

Mission possible: Measuring the railway world

Ethan Hunt and James Bond rush from one continent to the other to save the world. Using high-tech tools from the bag of tricks which had been developed by R&D teams, they always succeed in conquering the villains. And they accomplish every single top-secret mission. This is quite similar to the PJM-projects: To measure the railway world, our teams tour numerous countries all over the world. Using a package of metrological devices, know-how and many years' experience, we use to perform the measurements and analyse the results successfully. "Missions accomplished" always applies to our projects. For one of our current projects, a PJM team travelled from the USA to India. The mission was: Testing the vehicle dynamics of the TR6000 for vehicle approval.



The project is impressive. To measure the vertical and lateral forces of wheel discs, the wheel set was designed and built in Graz. There were several challenging technical aspects: The big wheel diameter, the very confined space due to the gear unit mounted on the axle and the weight of the wheel sets which is three times higher compared to regular wheel sets.

First station was Erie in the USA, the home base of GE Transportation Systems. There, GE designed and build the state-of-the-art diesel-electric locomotive meeting the high Tier 2 emissions standard. In the factory of GE, our team installed the wheel set on the locomotive. Then, the wheel set was shipped to Hyderabad in India for the test runs.

Due to the climate, the conditions were demanding. Both our team and our metrological devices were put on the test: 45 degrees Celsius and high humidity alternated with monsoon rains. But our team forged ahead and made the measurements

according to the predefined schedule, while the metrological devices provided reliable data.

Every project is different. In this project, the technical approach was quite unusual. When determining the forces, it is crucial to gather reliable data for every possible load case. In order to determine every possible combination of forces, PJM has developed a system of linear equitations.

During the test runs, more than 2 GB of data were generated within one hour. At the end of the project, a total of 140 GB data will have been analysed.

"We have a great treasure trove of experience for our international projects. Our customers benefit from our many years' experience with regards to technical expertise and project management. Wherever we perform our tests and measurements – we know everything about country-specific provisions and import regulations", says CEO Martin Joch. "To us, every project is a mission possible. We always complete our projects successfully."

The project at a glance



Project start 08/2018: Development and manufacture of the wheel set.

10/2018: The wheel set is air-shipped to Erie, USA. In the production site of GE Transportation Systems the wheel set is installed on the IR6000.

11/2018: The locomotive is shipped to Hyderabad, India.



The tests are performed in Hyderabad. PJM is in charge to analyse the vehicle dynamics for the admission of the IR6000. Indian Railways had tasked GE Transportation Systems to design and engineer the IR6000, which is the most modern diesel-electric locomotive meeting the Tier 2- emissions standards. A very neat design element are the chosen colours reflecting the yellow and orange of the Indian flag.



The technical approach: First, the sinusoidal signals have to be rectified. These rectified signals are the input variables for a system of equations. The forces in the contact point between wheel and track (vertical and lateral wheel forces) are the solution of the system of equation.

During the tests, the locomotive runs about 15.000 km.



Till the end of the project in 11/2019, 140 GB of data have to be analysed.



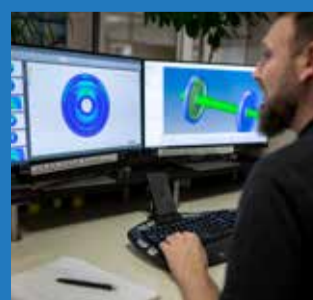
Fast Forward with the award:
PJM is awarded the grand business prize, the Fast Forward Award



Competence at its best:
An overview of PJM's comprehensive certifications



Total digital:
Monitoring and automation in just one digital overall system



Efficient engineering: EN-documented evidence of conformity by multi-body simulation models



Buenos días:
PJM joined a convention in Madrid



6. Railway Forum

PJM is joining the Railway Forum Berlin: October 1st – 2nd Booth D02

Visit us at the shared booth of AC Styria!

Totally digital

Monitoring and automation in only one digital overall system

„Easy to implement, reliable and independent from any other systems“ – these were the technical requirements for the WaggonTracker-system. Monitoring features and automated processes should be performed by only one digital overall system.

The features of the WaggonTracker system:

Due to the hub generator, it is energy self-sufficient and it provides a great many functionalities which perfectly meet the demands of wagon keepers and RU's. The information on the wagons is provided in real-time.

The WaggonTracker's asset is its "simplicity": *"All the functionalities are provided by one platform. Further functionalities from running operations or specific requirements from the wagon keeper can be implemented optionally. The WaggonTracker-system is scalable"*, says CEO Günter Petschnig.

Furthermore, the WaggonTracker features a system-independent and expandable design. The WaggonTracker provides a self-sufficient power-supply and an in-train-communication that generates a double benefit. The local RF system provides highest availability, independent from internet accessibility (e.g. in far reaches). Existing vehicle fleets can be upgraded easily.

The system is easy to implement. PJM has equipped both new vehicles and existing fleets. Wagon keepers and fleet operators benefit from an increase in efficiency and less costs: Crucial information is provided in real-time and complex processes are automated.

A general survey of the WaggonTracker system: <https://pjm.co.at/en/waggontracker/>



Automated processes

Load Monitoring: All the relevant information on the load is provided on the wagon and in the web-portal in real time. This opens up new paths in terms of safety and optimum load capacity.

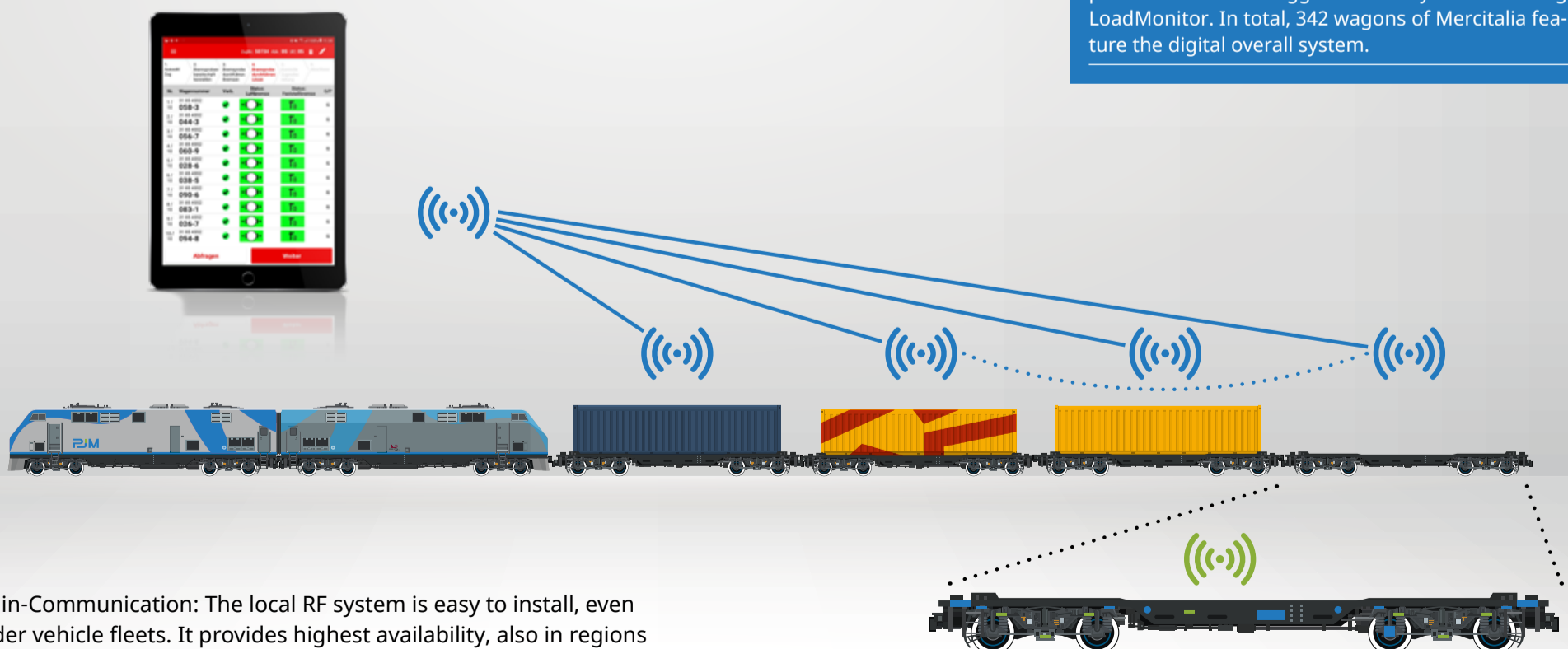
Automated brake test: Automated brake tests replaces time-consuming, manual testing. Given a 500 m long freight train, there is a time saving of 30 minutes. The results of the automated brake tests are visualised on the display of the train conductor or the one who is in charge of the brake tests. The automated brake test has been running successfully by 105 vehicles of SBB Cargo. An international partnership of SBB Cargo, RCG, PJM and Mercitalia had developed this innovation. The automated brake test fulfils all safety-related regulations in terms of operation and vehicle.

Latest projects:

In September, about 160 Transwaggon vehicles are equipped with WaggonTracker-systems in the north of Germany. From November on, further 196 systems will be installed for our customer **Mercer**.

The wagon keeper **GATX** has upgraded new wagons of Lenzing. The wagons were handed over in Burgas, Romania. In total, Lenzing has rented 106 wagons from GATX, EER and Transwaggon. All wagons are provided with the WaggonTracker-system.

40 Shimmns and 25 T3000-vehicles of **Mercitalia** are provided with the WaggonTracker-system including LoadMonitor. In total, 342 wagons of Mercitalia feature the digital overall system.



In-Train-Communication: The local RF system is easy to install, even on older vehicle fleets. It provides highest availability, also in regions without internet access.

Competence at its best: An overview of PJM's comprehensive certifications



The 360-degree-portfolio of PJM is made possible by a wide range of certifications. Very shortly after its foundation, PJM was the first accredited testing facility in Austria. By expanding the portfolio of services continuously, PJM was able to offer overall solutions very soon. The most important certifications at a glance:

- Accredited testing facility confirmed by ISO/IEC 17025
- Certified by ISO 9001
- Certified quality management system according to ATEX-regulation 2014/34/EN, attachment VII
- DeBo recognized by the Federal Railway Authority as project-independent and autonomous person/organisation for the testing of national regulations (NNTR).
- Certificate for bonding works according to DIN 6701-2

Find all the certificates on: <https://pjm.co.at/en/accreditation/>

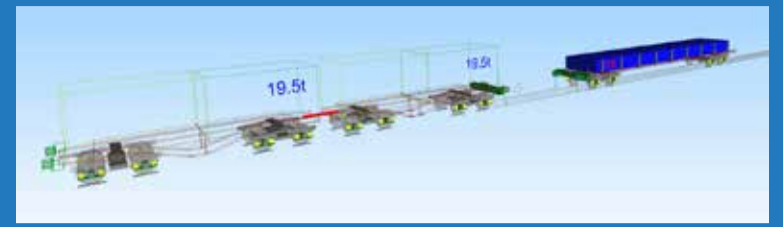
Full-service provider and one-stop shop

In cooperation with Railway Competence and Certification GmbH (RCC), we are able to provide overall solutions including approval procedures. RCC specialises in conformity assessments, product certifications and independent safety assessments. The accreditations include:

- Notified Body NB 2697
- Assessment Body AT/35/0116/0400

Furthermore, RCC is the top address for the realisation and approval of innovative technologies, namely the Clean Rail Technology (emission-free power units for railway vehicles) or telematics solutions for railway systems. ■

Efficient engineering: EN-documented evidence of conformity by multi-body simulation models



“Due to our many years’ experience we have gained from our tests for approval and due to our profound expertise on engineering, we are capable of determining reliable values by multi-body simulations. Our customers benefit from efficient project realisation since complex and elaborate tests are replaced by engineering”, says CEO Martin Joch. Recently, PJM completed the TransANT 2x33ft project. For the design of a new type of freight car, PJM played an important role. The specifications of the new freight car, which was initiated by RCG, were demanding: Less weight of the freight car, a flexible length yet a maximum load volume. By the means of topology optimisation which PJM has transferred from space technology to optimise freight cars, PJM designed a new, lightweight freight car. Due to its light-metal design, the net weight was reduced by 20 % yet achieving maximum safety and flexibility.

In this project, the task was to provide evidence for the shortest variant of the RCG baseframe by means of simulation calculations:

- Buffing impact testing according to EN12663-2
- Tests for safety against derailment under longitudinal forces according to EN15839:2012 and A1:2015
- Safety against derailment on twisted track according to EN14363:2016, attachment B ■



Buenos días PJM joined the convention in Madrid

The University Institute of Vehicle Safety and BFM (PJM partner Rubén de la Prida) have invited to an international meeting of experts at the Universidad Carlos III. The main issue was the current situation of monitoring the infrastructure of the Spanish Metro. The hosting experts and the operators of the Metro systems in Madrid, Bilbao and Valencia discussed the various requirements and possible future concepts. PJM was invited expert to provide an insight into the project “track monitoring system of the Metro in Oslo”. An expert of the Metro operator Sporveien Oslo AS joined the convention, too. ■

Fast Forward with the award:

PJM wins the grand business prize Fast Forward Award 2019

For its innovative power, the jury of experts voted for the WaggonTracker system and designated PJM winner of the competition. The popular award was handed over at the festive event on 11th of September. *“There is always a story behind a project”,* says Martha Mühlburger, chairwomen of the jury and vice president of the University of Mining and Metallurgy of Leoben. However, what’s the story of the WaggonTracker system? The idea was born many years ago, when the term digitisation was not more than a vision. From 2013 on, PJM put an enormous effort in designing, developing and prototyping. In 2015, the first train was provided with a prototype of the WaggonTracker system. To track the vision was the right decision. The figures speak for themselves:

- International customers benefit from 2.000 WaggonTracker systems
- Export quota: 80 %
- 19 jobs were created at the company site in Graz

Every year, the SFG is searching for the most innovative Styrian companies. 2019, more than 100 companies applied for the award, but only five are declared winners. The award is highly sought after: Among the list of winners are worldwide operating enterprises such as AT&S, AVL and Epcos. Barbara Eibinger-Miedl, member of the Styrian government and Christoph Ludwig, CEO of SFG, presented the award to Günter Petschnig, CEO of PJM.

Günter Petschnig thanked the PJM team but also emphasized the relevance of the WaggonTracker system in terms of environment: *“These days, reducing CO2 emission is a big issue. A monitoring system is crucial to make rail freight transport more attractive, faster and more transparent – and thus achieving a shift from road transport to railway transport.”* ■



PJM at a glance

PJM is an internationally renowned specialist in the field of railway systems. Based in Austria, PJM is technology leader for forward-looking overall solutions and railway automation.

PJM’s three main business fields are:

- 1. Monitoring systems for the digitisation of rail freight transport.**
The patented WaggonTracker system provides comprehensive information on the goods transport and automatizes demanding processes (e.g. loading and brake tests)
- 2. Engineering:** PJM has pioneered the application of topology optimisation for freight cars, a tool originally used in space technology. PJM’s highest premise is to both achieve minimal weight and maximum safety. Furthermore, PJM is a worldwide leading expert for multi-body simulation and FE calculation.
- 3. Testing facility:** PJM is accredited as ISO/IEC 17025 testing laboratory for railway vehicles.

Due to this unique portfolio of products and services, PJM offers comprehensive solutions including planning, simulation, calculation, testing and data analysis.

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On special occasions, PJMagazine issues novelties and latest projects of PJ Messtechnik GmbH and PJ Monitoring GmbH. Responsible for the content: Martin Joch and Günter Petschnig, CEOs of PJ Messtechnik GmbH and PJ Monitoring GmbH. Concept and realisation: Birgit Rami-Jauk, Corporate Communications. Layout: Crossdesign Werbeagentur GmbH, Graz. Photos: MOMOOD, PJM, SFG / Scheriau and Adobe Stock. We look forward to your feedback or further requests: news@pjm.co.at.