



ZF Test Systems presents at HMI 2019

- **ZF production test bench for 3rd generation electric drives**
- **Data analytics increases product quality and reduces costs**

Realizing cycle times from 90 seconds, optimizing data analytics and thus generating additional value for customers: These are the advantages offered by the Test Systems business unit of ZF with its new functional test bench for electric drives – for prototype construction as well as high-volume requirements. The test bench will be on display at the ZF booth in hall 25, booth C11.

ZF functional test bench for electric drives

The increased use of electro mobility in cars requires new test benches for electric drives. They differ from conventional engine and transmission test benches mainly due to the high speeds of up to 23,000 rpm as well as the geometric characteristics of e-axles. The 3rd generation E-Mobility EOL test bench (Fig. 1) from ZF, presented at the HMI, fulfills all the requirements arising from the transition to electric mobility. Core components are the battery simulator for supplying the drive motor as well as two powerful drive modules with rated output of up to 200 kW and an axle torque of up to 10,000 Nm. The drive unit essentially consists of a water-cooled asynchronous motor, which is connected to the item being tested via a coupling and a drive pinion with toothed shaft. Acoustics (structure-borne noise and airborne noise), efficiency, maximum operating points and functions such as parking brake or oil pump are tested. In addition, an efficiency (WLTP) and high-voltage test are performed.

ZF offers functional test benches for electric drives for prototype construction as well as for high-volume applications. Cycle times from 90 seconds can be achieved here.



Data analytics

An improved and more effective evaluation of a product's data during its life cycle can reduce costs while at the same time enhancing the quality of both the current product and its successor. This requires a linkage between the data from the fields of R+D, production, and EOL testing, as well as the evaluation of customer data (Fig. 2).

ZF Test Systems already performs data analytics for EOL testing and production. An important basis for this is the combination of different know-how areas from the ZF Group:

- Production process know-how from transmission production for more than 100 years
- Product know-how through countless applications in the areas of passenger cars, trucks and industrial technology
- Test know-how from more than 1,300 delivered test benches in the R+D and production area
- Applied data analytics know-how from topics such as autonomous operation, e.g. pattern recognition

ZF has the expertise to design superior data analytics methods and models to enable rapid results for the customer.

Data analytics 1

In the end-of-line test, a large amount of data is generated with regard to the tested item and the test bench. By evaluating these test data using big-data analysis and pattern recognition, the quality of the product can be increased and the testing process can be accelerated. Specifically, this means:

- A significant reduction in the error rate of the product is achieved
- The avoidance of test redundancies in the multi-stage manufacturing process leads to time savings



- Through the automated determination of meaningful test limits, the complexity of the product and process can be better controlled and continuously optimized

Data analytics 2

Linking the data from the EOL test with the data generated during the production of a product can help to optimize the production process and thus reduce product costs.

- By identifying influencing variables, the process can be optimized
- Delivery capacity is increased by reducing the internal return rate
- Targeted improvement measures lead to savings in time and materials

Data analytics 3

Here the data from the EOL test, from production and from development are combined and offer the potential for further optimization possibilities in the product and at the final development process e.g. by using digital twins.

- A derivation of performance capability allows the definition of new variants without the need for 100% field tests
- Achievement of time and cost savings
- Added value is generated for product quality and processes

Data analytics 4

In the last step, the data from the operational phase of the product are integrated and thus have a positive influence on the subsequent generations of the product and the optimization of process steps.

- For the development of the next product generation, this brings changed or optimized design requirements



PRESSE-INFORMATION
PRESS RELEASE

Page 4/5, April 01, 2019

- In addition, the determination of real load collectives allows adapted service intervals (example: ZF TraXon Predictive Maintenance)
- Targeted validation adjustment by using this operational data

ZF Test Systems

ZF Test Systems develops and produces test systems for on- and off-road mobility. As specialists for validation and development test facilities, we improve the quality of the driveline, active chassis, tires and wheels as well as brakes, thus contributing to enhanced safety and comfort for the driver.

Caption:

- 1) ZF functional test bench for electric drives
- 2) ZF Test Systems Data Analytic

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.



PRESSE-INFORMATION
PRESS RELEASE

Page 5/5, April 01, 2019

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 photo material please visit: www.zf.com