



The Future of Condition Monitoring is Digital: Greater Efficiency and Reliability for Graz Linien

- **Graz public transit authority to install Infrastructure and Driveline Monitoring System from ZF in the first ten of more than 40 planned vehicles**
- **Digitalization solution simplifies maintenance planning, prepares light rail for comprehensive condition and infrastructure monitoring**
- **Since December 2020, ZF has also been on the rails in Graz with a visual eye-catcher**

Friedrichshafen. After successfully piloting and pre-producing applications, the Condition Monitoring System, which supports infrastructure and driveline monitoring, is set to go into volume production. With the support of two innovation leaders from Graz Linien, ZF has been further developing its digital system for condition monitoring since 2018 and has tested it during operation. At the end of 2020, Graz Linien, the city's public transit company, equipped ten rail vehicles with the Infrastructure and Driveline Monitoring System. An extended agreement on the equipment for 30 more vehicles has already been reached. Thus, vehicle availability in the inner-city traffic of Austria's second largest city can be planned more efficiently and operations can be made more environmentally friendly.

With the new Condition Monitoring System solution from ZF, Graz Linien intends to improve efficiency and operational safety through predictive maintenance, as well as permanent infrastructure monitoring. To achieve this, ZF installs several sensor platforms on the bogie, which record acceleration and vibrations, as well as bumps in the wheel-rail contact during operation. This data enables operators to monitor the condition of the rail tracks and wheels in real time, and helps to identify potential problem areas early on, which promises even greater safety while further reducing downtime. Any damage to the wheels or rail



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tracks can be detected early on, as well as resulting noise emissions, so further damage can be avoided.

First application: Flat Spot Monitoring

As a first step, Graz Linien focuses on the detection of wheel flats. When exceeding the friction limit between wheel and rail, a flat spot occurs. In further operation, the wheel does not roll correctly on the rail, which causes excessive local material removal. Flat spots are a possible reason for noise pollution for passengers and residents. With the Infrastructure and Driveline Monitoring System, ZF provides an efficient basis for the early identification of flat spots and predictive maintenance planning, which results in reducing the impacts and comfort restrictions for people and the environment, that are caused by this issue.

Comprehensive Condition Monitoring “connect@rail”

The Infrastructure and Driveline Monitoring is part of an innovative system that ZF has developed, as it strives to achieve the overall goal of comprehensive condition monitoring for rail vehicles and infrastructure. The intelligent condition monitoring system, connect@rail, demonstrates how integrated sensors and advanced data analysis tools can further improve efficiency, reliability and safety in rail transportation. Various sensors record vibrations, oil quality, and temperature trends inside ZF rail drives. Then, a digital platform developed by ZF reliably transfers the collected data and information to the ZF IoT-Cloud. The analysis and recommended courses of action based on the collected data are made available to the operator from the ZF IoT-Cloud, on a user interface and via push message. Furthermore, they can optimally schedule maintenance dates and respond to the most diverse situations individually and flexibly. This guarantees that the entire fleet is operating smoothly and as cost-efficiently as possible.



Actively shaping the mobility of the future

#ShapingSmartTransportation

In addition to the technological and innovative upgrade of the rail vehicles, there is a special eye-catcher on the rail tracks in Graz since December 2020: A tram in ZF design draws attention to the digital condition monitoring system connect@rail installed in it. The slogan #ShapingSmartTransportation stands for the active participation of Graz Linien and ZF in the mobility of the future. Thomas Kerschberger, Division Manager for Workshops at Graz Linien explains: "ZF and Graz Linien have a long-standing partnership. Since 2018, we have been testing the digital condition monitoring system for the use in our trams. The short coordination paths with the development team have contributed to an optimal cooperation over the entire period." The innovative solution provides a significant advantage in terms of predictive maintenance planning as well as digital and permanent condition monitoring. "ZF always responded flexibly to our wishes and requirements. Now we have a system that is best suited to our needs in fleet management," adds Thomas Kerschberger.

Caption

Equipped with the innovative Infrastructure and Driveline Monitoring System: The Graz tram in ZF livery on its route through the inner city of Austria's second largest city.

Image: ZF

Press contact:

Dusanka Novakovic, Marketing and Communications,
Marine & Special Driveline Technology Business Unit,
Phone: +49 7541 77 969445, e-mail: dusanka.novakovic@zf.com

Gernot Hein, Head of Communication & Public Affairs / Press
Spokesperson, Industrial Technology Division,
Phone: +49 851 494-2480, e-mail: gernot.hein@zf.com



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ZF Friedrichshafen AG

ZF is a global technology company and supplies systems for passenger cars, commercial vehicles and industrial technology, enabling the next generation of mobility. ZF allows vehicles to see, think and act. In the four technology domains Vehicle Motion Control, Integrated Safety, Automated Driving, and Electric Mobility, ZF offers comprehensive solutions for established vehicle manufacturers and newly emerging transport and mobility service providers. ZF electrifies different kinds of vehicles. With its products, the company contributes to reducing emissions and protecting the climate.

ZF, which acquired WABCO Holdings Inc. on May 29, 2020, now has 160,000 employees worldwide with approximately 260 locations in 41 countries. In 2019, the two then-independent companies achieved sales of €36.5 billion (ZF) and \$3.4 billion (WABCO).

For further press information and photos please visit: www.zf.com