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OPTiMEAS

User report

ELL Austria GmbH

Smart MVB monitoring

Ulrich Renner
CIO, **ELL Austria GmbH**

*"The pilot projects have already shown that the chemistry is right. **optiMEAS** has a similarly flexible and always results-orientated way of working. We now have a very successful solution that perfectly covers our current needs and is open to further use cases to optimise our maintenance."*

A closer look inside the locomotive

European Locomotive Leasing (ELL), based in Vienna and Gräfelfing near Munich, is an established company in the European cross-border rail market and specialises in the full-service leasing of modern electrical Siemens Vectron locomotives.

As the provider with the largest single-variety Vectron fleet, **ELL** is a leader in terms of quality and vehicle availability. In order to monitor the critical components of the locomotive even better and develop predictive maintenance strategies, **ELL** relies on the digitalisation and rail technology of the Vectron.
expertise of **optiMEAS**.

Smart monitoring keeps high-tech locomotives moving

As the leading full-service leasing provider for Siemens Vectron locomotives, **ELL Austria GmbH** offers its customers maximum flexibility and reliability for every traction task. The IoT monitoring solution from **optiMEAS monitors** the rail vehicles and enables improved maintenance plans to optimise availability.

ELL locomotives are in use throughout Europe

THE CHALLENGE: MAINTENANCE PLANNING WITH DETAILED OPERATING DATA

With more than 200 locomotives, **ELL has** the largest homogeneous Vectron fleet on the market. Most of the vehicles are multi-system locomotives that operate cross-border freight and passenger transport services with various voltage and train protection systems. In order to provide customers with optimum support, **ELL** deploys the vehicles in the customer pool flexibly

Full-service leasing means that **ELL takes care of the** complex maintenance of the locomotives, which is due after specified times, kilometres or switching cycles and operating hours of individual components. Combining the many maintenance plans in such a way that downtimes are minimised and every customer can run the desired service is a complex task. An additional, particularly

Unplanned breakdowns, where a replacement vehicle often has to be organised, are a major challenge. The aim is to recognise faults reliably at an early stage. For this reason, the vehicle manufacturer's remote transmission solution is to be supplemented by an independent fallback level.

After a detailed evaluation, the Vectron specialist decided in favour of **optiMEAS**. In addition to the measurement technology expertise and the IoT portfolio, the decisive factors were the flexible, cooperative way of working and the technical competence, which has been proven in numerous projects. IIII

THE SOLUTION: CONTINUOUS RECORDING OF OPERATING DATA WITH INTELLIGENT POWER SUPPLY

The monitoring solution developed is designed for large volumes of data. It consists of the IoT system **smartRAIL MVB**, the **smartI/O BATMON** battery monitoring system and the **optiCLOUD** IoT platform. **smartRAIL MVB** seamlessly records the operating data provided by the **MVB bus at a** maximum of around 60 Hz and transfers it to the cloud without loss.

The smartRAIL MVB is based on the robust **smartRAIL system**. It specialises in condition-based maintenance and future predictive maintenance applications in rail transport and can be customised via hardware and software extensions.

The **MVB interface module** specially developed by **optiMEAS** is integrated into the **smartRAIL hardware** as an internal module. A software module was added to the **smartCore** device software for integration with little effort.

The **MVB interface** is designed in such a way that it has no feedback effect on the vehicle bus. It reads the **MVB bus** in accordance with **EN61375-3** without actively participating in the **MVB communication** itself. Even if the module malfunctions, the operational safety of the bus is ensured.

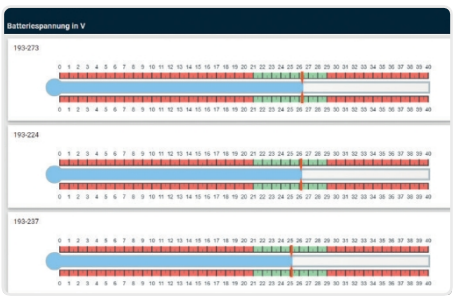
The internal **FPGA** processes the physical **MVB signals** seamlessly, so that all data traffic with short-term status changes is reliably recorded and stored on the device. And
This is done at the right time with lots of additional status information that even
allows the **MVB communication** to be diagnosed.

As an IoT gateway, **smartRAIL MVB sends** the data via mobile radio to the **optiCLOUD,** where it is available for analyses. At the same time, the device transmits position data every few seconds

and operating variables to the **cloud dashboard**. Changes to the configuration of the devices or software updates can be made remotely at any time via the **cloud.**

"INTELLIGENT POWER SUPPLY UNIT" MONITORS BATTERY

The power supply unit and simultaneous **smartI/O BATMON** measuring module installed with the **smartRAIL MVB** realises battery monitoring including undervoltage protection and serves as an intelligent power supply.



The battery voltage is permanently under control.

The module is connected to the battery and vehicle electrical system, determines whether the vehicle is charged, continuously monitors the battery voltage and tracks every charging and discharging process. If the battery voltage falls below critical values, it triggers an alarm.

The **BATMON** is also an intelligent power supply unit: when the vehicle is switched off, it wakes up the **smartRAIL MVB** in configurable cycles so that the device sends the most important information, including position and battery voltage, to the cloud. It then puts the device back to sleep. This function ensures continuous monitoring of vehicles in towing mode IIII

THE BENEFIT: VEHICLE MONITORING AND DATA POOL FOR PREDICTIVE MAINTENANCE

Vehicle availability is the key success factor for **ELL** and the European railway system. The continuous monitoring reduces downtimes and provides a deeper insight into the physical processes within the locomotive. This allows the **ELL to** determine maintenance requirements at an earlier stage and reduce unexpected downtimes.

The monitoring solution from **optiMEAS** serves as a backup for the manufacturer's system and offers additional options. The **BATMON system** enables time-controlled access to the vehicle even when it is parked and in disarmed towing mode. Before the battery voltage is no longer sufficient to raise the pantograph and start the vehicle, the system automatically informs the driver. The tracked data can be used to estimate whether the battery needs to be replaced as a precaution.

The solution also improves the documentation of emergency stops that have occurred: The minute values alone show whether the locomotive, a wagon or the railway infrastructure was responsible for the emergency stop. As a digital service, customers have access to the dashboard and can track down errors that may be related to their wagon fleet themselves.

The time series data makes it possible to recognise how failures are announced and what the causes are. The data analysts use the data pool to identify anomalies and work out probabilities of occurrence using artificial intelligence and machine learning methods. Then, for example, a fan is preventively replaced during the next inspection replaced, even if the maintenance stage specified by the manufacturer has not yet been reached. Conversely, maintenance intervals can be extended with the effect that locomotives are idle for less time, fewer resources are consumed and maintenance costs are saved.

Part of the fleet is already equipped with **smartRAIL MVB** and **smartI/O BATMON,** the rest will follow successively in the course of planned workshop visits. In parallel, the **ELL** and **optiMEAS** hold technical workshops to determine where there is potential for improvement, which components should be closely monitored and which signals and signal conditioning are required for this. The **smartRAIL MVB system** is open to expansion. IIII

ADVANTAGES AT A GLANCE:

" Continuous vehicle monitoring
" Remote access even during shutdowns
" Fewer failures
" Savings through optimised maintenance plans
" Database for predictive maintenance

COMPONENTS USED BY OPTIMEAS:

" IoT system **smartRAIL MVB** with software **smartCORE**
" Battery monitoring system **smartI/O BATMON**
" **optiCLOUD**

FURTHER INFORMATION:

www.optimeas.de
www.ell.co.at

optiMEAS
Measurement and Automation Systems GmbH
Software Solutions GmbH

Tel: +49 (0) 61 72/99 77 12-0
Email: info@optimeas.de | www.optimeas.de
Am Houiller Platz 4/B | 61381 Friedrichsdorf