



Loading made easy with the digital freight train

Fast and safe loading with PJM's automatic load weight monitoring system

The loading process is a big challenge for everyone involved: Loading has to be carried out under high time pressure and the cargo has to comply with a number of rules and regulations. In addition to the time and cost pressure, safety has top priority. If a wagon is not loaded correctly (e.g. asymmetrically), safe transport is no longer guaranteed. In short, the responsibility for the loaders on site is great and the economic pressure for the forwarder is high.

In rail freight transport, these problems are a thing of the past - with the right system of an intelligent freight train such as provided by PJM. An important component of PJM's digital freight train is the automatic load monitoring

system. The LoadMonitor system enables the loading process to be monitored directly on site and loading to be carried out quickly and correctly. During the loading process, signal lamps on the wagon indicate in real time when the maximum loading weight has been reached or the load is placed asymmetrically. This ensures that the wagon is loaded optimally and correctly and that the maximum loading capacity is used in the best possible way. The loading process is completed more quickly and the person responsible for loading has the certainty that overloading is excluded.





The best possible use of the loading capacity is ensured by the automatic load monitoring system. This provides safety, for the person in charge on-site as well as for the forwarder.

Overloaded wagons with „difficult“ material such as wood, gravel, scrap or bulk material are a thing of the past.

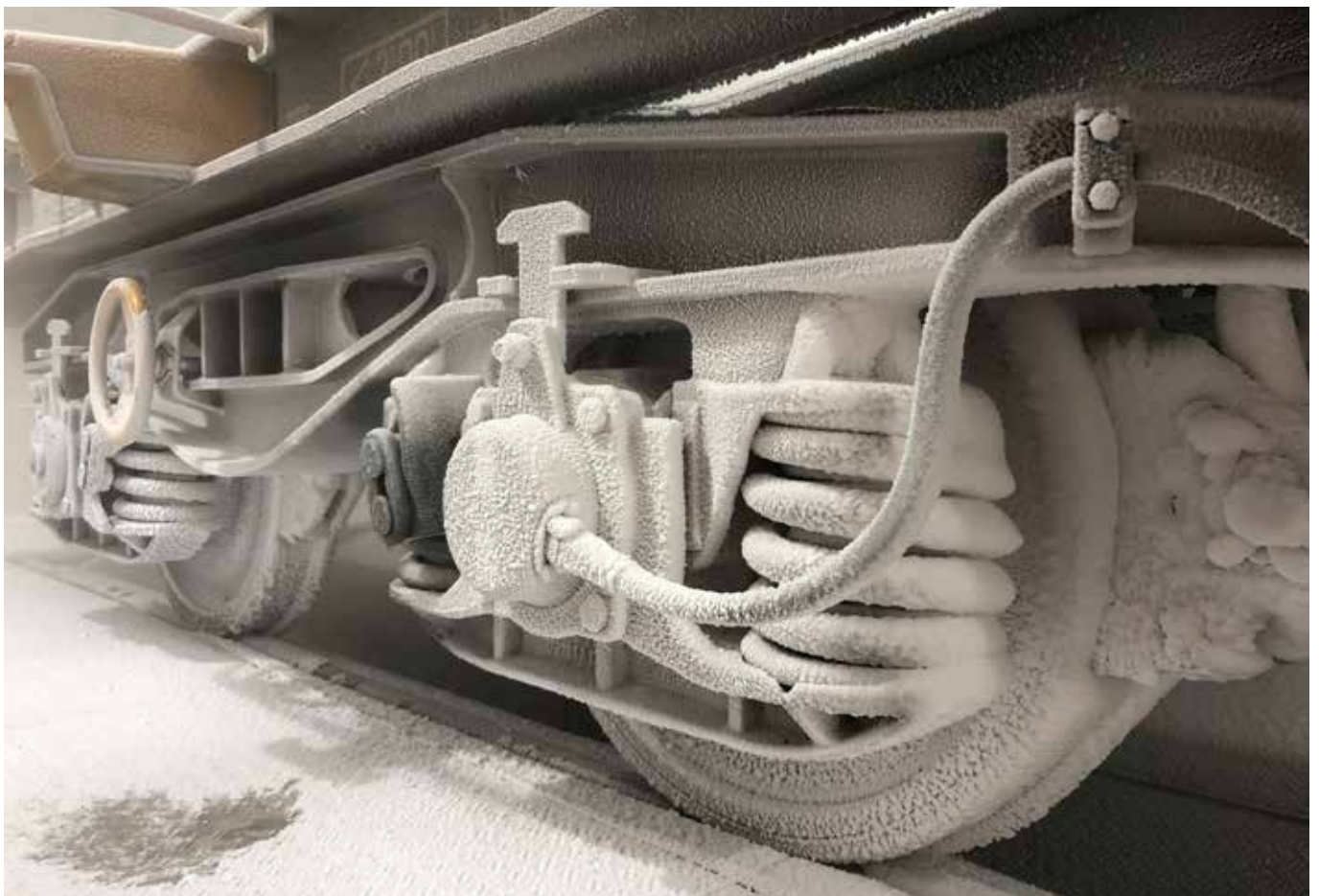
The challenge: Making the best possible use of loading capacity

The business model for freight forwarders and logistics companies can only be profitable if delivery dates are reliably met and maintenance costs are kept as low as possible. How is this possible? By automating complex processes and making the best possible use of loading capacity in the long term. This does not only concern the forwarders, but also the vehicle drivers, as they are responsible for the loading and, in case of overloading, are themselves responsible for not exceeding the specified loading maximum. Understandably, this leads to the loading personnel playing it safe and always keeping a reserve margin in the loading volume. However, the forwarder incurs higher costs because the loading volume is not used in the best possible way.

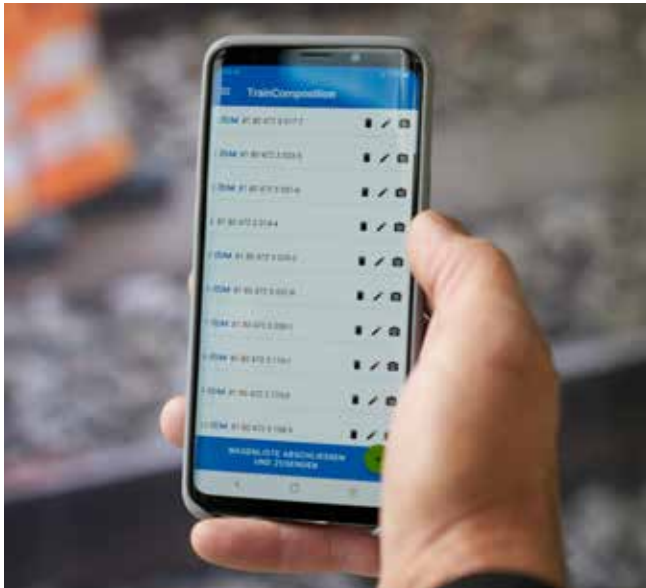
The LoadMonitor system is a win-win for everyone and efficiency is at play: carriers and wagon keepers benefit from lower maintenance costs and from cost savings due to the best possible use of the load capacity. Wagon drivers are reassured that they will no longer exceed the loading maximum.

A digital overall system is the basic platform for the LoadMonitor

The basic system is the digital overall system WaggonTracker which was developed especially for freight wagons. The system both captures relevant data on the wagon in real-time and automates processes. A hub generator provides an autonomous and powerful power supply.



The WaggonTracker system is the basis of the intelligent freight train. It is energy-autonomous, durable, maintenance-free, extremely robust and withstands a wide temperature range from +45 to -25 degrees.



Just one click and everything is clearly presented: Train composition via app.

The monitoring information is set according to application or customer requirements and can basically be divided into two data blocks: Relevant data about the wagon are captured, processed and transferred to a web service in real-time. This guarantees the highest availability of the data. The data is transmitted via an encrypted, secure connection.

The data are divided in two categories:

- Basic data: vehicle performance, travel direction, current position, last report, last move, historic data, geo-fencing, running direction and wheel set running performance.
- Further data: running behavior, axle bearing temperature, signaling / acoustic warning for loading processes directly on the wagon, derailment, braking status of last wagon, diagnosis of incorrectly braked wagons.

The technical concept of the load weight monitoring system

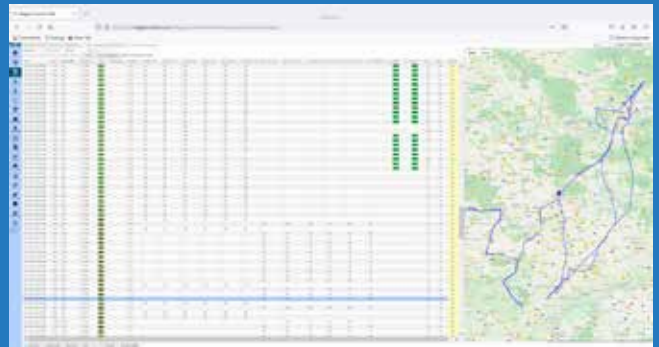
Based on the basic functionalities of the overall digital system, the technical requirements for the automatic load weight monitoring were implemented as follows:

- A strain gauge-based system, which is designed to be maintenance-free and durable, is used to determine the weight. These strain gauges are applied to the bogie frame and, depending on the required range of functions, one to four measuring points are attached to the wagon frame.

- Signal lamps or a digital display are installed on the freight wagon, which serve as on-site visualisation and provide the person responsible for loading with immediate information about the loading status. The system checks the loading status at predefined time intervals or activates automatically in the event of weight changes. The signal lamps indicate when the maximum weight has been reached or the load is asymmetrical.
- The calibration values are set via the web portal, the data is transferred to the system on site and stored. The functionality is guaranteed even if there is no internet connection. This ensures that the loader always has the information about wagons that are ready for use, including calibration and loading limit values.
- Comprehensive monitoring information such as mileage, location and ambient temperature is available as standard through the Waggon-Tracker digital overall system. In addition, e.g. non-compliant impact monitoring, vertical impact monitoring or running safety monitoring can be recorded optionally. The system is fully scalable and expandable.
- The web portal is of particular importance. The data recorded by the measuring system and transmitted to the web portal show, among other things:
 - Train formation (on customer request): The trains are composed via app, via scan of QR codes, NFC or manual input by the wagon examiner. The aim is to simplify the composition of train lists, including sending them by e-mail. Wagons without a PJM system can also be added.
 - Web service with API interface for integrating the loading data into the user's existing system.
 - Live monitoring of the loading status of entire trains in the web portal with an overview of how many wagons per train or complete trains have already been loaded or unloaded.
 - Automated notification by e-mail in case of deviations, e.g. overloading or impacts.
 - The different load limits for loading stations, routes or countries are defined and stored in the system so that the shipper can load on site exactly according to the specified loading plan.

Benefits of automatic load weight monitoring

- **Optimal utilisation of loading capacity:** The on-site visualisation via direct display on the wagon or via app is an important support for the loading personnel during the loading process. Especially with „difficult“ loads such as wood, scrap or bulk goods, this is a great relief. Optimally loaded freight wagons are efficient, prevent unnecessary extra journeys and save costs.
- **No more overloading:** Exceeding the permissible maximum weight is displayed in real time and can be corrected immediately, as can asymmetrical loading. The loading personnel as well as the wagon owner and the logistician have the certainty of an optimal, permissible loading.
- **Time saving:** Loading can be carried out faster, as the loading maximum is reached more quickly. Since the wagons no longer exceed the maximum permissible weight, time-consuming separation at infrastructure points is also eliminated. Many companies run additional distances for a separate weighing in order to detect any overloading. In these cases, the time saved can be booked twice (at the additional cost of making these journeys).
- **Reduced process flow:** Automatic weight detection reduces or completely eliminates manual weighing.
- **Paperless administration and thus significantly less possible errors:** The wagon lists are provided in a clear, digital form.
- **Reduction of wear and repair costs:** Since there are no more overloaded wagons, wheel sets and frames are less stressed and thus repairs are reduced or the possible mileage is increased.



The web portal enables easy management of the fleet. Parameters can be configured in the web portal and the settings are transferred to the wagons on site.

- **Generally improved repair management:** Through the early detection of e.g. flat spots, costly reprofiling with high material removal and possibly follow-up costs are avoided, thus also preventing the particularly expensive downtimes.
- **Improved communication:** End customers as well as freight forwarders receive important information such as loading progress and shunting times in real-time.
- **Reliable data transmission:** Data acquisition is precise and convenient. Users thus save time and costs, as there is no more time-consuming fault finding.
- **Immediate effects:** The automatic monitoring of the loading weight brings immediate positive effects. The significant increase in the factors of system efficiency, safety and cost-effectiveness ensures a rapid ROI effect. Concrete efficiency increases are consistently present, but vary depending on the transport material.

„For our customers, a big issue is when vehicles are stopped or removed from the track. That costs time and money. The use of capacity has increased a lot. It's a great benefit that the loader can immediately see whether the wagon is overloaded or not. The cooperation with PJM worked very well, as did the implementation of the PJM-system and the entire project management. The system runs very smoothly.“

Lothar Krebs, Deputy Sales Manager,
TRANSWAGGON GmbH in Hamburg

„We need reliable, stable wagons and loading safety - both for the shipping companies and for the and for companies. With the Load Monitor system, Mercer Holz has closed the gaps in the logistics process chain: All essential information about the freight wagons as well as an automatic load control on-site are covered by just one system“.

Jürgen Köhler, Division Manager,
Mercer Holz GmbH



Awarded WaggonTracker-System

- ERCI Innovation Award 2021
- German Innovation Award Winner 2020
- Austrian Mobility Award 2020 (category digitalisation)
- Fast Forward Award 2019

PJM at a glance

PJM is a worldwide leading specialist in the field of railway systems. The Austrian company has successfully realised projects in 30 countries in 5 continents.

PJ Messtechnik GmbH is an accredited test centre by ISO /IEC 17025 standard focusing on approval tests for railway vehicles.

PJ Monitoring GmbH is a technological leader in automation and digital systems for rail freight transport. The WaggonTracker system which made the „intelligent freight train“ reality, is the only system worldwide both providing a wide

range of monitoring functions and automated processes. The digital system has won several awards.

- 2006 founded by Martin Joch und Günter Petschnig
- R&D quota: 14 % PJ Messtechnik GmbH // 21 % PJ Monitoring GmbH
- Projects in 30 countries & 6 continents
- 60 employees at the Graz site ensure “100 % Made in Austria”: R&D, hardware and software development, production & administration come exclusively from Austria