



Predictive Maintenance Provides Keys for Intelligent and Efficient Industrial Technology

- **ZF offers a broad portfolio of digitalization solutions for industrial use**
- **Predictive maintenance adapts maintenance intervals to suit the intensity of use**
- **Shorter, predictable downtimes reduce costs for operators of ropeways, wind turbines and rail vehicles and increase their availability**

Friedrichshafen/Hanover, Germany. ZF use their extensive system and networking expertise to bring predictive maintenance to every type of industrial drive: Operators of ropeways, wind turbines and rail vehicles alike benefit from the company's cost-saving and smart predictive maintenance solutions. The predictive maintenance functions all share one common foundation, namely ZF's Cloud-based IoT platform, which all data is fed into and then evaluated using intelligent algorithms. At the Hannover Messe 2019 trade fair, the technology company will present their broad portfolio for the digital future of industrial technology.

Maximum efficiency at the lowest possible costs – this is the call heard across the industry when it comes to the requirements for industrial technology applications. Here, unscheduled downtimes frequently interrupt operations: If a system breaks down unexpectedly, operators face tremendous losses. This is why ZF has developed digital and interconnected solutions for predictive maintenance that minimize downtimes and increase the reliability of industrial drives. In doing so, the technology company combines smart sensor systems with extensive networking know-how and hardware expertise to create intelligent mechanical systems. "ZF is in the unique position of uniting the competencies necessary for intelligent predictive maintenance under one roof," says Dr. Klaus Geißdörfer, Head of the Industrial Technology Division at ZF. "This allows us to offer our customers solutions that have been tailored to their needs, that can maximize their applications'



PRESSE-INFORMATION
PRESS RELEASE

Page 2/4, April 1, 2019

efficiency and significantly reduce operating costs – regardless of the application."

Increasing efficiency and reliability in the rail sector

Digitalization has long arrived in the rail sector: There is an increasing demand for monitoring systems for rail drives that include constant data connectivity and automatic evaluations. With their intelligent transmission systems for railroad applications, ZF has developed a solution that combines state-of-the-art sensor systems with data analysis tools, continuously keeps an eye on the drive's condition and thus allows demand-oriented maintenance. The intelligent condition monitoring system connect@rail, for example, monitors bearings, gearing and transmission housing, among others, and recognizes potential malfunctions at an early stage. At the same time, the installed technology makes it possible to monitor various oil parameters. These can then be specifically linked with the current temperature behavior of the rolling bearings and transmission oil. The ZF IoT platform collects the data from all sensors. This information is stored either locally or in a Cloud and can be accessed in real time using a smartphone, for example. With these functions, intelligent transmission systems increase the efficiency and reliability of rail vehicles and contribute significantly to reducing the operating costs of rail overall whilst optimizing performance and increasing safety. A pilot project is already being run using a test vehicle in a tram.

A clear focus on performance management for ropeways

Ropeways often operate under challenging conditions – whether as ski lifts in freezing temperatures or as urban shuttle systems in the tropical heat of South America. At the same time, passengers expect them to operate comfortably and safely. Here, ZF not only delivers robust and compact transmissions that run smoothly. With the ZF ProVID performance management system, they also offer a solution that ensures operations with maximum efficiency: Constantly monitoring the condition of the entire drive system allows operators to recognize potential damage to transmissions and systems at an early stage. This in turn enables them to initiate preventive maintenance measures, reduces



PRESSE-INFORMATION
PRESS RELEASE

Page 3/4, April 1, 2019

downtimes and significantly increases the availability of the systems. The data is captured by means of a sensor system that can be configured variably and is based on tried and tested industry standards. ZF has developed system-specific algorithms that evaluate the collected data with regard to oil characteristics and vibration behavior of the transmission's gearing and bearings as well as other driveline elements. The edited information is then made available to operators on a customer and user-friendly dashboard via the Cloud. In Austria, first lifts equipped with ZF ProVID confirm the performance management system's positive results.

Cloud-based solution reduces costs for wind turbine operators

Digital solutions also provide wind turbines with more efficiency and optimized performance management. ZF offers operators a system that continuously monitors the wind turbine's entire driveline during operation and feeds the data into the open and Cloud-based ZF IoT platform. This allows operators to monitor the transmission's condition and performance from afar and schedule upcoming predictive maintenance. Additionally, the interconnected wind turbines can calculate the best operating mode for the current weather conditions at any time and thus optimize energy generation. This largely prevents overloading the transmissions and allows operators to predict necessary maintenance whilst improving alignment of the current workload. The increased efficiency and shortened downtimes reduce operating costs for manufacturers and operators and with them the manufacturing costs for wind energy as a whole.

Captions:

- 2) More efficiency and reliability for rail vehicles: ZF's intelligent transmission system monitors the condition of rail drives and thus prevents idle times and downtimes.
- 3) The ZF ProVID performance management system allows operators to monitor the operating state of ropeways in real



PRESSE-INFORMATION
PRESS RELEASE

Page 4/4, April 1, 2019

time. The data is displayed on a dashboard – including recommended actions for the operator.

- 4) Optimizing energy generation: ZF's Cloud-based IoT platform allows remote monitoring of wind turbines and additionally calculates the best operating modes for all weather conditions.

(Images: ZF)

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ZF Friedrichshafen AG

ZF is a global leader in driveline and chassis technology as well as active and passive safety technology. The company has a global workforce of 146,000 with approximately 230 locations in some 40 countries. In 2017, ZF achieved sales of €36.4 billion and as such, is one of the largest automotive suppliers worldwide.

ZF enables vehicles to see, think and act. The company invests more than six percent of its sales in research and development annually – in particular for the development of efficient and electric drivelines and also in striving for a world without accidents. With its broad portfolio, ZF is advancing mobility and services for passenger cars, commercial vehicles and industrial technology applications.

In the Industrial Technology Division, ZF pools its activities for off-road applications. These include the development and production of transmissions and axles for agricultural and construction machinery along with driveline technology for forklift trucks, rail and special vehicles. The division is also responsible for the worldwide business of marine propulsion systems, aviation technology as well as the development and production of gearboxes for wind turbines and industrial applications. Test systems for all kinds of applications in driveline and chassis technology are also included in the division's portfolio.

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