Press Conference
Agritechnica 2019

Udo Kneitz / Dr. Karl Grad
ZF Shapes the Future of Farming

Intelligent System Solutions

Smart Farming

Safety

Intelligent Drive Strategy

Electrification
ZF Group – Financial Overview 2018

EUR 2.1 billion  
adjusted EBIT

EUR 2.5 billion  
Research & Development

EUR 1.6 billion  
investments in property, plant, and equipment

EUR 36.9 billion  
sales

EUR 1.4 billion  
reduction of gross debt

148,969  
employees

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Facts and Figures
Division Industrial Technology
Profile Division

Profile 2018: Division Industrial Technology

Business Units: 6
Off-Highway Systems, Industrial Drives, Marine and Special Driveline Technology, Aviation Technology, Wind Power Technology, Test Systems

Sales*: 2,781.9 Mio. €

Employees: 9,800

Locations: 26

*consolidated
ZF Off-Highway Systems

Construction Machinery Systems

Agricultural Machinery Systems

Material Handling and Electric Drives
ZF Off-Highway Systems – Profile

Total sales million € 1,276.1 Mio.

Europe 708.231 million €
Asia-Pacific Region 241.674 million €
North America 247.808 million €
South America 74.322 million €
Africa 4.100 million €

North America

Sales by region

Material handling 139.343 million €
Components 59.741 million €
Agricultural machinery 360.788 million €
Construction machinery 716.228 million €

Sales by product

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AGRICULTURAL MACHINERY SYSTEMS
Agricultural Machinery Systems

Product highlights

Transaxles for tractors
TERRASHIFT, TERRAPOWER, TERRAMATIC

Steering axles for tractors
TERRASTEER

Drivelines for combine harvesters
CERAMATIC

Electric Drives
eTRAC

Intelligent System Solutions
Latest ZF technology combined in one vehicle
The Future of Farming
Press Conference Part 2

Dr. Karl Grad
ZF – The Future of Farming

Intelligent and innovative system solutions

**Efficiency**
ZF Best Choice – The best technology for your business

**Electrification**
System optimization boosted by Electrification

**Safety**
Radar technology for environment detection

**Drive Strategy**
Intelligent and predictive drive strategies for agricultural machinery

**Connectivity**
Intelligent vehicle and implement interconnection

SMART FARMING
The Future of Farming

- Electrification Tractor
- Electrification Implements
- Connectivity
- Safety
- Intelligent Drive Strategy
- Efficiency
Efficiency – ZF Best Choice Strategy

With the Best Choice Strategy ZF is offering the matching technology according to the customer and market requirements.

ZF PREMIUM LINE
Innovative technologies for advanced vehicle concepts and superior performance

ZF HIGH LINE
Upgrade options for more performance and higher efficiency

ZF BASIC LINE
Best cost products with high local content
The Future of Farming

- Electrification Tractor
- Electrification Implements
- Safety
- Intelligent Drive Strategy
- Efficiency
- Connectivity
Electrification – Generator module TERRA+
The source of power

- Power-on-demand for electrical auxiliaries
- High-precision, controlled operation of electric drives on mounted implements
- Increase of operational performance and tractive effort
- Reduction of CO2 emissions

Low voltage version
- Generates electric low voltage power (10-20 kW continuously)
- Enables efficiency optimization through electric aggregates in tractor and implements

High voltage version
The high-voltage generator and inverters from the hybrid truck transmission serve as a tractor power source, delivering up to 80 kW of continuous electric power
**ZF Innovation - eTERRAMATIC**

- **Functional Integration:** Combination of variator and electric power take-off function via two e-machines
- **Performance:** Optimized variator efficiency and less fuel consumption
- **Architecture:** Modular with conventional TERRAMATIC transmissions
- **Design:** Same installation space including electrical components for drivetrain

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Concept Study: Electric CVT Technology
Electrification for Implements

In combination with appropriate traction management, systems with electric traction drives on implements offer significant advantages.

System optimization with electrically distributed traction management has the potential to boost both productivity and tractive effort.

- Electrical single-wheel drive for agricultural applications
- Different total ratios and voltages available
- Compact high integration motor design
- Integrated brake control system

eTDW 80

Ps₁ = 60 kW
n_nominal = 4,500 rpm

iMech = 35.8

n_output_max = 210 rpm
T_output_max = 16,500 Nm
Electrification for Trailers

Agriculture needs to move a lot of goods from and to the fields. Trailers are hence important implements on every farm. Weight of the trailer can be up to 3-times of the tractor weight.

Especially for agricultural trailers, ZF offers its eTRAC electric central drive with an optional transfer gear box.

- ZF system including inverter and electronics
- Can be combined with common drive axles and ratios
- Application of proven components from ZF-EcoLife city bus transmission
Electrification for Compact Vehicles

- A ‘best in class solution’ for power density in electric compact loaders / tractors
- 20 kW (continuous performance) and 48 V performance classes
- The use of liquid coolant in the traction motor and the power electronics
Electrification for Subcompact Vehicles and Field Robots

- **eTRAC**: Wheel Drive for small self-propelled vehicles or articulated wheel loaders (mini yard tractor)
  - Easy installation, high level of service friendliness
  - Motor power 5 kW, max. output torque 1,800 Nm

- **GK-Series**: Steer-Drive systems for field robots
  - Patented ZF hypoid tooth ing provides the customer with optimum performance (torque capacity), service life and high ratio in a minimal installation space
  - Motor power 6 kW, max. output torque 1,400 Nm
The Future of Farming

- Electrification Tractor
- Electrification Implements
- Connectivity
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- Efficiency
ZF Observation Assist
Short-range radar technology supports functions such as the „ZF Observation Assist“. Environment can be detected within a range of up to 90 meters in a grid of 20 centimeters and an opening angle of +/- 75 degrees.

ZF Blind Spot Assist
Short-range corner radars monitor the traffic to the sides and recognize bike riders or pedestrians even at night and in the blind spot area. If people or objects are detected, the driver will be warned. The ZF Blind Spot Assist can thus help to prevent serious accidents.
Smart Farming – Intelligent Drive Strategy

Radar-based prevision for an optimized driving strategy
Thanks to this Intelligent Drive Strategy it is possible for the first time to respond anticipatory to a changing topography without the existence of highly accurate map data. One possible use case is the slope detection with the corresponding optimized driving strategy.

• Performance increase or reduction of fuel consumption
• Driving strategy adapted to actual topography
• Optimization of shift times and gear selection
• Reduction of shift frequency
Smart Farming – Connectivity

ZFlink Basic / ZFlink Premium

deTAGtive

How are your assets connected?
deTAGtive TAGS

- Installed on machines or vehicle attachments
- Ability to communicate with each other
- Store several thousand events
Thank you for your attention.

Visit ZF – hall 15, booth D03