, such as timber. On account of the variable density of timber, volume is not the ideal loading parameter for this type of payload. A loading weight monitoring system ensures that the maximum weight is to be loaded, regardless of the condition of this organic material - the weight difference between dry and wet or freshly cut timber is considerable.
- Maximum safety, on account of the fact that the wagon is not overloaded. This ensures that wagons are not removed from trains at checkpoints.
- Reduced maintenance costs. Since a weight-monitored wagon is not overloaded, the wheelsets and underframes are subjected to less stress, and this reduces the repair costs.
- There is a trend towards lightweight wagon design. A weight monitoring system precisely meets the demands of very lightweight wagons. Hence, clients benefit from an optimum load capacity.
- The weight monitoring system has a wide range of uses: wagons used

for gravel, scrap, bulk payloads, steel coils and even for intermodal containers are perfectly suited to be upgraded with the fitting of a weight monitoring system. Every wagon has to be weight-checked. If the loading weight is below the limit, a return to the loading site to load more payload is unprofitable. The result is that the rake of wagons is not optimally loaded, and more wagons are needed to carry the complete consignment.

## Functionalities And Benefits Of A Loading Weight Monitoring System

PJM is the Austrian specialist for rail vehicle monitoring systems, and many years ago started addressing the whole question of railfreight consignment monitoring. One of the first products it developed was the range of WaggonTracker ADVs. These have been acquired by numerous clients since they went on the market.

PJM's loading weight monitoring system is also now well and truly tried-and-tested. It incorporates a large number of functionalities and **advantages**:

- The wear-free hub generator provides the monitoring system - and further applications - and is energy self-sufficient.
- The automatic load identification determines changes of the loading weight immediately and turns on and off the signal lamps mounted on the wagon and activates the digital monitoring system. The system checks the loading situation at specified intervals and is activated automatically when any weight changes occur. In addition, the on-site visualisation is activated to

identify an overload or asymmetric loading and thus assists the loading staff during the loading procedure (this also depends on the type of WaggonTracker system used). It is not possible to power such an automated system using batteries.

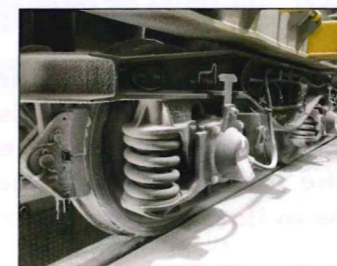
- On account of the simultaneous automatic data transfer into the web portal, the train driver or operator is continuously informed about the loading situation. This facilitates better planning of loading capacity. In addition, the permanent monitoring of load and tonne-kms enables a better planning of maintenance intervals, maintenance stops and components required during the servicing of wagons.

- The WaggonTracker ADV which was designed especially for wagons, determines the loading weight with a strain gauge-system which is maintenance-free and long-lasting. These strain gauges are usually mounted on the bogies. Depending on the WaggonTracker type, between one and four metering points are installed on the bogie frame. The average annual measurement accuracy is about 2.5 % per year.

- The calibration is set in the web portal, and the data is transferred and recorded into the on-wagon-system. Thus, the loading staff can always rely on the full range of functionalities and crucial data such as calibration and loading limits, even without an internet connection. In addition, the system also takes into account both summer and winter season conditions, including, for instance, the weight of snow on a wagon. The required data for calibration is determined when the wagon traverses a calibrated scales. Further-



The WaggonTracker is energy self-sufficient, since the hub generator provides its power supply.



The WaggonTracker has been tested in a climatic chamber. This has demonstrated its ability to perform reliably even under extreme temperatures and harsh winter conditions.

more, the manufacturer can undertake such a calibration using a bogie testing rig to simulate the weight of the carriage.

- The WaggonTracker ADV product range provides reliable information - the status of the running gear, position, direction of travel and ambient temperature are all determined and recorded. In addition, depending on the WaggonTracker requirements, it is possible to determine running safety, and standardised buffing and vertical wheel forces. The system can be upgraded with any necessary requirements.

- To automatically determine the maximum permitted loading weight on various parts of route according to rail infrastructure classifications, geofencing is used to set the system parameters.

## A Cost-Saving Example

Load weight monitoring is a cost saver. Here is a best practice case study calculation. The end customer benefits from a value-added factor of 15 EUR per tonne, this being the case of the costs for timber transport. Use of the WaggonTracker system enables the average load to be increased by 5 t. Assuming that around 45 services per annum are run, this results in **revenue increased** by almost 4,000 EUR per annum. Moreover use of the WaggonTracker system prevents a wagon from the risk of being overloaded. If a wagon is eliminated from a train from this reason, it costs usually about 1,000 EUR.

The WaggonTracker system only costs 2 EUR per day, this based on a typical ten-year period of use. Taking this into account, the **total cost saving** accrued by the client can be over 3,000 EUR per annum, when savings from wagons not being eliminated from the train because of overloading, is taken into account as well. The wagon owner



Real-time load monitoring with digital display.

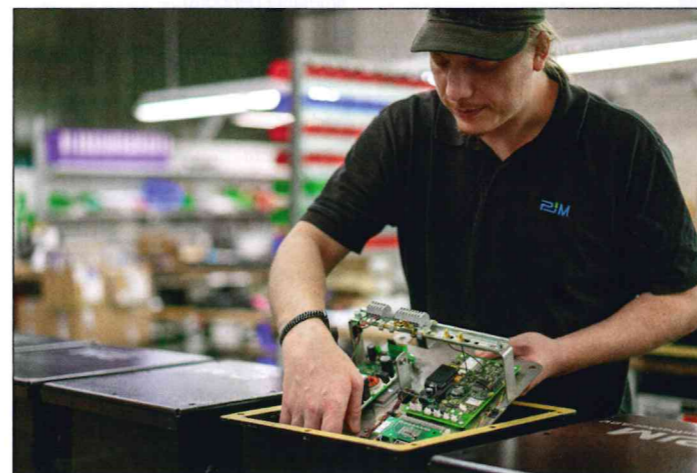
will also benefit from long-term hire contracts. So, under normal circumstances, the economic conditions work out as more disadvantageous if a monitoring system is not installed.

## Loading Weight Monitoring Benefits Everyone!

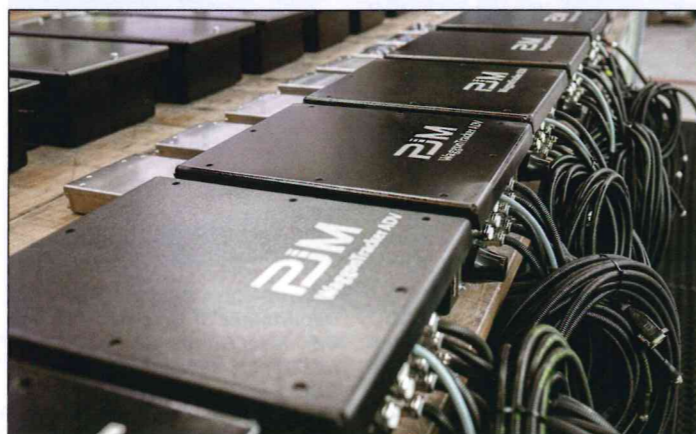
On account of being able to achieve maximum load capacity, transport companies, carriers and wagon keepers appreciate the cost savings and reduced maintenance costs. Train drivers are provided with reliable and clear on-site information on the maximum loading weight. The optimum load capacity achieved on every single freight run significantly reduces CO<sub>2</sub> emissions.

We can thus conclude that the loading weight monitoring system is a **perfect option** for all involved in railfreight to consider. The WaggonTracker monitoring equipment is easy to install, maintenance-free and energy self-sufficient. Transport companies benefit from an optimum load capacity and overloading so becomes a thing of the past. Thus, highly efficient railfreight operations are achievable.

PJ Monitoring



Overloading of wagons has thus become a thing of the past: The signal lamps immediately indicate up to seven loading situations. Transport companies benefit from achieving optimum load capacity, even with „difficult“ payloads such as wood, scrap and bulk consignments.



The WaggonTracker range of monitoring systems perfectly combines monitoring and automation and thus enable the development of a robust overall system. The multi-talent WaggonTracker is maintenance-free, long-lasting and wear-free.



## Mercitalia Rail: „On Track“ With Intelligent Wagons

Mercitalia has upgraded 240 Shimmns steel coil platform wagons with the WaggonTracker ADV monitoring system, which perfectly combines monitoring and automation and is very robust overall, achieving efficiency and cost-savings. It provides automated processes plus crucial real-time information about the wagon fleet. The multi-functional system provides **comprehensive information** in a very clear and well-arranged way:

- Weighting determination and analysis including a precise overview of the load condition, detecting, for instance, defects such as asymmetrical loading. The loading staff get all the required information while loading is taking place, so it is possible to correct the load if necessary.
- Monitoring of impact detection when wagons are stationary.
- Running behaviour of the wagons during the journey is monitored.

PJM installed the intelligent monitoring system on the wagons of the latest generation, as they left the works where they were built (see R 1/19, p. 48). 200 wagons are on order for Mercitalia, and another 40 were delivered in March 2019.

The WaggonTracker system has been developed especially for railfreight usage and provides a wide range of functionalities, precisely meeting clients' requirements.

## Functionalities At A Glance:

WaggonTracker offers vehicle performance, current position, last report, last move, current country, historic data, geofencing, direction, management wheelset/vehicle performance. WaggonTracker ADV offers, in addition to the STD-functionalities:

- Safe train operation by monitoring of:
  - Axle bearing temperatures.
  - Running characteristics (ride safety and ride comfort as defined by EN 13749).
  - Loading condition (overload, asymmetric loading, load on each wheelset).
  - Visual signals/acoustic alerts while loading is taking place, to warn of abnormalities.
  - Derailment diagnosis.
- Cost-savings by means identifying the cause of damage:
  - Impact detection (as defined by to EN 12663, vertical impact monitoring).
  - Monitoring of the parking brake position.
  - Detection of wheel flats.
  - Protection against incorrect or improper use (such as overloading, or reporting of incorrect usage).
- Railfreight is safer thanks to the monitoring of:
  - Acceleration.
  - Moisture and temperature.
  - Door status monitoring, including alerts (thanks to the use of anti-theft protection systems and CCTV footage).

See us at transport logistic in Munich, Hall B6, Booth 104.

PJM, the Austrian specialist for the development of rail vehicle monitoring systems, designed and developed the patented wagon weight monitoring system, which is manufactured in Graz. It fully complies with the exacting „Made in Austria“ quality standards.