

cti symposium

 AUTOMOTIVE DRIVETRAINS
INTELLIGENT
ELECTRIFIED

International Congress and Expo
9 - 12 December 2019, Berlin, Germany

**Hitting the sweet spot
between customer expectations,
technology and regulations**

www.drivetrain-symposium.world/de

THE EXPERT SUMMIT THAT DRIVES MOBILITY



“The transformation of the automotive industry into the age of electromobility and automation requires high investments. Consequently, knowledge about technical innovations and the potentials for one's own company are of fundamental importance. An exchange between automobile manufacturers and suppliers as well as their subcontractors at all levels is more important than ever.”

Prof. Dr Ferit Küçükay

Director, Institute of Automotive Engineering,
Technische Universität Braunschweig, Germany

**“This is the best transmission-
related symposium money can buy!”**

— C. Lee, BAIC R&D

**“World's drivetrain experts'
most important meeting,
where the trends are set.”**

— T. Meinhard, Punch Powertrain

9 DECEMBER 2019 | INTRODUCTORY DAY

BASICS AND PRACTICE OF HYBRID AND ELECTRIC DRIVES, AUTOMOTIVE TRANSMISSIONS

9.00	Registration and hand out of the documents
9.45	Begin of the seminar
11.30	Lunch
12.30	PARALLEL SESSIONS: TRANSMISSIONS AND ALL-WHEEL-DRIVES ELECTRIC COMPONENTS: BATTERIES, ELECTRIC MOTORS, POWER ELECTRONICS
6.00	End of Introductory Day

PRE-CHECK-IN

5.00 – 8.00	Pre-Check-In for the CTI SYMPOSIUM
6.30 – 9.00	Welcome reception

Start networking during the informal kick-off meeting. CTI invites you to a reception with drinks and finger food. We are looking forward to welcoming you.

10 DECEMBER 2019 | SYMPOSIUM, DAY ONE

7.45	Check-in, reception and opening of the CTI SYMPOSIUM EXPO
8.30	Welcome address
8.50	Plenary speeches
10.45	Panel discussion
12.30	PARALLEL SESSIONS:

- > TRANSMISSIONS, DRIVETRAINS FOR ICV AND HEV
- > BEV DRIVETRAINS, E-AXLES
- > CONCEPT COMPARISON BEV, HRV/48V
- > ELECTROMECHANICAL ACTUATION
- > COMMERCIAL VEHICLES DRIVETRAINS AND TRANSMISSIONS
- > AWD, EAWD
- > AUTOMATED DRIVING, CONNECTIVITY, SAFETY, AI
- > BATTERIES

1.30	Lunch
3.00	Continuation of the parallel sessions
5.10	Plenary speeches
6.00	End of the lecture programme, day one
7.00	Start of the evening event

11 DECEMBER 2019 | SYMPOSIUM, DAY TWO

8.00	Reception and opening of the CTI SYMPOSIUM EXPO
8.30	Welcome address
8.40	Plenary speeches
9.55	10th CTI YOUNG DRIVE EXPERTS AWARD
11.00	PARALLEL SESSIONS:

- > TRANSMISSIONS, DRIVETRAINS FOR ICV AND HEV
- > E-AXLES, TRANSMISSIONS
- > LAUNCH AND SHIFT ELEMENTS
- > E-MOTOR, POWER ELECTRONICS
- > DRIVETRAIN COMPONENTS, NVH, SENSORS
- > OIL, LUBRICATION
- > INNOVATIVE PRODUCTION PROCESSES AND LIGHTWEIGHT DESIGN
- > TOOLS, TESTING

12.30	Lunch
2.00	Continuation of the parallel sessions
4.15	Plenary speeches
5.10	Summary of the CTI SYMPOSIUM and final discussion with the attendees
5.30	End of the lecture programme, day two

12.00 – 5.00 Check-In for the CTI TEST DRIVE

12 DECEMBER 2019 | CTI TEST DRIVE

ADAC CENTRE OF DRIVING SAFETY, BERLIN/BRANDENBURG

8.30	Departure by bus shuttle
9.30	Arrival at the ADAC Centre of Driving Safety Welcome address, tour around the proving ground and instruction

4.00	End of the ride and drive and return to the Estrel Hotel Berlin
ca. 5.30	Arrival at the hotel

Limited number of participants – register early

9 DECEMBER 2019 | INTRODUCTORY SEMINAR

OBJECTIVE

Newcomers and career changers will get an overview of the basics of conventional, hybrid and electric drives. Different transmission concepts and AWD systems will be illustrated. The concepts will be compared and their benefits for the various vehicle classes and types discussed. A parallel session focusses on the basics of Li-ion batteries - most used energy storage device -, on the electric - a component of rising importance -, and the power electronics which task it is to provide the requested energy at the right time at the right place.

The content of the introductory seminar is presented by highly experienced experts, the schedule allows time for your personal questions and an interactive exchange.

9.00 Registration and hand out of the documents

9.45 Beginning of the seminar

12.15 Lunch break

18.00 End of Introductory Day

Coffee breaks will be handled flexibly.

11.00

Hybrid drivetrain concepts in comparison

- Introduction, classification (from mild incl. 48 V to strong hybrid)
- Add-on concepts: parallel (P0-P4, incl. e-axle)
- Dedicated Hybrid Transmissions (DHT): series, power-split, multimode
- Comparison of hybrid drivetrain concepts regarding performance and energy consumption

MORNING SESSION

9.15 Welcome Address

AUTOMOTIVE POWERTRAIN AND DRIVETRAIN CONCEPTS

9.30

Tasks and characteristics of powertrain, drivetrain and transmissions

- Requirements on automotive propulsion systems based on vehicle characteristics
- Characteristic maps of e-motors and combustion engines
- Classification of propulsion systems (powertrain, drivetrain) and transmissions
- Energy consumption resulting from road resistance, propulsion system losses and auxiliaries for different vehicle and propulsion concepts

Prof. Dr Ferit Küçükay

10.45 Short break

Electric drivetrains concepts in comparison

- Central, close-to-wheel and in-wheel-concepts
Comparison of concepts regarding performance and energy consumption
- Concepts with 1- and 2-speed-transmissions

Axle Sturm, Research Associate, Institute of Automotive Engineering, Technische Universität Braunschweig, Germany

12.15 Lunch break



PARALLEL SESSIONS

SESSION A

TRANSMISSIONS AND ALL-WHEEL-DRIVES

1.15

Transmission concepts and components

- Launch elements: clutch, e-clutch, torque converter, electric motor
- Design layouts
- Transmissions Concepts
 - MT, AMT, DCT, AT, CVT
- Efficiency of transmissions
- Comparison of transmission concepts

Gerrit Brandes, Research Associate,
Institute of Automotive Engineering,
Technische Universität Braunschweig, Germany

2.30 Short break

2.45

All-Wheel-Drive and Differential Systems

- Concepts of differentials, locks and their comparison
- Mechanical, hybrid and electric AWD concepts
- Series applications: eLSD, TorSen, xDrive, torque splitter, eAWD, etc.

Carl-Philipp Seekamp, Research Associate,
Institute of Automotive Engineering,
Technische Universität Braunschweig, Germany

4.00 Short break

4.15

Drivetrain management

- Mechatronics of automated transmissions
- Shift strategy, calibration

Dr Gunter Alvermann, Research Associate,
Institute of Automotive Engineering,
Technische Universität Braunschweig, Germany

5.30 Short break

5.35

**Summary of the parallel session
"Electric Components:
Batteries, Electric Motors, Power Electronics"**

6.00 End of the seminar

SESSION B

ELECTRIC COMPONENTS: BATTERIES, ELECTRIC MOTORS, POWER ELECTRONICS

1.15

Lithium-ion batteries

- Overview on lithium-ion batteries: design and operating principle
- Cathode and anode materials
- Electrical behavior and ageing
- System technology (charging protocols, state diagnostics, system integration)
- Cost and safety aspects

Prof. Dr Julia Kowal, Chair of Electrical Energy Storage Technology,
Technische Universität Berlin, Germany

2.30 Short break

2.45

Electric motors as vehicle drives: design, features, characteristics

- Physical basics
- Design and characteristics of the most important types of electric motors
- Operation of synchronous and induction motors of the frequency converter
- Important technical characteristics

Prof. Dr Bernd Ponick, Director of the Institute, Electrical Machines and Drive Systems Department, Institute for Drive Systems and Power Electronics, Leibniz Universität Hannover, Germany

4.00 Short break

4.15

Power electronics for hybrid and electric vehicles

- Power electronic components and circuits
- Assembly concepts and thermal management
- Control of power electronic converters
- Special considerations for vehicular applications

Prof. Dr Axel Mertens, Director of the Institute, Power Electronics and Drive Control Department, Institute for Drive Systems and Power Electronics, Leibniz Universität Hannover, Germany

5.30 Short break

5.35

**Summary of the parallel session
"Transmissions and All-Wheel-Drives"**

6.00 End of Introductory Seminar

PLENARY SPEAKERS DAY ONE

7.45 Opening of the registration desk and of the CTI SYMPOSIUM EXPO

8.30
Welcome address by CTI and the chairman of the CTI SYMPOSIUM



Prof. Dr Ferit Küçükay,
Director, Institute of Automotive Engineering,
Technische Universität Braunschweig, Germany

8.50
Electrified powertrain strategy from Geely's perspective

- Electrification trends in China market
- Customer needs on future powertrains
- Geely's powertrain strategy & innovation
- Geely's transmission roadmap



Ruiping Wang,
Vice President of Geely Auto Group,
Zhejiang Geely Auto Group, China

9.10
E-mobility for all – the concept behind



Frank Bekemeier,
Chief Technology Officer e-Mobility,
Volkswagen AG, Germany

9.30
Customer in focus: optimising TCO and technology shifts at the same time

- Commercial vehicles are investment goods. It's all about the customer:
 - Focus
 - Modularization
 - Legislation
 - Commercial vehicles are different



Christian Levin,
Chief Operating Officer,
TRATON Group, Sweden

9.50 Q&A

10.10 Short break

10.45 PANEL DISCUSSION

Will regulation allow technology to match customer expectations?

Moderator:



Ulrich Walter

Panellists:



Prof. Dr Christian Beidl, Head of the Institute for Internal Combustion Engines and Powertrain Systems, Technische Universität Darmstadt, Germany



Jörg Grotendorst, Head of E-Mobility Division, ZF Friedrichshafen AG, Germany



Prof. Dr Arno Kwade, Director, Institute for Particle Technology, Technische Universität Braunschweig, Germany



Christian Levin, Chief Operating Officer, Traton Group, Sweden



Uwe Wagner, Head of Research and Development Automotive OEM and Industry, Schaeffler AG, Germany

11.45 Coffee break and visit to the CTI SYMPOSIUM Expo
Change to parallel sessions

12.30 **PARALLEL SESSIONS**

4.30 Coffee break and visit to the CTI SYMPOSIUM Expo
Change to plenum

5.10
Automotive industry undergoes the most significant change ever – impacts to powertrain and vehicle design



Stephan Rebhan,
Senior Vice President Technology & Innovation
Vitesco Technologies (Continental AG), Germany

5.30
Not just a truck: rethinking the last mile delivery business

- Powering consumers' delivery expectations
- What on-demand delivery means for commercial transportation
- Creating an ecosystem rooted in energy services & logistics
- Why most commercial vehicles will be electric before passenger cars



Jörg Sommer,
Chief Executive Officer,
StreetScooter GmbH, Germany

5.50 Q&A

6.00 End of the lecture programme, day one

6.15 Departure to the **CTI NETWORKING NIGHT**

7.00 Start of the evening event

PLENARY SPEAKERS DAY TWO

8.00 Reception and opening of the CTI SYMPOSIUM EXPO

8.30
Welcome address



Prof. Dr Ferit Küçükay,
Director, Institute of Automotive Engineering,
Technische Universität Braunschweig, Germany

8.40
Sports car powertrains of the future

- Drivetrain concepts for sports cars in the era of electromobility
- Steps towards a fully electrically powered Porsche
- High-speed, high-performance charging network
- Taycan – the first Porsche BEV



Dr Oliver Blume,
Chairman of the Executive Board Porsche AG,
Dr Ing. h.c. F. Porsche AG, Germany

9.00
Battery cell technology for automotive applications: state of the art and possible future



Prof. Prof. h.c. mult. Dr Martin Winter,
Scientific Director,
Forschungszentrum Jülich GmbH, Germany

9.20
Future trends on battery systems – ready for the next generation



Dr Holger Manz,
Head of Energy Management and High Voltage Systems
Electric/Electronic Development, Volkswagen AG, Germany

9.40 Q & A

9.55
cti award
young drivetrain experts

**11TH CTI YOUNG DRIVETRAIN EXPERTS AWARD
Presentation of the finalists.**

The authors of the best Bachelor, Master or PhD thesis submitted in the field of transmission and drive technology selected by the expert committee will be introduced. The finalists will present a short version of their theses live on stage, the winner will be identified by audience vote. Further information at: www.cti-award.com

10.15 Coffee break and visit to the CTI SYMPOSIUM EXPO
Change to parallel sessions

11.00 **PARALLEL SESSIONS**

3.30 Coffee break and visit to the CTI SYMPOSIUM EXPO
Change to plenum

4.15

Path to plug in e-propulsion with balanced, scalable and sustainable products

Suppliers perspective on managing the e-propulsion challenge by

- balancing the hybrid and electric products to overcome regulatory requirements
- focusing on scalable PHEV and EV architectures for power and range
- establishing the sustainable product verticals and ecosystems for compelling products



Hakan Yilmaz,
Chief Technology Officer,
BorgWarner, USA

4.35

Trans:Mission performance – the all-new Ferrari 8DCL900 high-end dual clutch transmission by Magna

- The latest technology for a super sports car transmission
- Improved torque density, shiftability, race track capability, hydraulic concept
- Synergies for mass production transmissions



Dr Jörg Gindele,
Sr. Director Engineering
Magna Powertrain, Germany



Francesco Strati,
8DCL Project Manager,
Ferrari SpA, Italy

4.55 Q&A

5.10

Summary of the key messages and final discussion with the attendees



Prof. Dr Ferit Küçükay

5.30 End of the lecture programme, day two



PARALLEL SESSIONS DAY ONE

A TRANSMISSIONS, DRIVETRAINS FOR ICV AND HEV

B BEV DRIVETRAINS, E-AXLE

12.30 The 8F-DCT plug-in hybrid transmission for the Mercedes-Benz compact car family

- Development of the 8F-DCT Hybrid Transmission
- Highly efficient Hybrid Powerhead
- Powertrain Integration
- Efficiency and Hybrid System Application

Dr Matthias Maisch, Manager Design Hybrid Transmission & Project Manager Hybrid Transmission, Daimler AG, Germany

Benchmark of modern electrification concepts – which electric vehicles fascinate customers with their technologies?

- Overview of electric vehicles on sale in 2019
- Identification of mass market compact EVs for comparison
- Analysis of selected EVs' electric powertrain setup
- Selection of best implementation for electric powertrain

Johannes Flemming, P3 automotive GmbH, Germany

1.00 Aisin AW's 1-motor hybrid transverse automatic transmission

- Development concept
- PHEV performance
- New technologies for compact design

Tetsuya Shimizu, Assistant General Manager, Aisin AW, Co. Ltd, Japan

The propulsion, energy storage and charging systems of the new e-Corsa

- BEV car usage statistics: input to development target
- Comparison between e-Corsa and Ampera e-design and performance
- Balance between autonomy range, charging capabilities and reduced road load
- Recommendation for EV charging

Dr Peter Ramminger, Chief Engineer & Program Manager, Propulsion Electrification, Opel Automobile GmbH, Germany

1.30 LUNCH AND VISIT TO THE CTI SYMPOSIUM EXPO

2.30 START OF PRESENTATIONS IN SESSIONS A, C AND H

3.00 P2i - a family of modular, scalable, and integrated hybrid drive modules

- Scalable and modular P2 architecture for 48V and HV
- Component optimization based on system approach
- Specific high integrated inverter development

Chris Spangler, Technical Specialist – System Engineering, BorgWarner Transmission Systems, Germany

The drivetrain of SVEN – an electric vehicle dedicated for urban shared mobility

- Requirements to e-drivetrain and battery in context of urban shared mobility
- Drivetrain concept for a small urban 3-seater-EV
- Integration and technical package of e-drivetrain in consideration of front crash targets

Christian Kürten, Department Manager, Lightweight & Pre-Development, FEV Vehicle GmbH, Germany

3.30 Scalability goes live – modular hybrid transmission family for high-volume applications

- Modular scalable hybrid transmissions for below 300 Nm applications
- Flexibility for reducing complexity by increasing electrification
- Robust technology through scalable innovation on building block level

Dr Carsten Bündler, Director Global Product Management, Transmission Systems, Magna Powertrain, Germany

BEV range increase by optimal combination of 800V e-machine and multispeed transmission

- Illustration of requirements (power, torque, size) on e-drive systems and electrical machines
- Identification of machine efficiency and decisive operation points
- Description of main enablers of multi speed transmissions
- System efficiency and range increase

Dr Boris Dotz, Lead Engineer, Electrical Motor Innovation, Valeo Siemens eAutomotive Germany GmbH, Germany
Camelia Jivan, Advanced Development Technical Leader for e-Drive, Valeo Powertrain Systems

4.00 The hybrid transmissions of the future – solutions for all new market demands

- Driveline concepts depending on future requirements considering the engine development
- Architecture and design for P2 and AMT based transmissions as well as the Schaeffler DH-MD (Dedicated Hybrid Multi Drive)
- Efficiency characteristics as a result of the loss terms on subsystem level

Dr Christian Lauinger, Manager Advanced Development CVT, Schaeffler Automotive Buehl GmbH & Co. KG, Germany

Drivemode – high speed electric drivetrain

- Electric drivetrain
- Modular integrated drivetrain
- High gear ratio transmission
- High speed electric motor

Mattias Flink, Mechanical Lead Engineer, Electric Drive Mechanical Engineering, BorgWarner Sweden, Sweden

4.30 COFFEE BREAK AND VISIT TO THE CTI SYMPOSIUM EXPO, CHANGE TO PLENUM

6.15 DEPARTURE TO THE CTI NETWORKING NIGHT

7.00 START OF THE EVENING EVENT

PARALLEL SESSIONS DAY ONE



12.30	<p>The ideal future hybrid powertrain Fabian Holldorf, Engineer Transmission Development, hofer f&e GmbH, Germany</p>	<p>Highly integrated and efficient actuators for e-mobility</p> <ul style="list-style-type: none"> • Electro-mechanical and e-hydraulic actuators for conventional and e-mobility power trains • Modular clutch actuator (MCA) with integrated local control unit (LCU) and rotor integrated planetary spindle drive • High efficiency Schaeffler smart hydraulic systems for multi consumer e-mobility applications <p>Simon Hör, Senior Specialist, Product Management and Reinhard Stehr, Expert – System Hydraulic Actuation, Schaeffler Automotive Buehl GmbH & Co. KG, Germany</p>
1.00	<p>Powertrain-platforms for future mobility scenarios</p> <ul style="list-style-type: none"> • From future mobility demands to concrete powertrains • Trade-off between CO2 TtW, CO2 WtW, performance and costs • Rightsizing and objective comparison of powertrain systems • Systematical generation of DHT- and EV-platform systems <p>Dr Christoph Danzer, Manager Portfolio Powertrain, IAV GmbH, Germany</p>	<p>Customised powertrain actuation systems for passenger cars and commercial vehicles</p> <ul style="list-style-type: none"> • Systematic development process • Electromechanical actuation solutions • Clutch and gear actuation for EV and HEV <p>André Uhle, Team Manager, Actuation System Development, Transmission and Hybrid Driveline, IAV GmbH, Germany</p>
1.30	LUNCH AND VISIT TO THE CTI SYMPOSIUM EXPO	
2.30	<p>Highly Efficient Drivetrains for the mobility of the future</p> <ul style="list-style-type: none"> • Electrification roadmap • P4 solutions • High end concept features • Integration capabilities <p>Dr Andreas Mair, Director Product Technology Mechanical Systems – ePowertrain, GKN Automotive</p>	START OF PRESENTATIONS IN SESSIONS A, C AND H
3.00	<p>System cost reduction by electric powertrain design optimisation</p> <ul style="list-style-type: none"> • Method for multi-objective optimisation of e-drives • System cost model considering quantity-dependent cost reduction • Case study shows significant cost reduction potential <p>Martin Hofstetter, Scientific Project Researcher, Graz University of Technology, Austria</p>	<p>Replacing hydraulic actuation in electrified drivelines</p> <ul style="list-style-type: none"> • Achieving adequate speed and performance with electromechanical actuators • Increasing driveline electrification • Simplification of electrified drivelines <p>Alex Haldane, Senior Engineer, Vocis Ltd., UK</p>
3.30	<p>48 Volt high power – lowest CO₂ and emissions and enriched driving performance</p> <ul style="list-style-type: none"> • Requirements for future 48V electric drive system • '48V High Power' electric fully integrated drive component • Vehicle performance with '48V High Power' electric drive • Emission management <p>Friedrich Graf, Director Development Powertrain, Systems & Technology, CPT Group GmbH, Germany</p>	<p>Optimised synergy between electro-mechanical and electro-hydraulic actuation in transmission applications</p> <ul style="list-style-type: none"> • Overview of Nidec's BLDC smart actuators & pumps • Drivetrain & transmission actuators for park-locks, disconnects, clutch actuation and transmission lubrication & cooling • Focus on mechatronic system integration, interfaces, efficiency and dynamics • Synergy by use of modular platform components product & process enhancements and model-based-design <p>Jörg Trommer, Chief Technical Officer, Nidec Motors & Actuators, Germany</p>
4.00	<p>48V 50 kW e-drive system consisting of two motors of different types</p> <ul style="list-style-type: none"> • Integration of a high-speed radial flux motor and high torque axial flux motor into an e-drive system • New materials enable new solutions • Cooperation accelerates innovation - network developments are faster and more innovative <p>Dagmar Münch, Chief Technology Officer, Development, Alvier Mechatronics GmbH, Germany</p>	<p>ZF Rotatronic shifter – robust noise reduction via real-time embedded learning algorithms</p> <ul style="list-style-type: none"> • Mechatronic rotary shifter for vehicle interior • Noise reduction via numerically efficient real-time embedded algorithms • Robustness to relevant tolerances through real-time learning strategies <p>Dr Lothar Kiltz, Development Engineer, ZF Friedrichshafen AG, Germany</p>
4.30	COFFEE BREAK AND VISIT TO THE CTI SYMPOSIUM EXPO, CHANGE TO PLENUM	
6.15	DEPARTURE TO THE CTI NETWORKING NIGHT	
7.00	START OF THE EVENING EVENT	

PARALLEL SESSIONS DAY ONE

COMMERCIAL VEHICLES DRIVETRAINS AND TRANSMISSIONS

AWD, EAWD

12.30	<p>Compact e-drive for trucks – efficient utilisation of the e-motor through multi-speed transmission</p> <ul style="list-style-type: none"> All-electric multi-mode transmission using electric clutches Using modular design to flex a multi-mode transmission across all commercial duty applications No compromise PHEV option <p>John W. Kimes, Director of Engineering, Sigma Powertrain, Inc., USA</p>	<p>48V AWD demonstrator with P0+P4 close to wheel concept</p> <ul style="list-style-type: none"> Concept of a 48V hybrid demonstrator with an electric rear axle Dimensioning of the electric rear axle's gear ratio Design and construction of the electrified axle <p>Dr Sven Hartmann, Director Advanced Engineering, SEG Automotive Germany GmbH, Germany</p>
1.00	<p>Multi-speed electric drive unit for commercial vehicle applications</p> <ul style="list-style-type: none"> Powertrain of heavy-duty commercial vehicle Electric drive system Concept and design details <p>Jiantao Geng, Director, ekontrol Drive Technology GmbH, China</p>	<p>48V AWD with P0+P4 as a free-wheel concept</p> <ul style="list-style-type: none"> P4 architecture background (list of technical solutions) P4 as a free wheel concept (pros and cons) P4 as a free wheel concept efficiency (simulation result and benefits for the OEM) Application example <p>Jerome Mortal, Director, Special Vehicle Application, VALEO, France</p>
1.30	LUNCH AND VISIT TO THE CTI SYMPOSIUM EXPO	
2.30	START OF PRESENTATIONS IN SESSIONS A, C AND H	
		<p>Torsen LSD in conventional and electric axles with EPS tuning</p> <p>Paolo Sacchetti, Expert, Torque Management Products JTEKT Torsen Europe S.A., Italy</p>
3.00	<p>E-axle product family for electrified commercial vehicles</p> <ul style="list-style-type: none"> Electric axles for truck and busses Interior permanent magnet (IPM) motor technology E-axle system development Production ready solutions <p>Nicholas LaForce, Senior Engineer, Dana Inc., USA</p>	<p>High performance 48V integrated e-axle</p> <ul style="list-style-type: none"> Full integrated e-axle with 6 phase e-machine High efficient concept Hairpin windings as enabler for package reduction <p>Inigo Garcia de Madinabeitia Merino, Analysis Engineer, AVL List GmbH, Austria</p>
3.30	<p>From mild hybrid to e-tractor – novel vehicle concepts to realise marketable electrified agricultural vehicles</p> <ul style="list-style-type: none"> Future e-powertrain solutions AVL's novel vehicle concepts for electrified agricultural vehicles AVL's investigations regarding e-CVT concepts for off-road applications Battery system design, integration and charging concept <p>Jürgen Tochtermann, Lead Engineer Design, AVL Commercial Driveline & Tractor Engineering GmbH, Austria</p>	<p>Scaling dynamics and efficiency of mechanical and electric all-wheel drives</p> <ul style="list-style-type: none"> Evolution of mechanical and electrified AWD drives Modular system of mechanical and electrified drivetrain components Opportunities for improved torque vectoring through electrification <p>Simon Kaimer, Global Product Manager AWD 4WD, Driveline Systems, MAGNA Powertrain GmbH & Co. KG, Austria</p>
4.00	<p>Review on hybrid and full electric driveline integration for heavy duty applications</p> <ul style="list-style-type: none"> Hybrid and full electric driveline integration Heavy duty applications on-road and off-road Commercial and municipal purpose vehicles Proprietary and co-shared development program <p>Robert Alvarez, Project Manager, Emoss Mobile Systems BV, The Netherlands</p>	<p>Representative AWD system evaluation by high-function dyno – new simulation model of sand road</p> <ul style="list-style-type: none"> Construction of the soft road surface simulation model Reproduction of car running by low-inertia and high response dynamo Establishment of AWD evaluation method without relying actual road <p>Wataru Kobayashi, Engineer, Nissan Motor Co., Ltd, Japan</p>
4.30	COFFEE BREAK AND VISIT TO THE CTI SYMPOSIUM EXPO, CHANGE TO PLENUM	
6.15	DEPARTURE TO THE CTI NETWORKING NIGHT	
7.00	START OF THE EVENING EVENT	

PARALLEL SESSIONS DAY ONE

AUTOMATED DRIVING, CONNECTIVITY, SAFETY & SECURITY, AI

BATTERIES

12.30	<p>Energy-efficient cooperative adaptive cruise control with receding horizon of traffic, route topology & traffic light</p> <p>Receding horizon of road topology, speed limit, traffic, & traffic light timing data • Holistic approach covering both highway and city driving in the Connected Powertrain™ • Includes powertrain design characteristics and state e.g. efficiency, battery SoC • A single model predictive control formulation, tested in real-time in vehicle</p> <p>Dr Stephen Jones, Principal Product Manager Systems, System Engineering & Powertrain Electrification, AVL List GmbH, Austria</p>	<p>EMBATT – A bipolar battery approach to meet future requirements for extended ranges</p> <ul style="list-style-type: none"> • Bipolar battery technology • Integration of batteries with high energy density into automotive applications • Material development: polymer current collectors • Simulation: electrochemical modelling <p>Karsten Müller, Senior Vice President, TS-S System Integration and Energy Management, IAV GmbH, Germany</p>
1.00	<p>Fuel-saving potential of hybrid electric vehicles using surroundings sensor system information</p> <ul style="list-style-type: none"> • Speed prediction using a surroundings sensor system • Fuel-saving potential with prediction data in driving cycles • Validation with real data from highway and urban traffic <p>Dominic Waldenmayer, Researcher, Karlsruhe Institute of Technology, Germany</p>	<p>All-solid-state batteries – status and prospect for e-mobility</p> <ul style="list-style-type: none"> • Introduction to all-solid-state batteries • Classes of solid electrolytes • Inorganic all-solid-state cells • View on application in e-mobility <p>Dr Martin Finsterbusch, Team Leader, Institute of Energy and Climate Research, Forschungszentrum Jülich GmbH, Germany</p>
1.30	LUNCH AND VISIT TO THE CTI SYMPOSIUM EXPO	
2.30	START OF PRESENTATIONS IN SESSIONS A, C AND H	
		<p>Development and prototyping of lithium-ion cells for demonstrator drivetrains</p> <ul style="list-style-type: none"> • Cell designs for automotive applications • Achievable energy densities and optimisation of properties • Influences of cell component adaptations <p>Jan Diekmann, Head of Process Engineering, Custom Cells Itzehoe GmbH, Germany</p>
3.00	<p>Quick start with AI for drivetrain calibration and diagnostics</p> <ul style="list-style-type: none"> • AI and drivetrain calibration/diagnostics • AI value proposition and strategy • Experiences from 25 years of commercial AI application that will advance AI in automotive applications <p>Dr Ulrich Bodenhausen, Manager Consulting, Vector Consulting Services and Ulrich Bodenhausen AI Coaching, Germany</p>	<p>Effective battery design and integration of cylindrical cells for high power applications</p> <ul style="list-style-type: none"> • Superior battery pack technology at competitive cost • Key aspects to increase energy and power density • Best in class thermal management • Platform approach <p>Helmut Kastler, Project Director, R&D, Kreisel Electric GmbH & Co. KG., Austria</p>
3.30	<p>Realise highest cyber security standards within development – an approach from an automotive supplier's perspective</p> <ul style="list-style-type: none"> • Overview of vehicle gateways associated with connectivity • Identification of new cybersecurity hazards and risks • Challenges to include cybersecurity into development process <p>Holger Schulz, Cyber Security Engineer, Continental Engineering Services GmbH, Germany</p>	<p>Thermal management system for high performance battery based on an innovative dielectric fluid</p> <ul style="list-style-type: none"> • Test Bench experiments to evaluate thermal performances • Experiment simulation at the battery pack level • Consideration of the whole thermal management system <p>Dr Nicolas Champagne, R&D Scientist, TOTAL, France</p>
4.00	<p>How to ensure safety of EV or FCV without reliable, helpful saving functions made by ICE</p> <ul style="list-style-type: none"> • Everlasting brake function obtained by engine brake • Temporary brake until full charge by regenerative system • Increasing customer's notes about lack of brake in full SOC • Smart everlasting brake installed inside of transmission <p>Takashi Shibayama, Fellow, Shin Nippon Tokki Co., Ltd, Japan</p>	<p>Environmental benefits of used batteries from e-vehicles as stationary energy storage</p> <ul style="list-style-type: none"> • Environmental benefits secondary use opposed to recycling • Differences mobile to stationary battery applications • Experience of already realised systems on a megawatt scale <p>Dr Juergen Koelch, Senior Referent, EVA Fahrzeugtechnik GmbH, Germany</p>
4.30	COFFEE BREAK AND VISIT TO THE CTI SYMPOSIUM EXPO, CHANGE TO PLENUM	
6.15	DEPARTURE TO THE CTI NETWORKING NIGHT	
7.00	START OF THE EVENING EVENT	



CTI NETWORKING NIGHT @ MOTORWERK BERLIN

10 DECEMBER 2019

An outstanding opportunity to mingle with all participants, speakers, exhibitors and sponsors. Make new business contacts in a relaxed atmosphere, discuss the topics of the day with your colleagues and peers while enjoying delicious food and drinks at the CTI NETWORKING NIGHT.

CTI TEST DRIVE

12 DECEMBER 2019

An ounce of experience is worth a ton of theory.

Don't miss this opportunity to test the latest transmission technologies and vehicles with alternative drives. Experience the entire drivetrain spectrum as part of a complete system.

This parcours offers all participants a full-feature experience of the transmissions and drives on show. Engineers from the corresponding vehicle/transmission manufacturers or suppliers will be in attendance and look forward to answering your questions in detail.

New developments of transmission and drive research can be tried and tested exclusively in up to 25 vehicles on the test track.

**LIKE TO PROVIDE A TEST CAR
AND SHOW PEOPLE WHAT
YOU DO?**

Contact us for details:



Sophia Tente

sophia.tente@car-training-institute.com

www.drivetrain-symposium.world/de/test-drive

- 8.30 Departure with the shuttle service from Estrel Hotel Berlin to ADAC Center of Driving Safety Berlin-Brandenburg
- 9.30 Arrival at the ADAC and welcome address, tour around the proving ground and instruction
- 10.30 Start of the test drive
- 4.00 End of the test drive and departure to the Estrel Hotel Berlin
- ca. 5.30 Arrival at the hotel

Please be flexible when planning your return journey.

Register early – places are limited

Check-In for the CTI Test Drive
Wednesday, 11 December 2019, 12.00 – 5.00 p.m.

Registered participants and persons accompanying demo vehicles are kindly requested to use our special Check-in desk at the CTI Symposium. Please show your German or international driver licence and bring your completed declaration of non-liability (supplied by CTI in advance). We also need to know if you are using our shuttle bus to the ADAC driving centre in Linthe or making your own travel arrangements. You will receive all the details for the test drive at the Check-in.



11 DECEMBER 2019

cti award

young drivetrain experts

For BSc, MSc Graduates and PhD Students
of Automotive, Mechanical, E/E, Mechatronics and
Mobility Engineering

**Young experts present their
thesis to more than
1,000 industry representatives**

**Win 2,000 €
Apply by 1 November 2019**

Details at:
www.cti-award.com

PARALLEL SESSIONS DAY TWO

TRANSMISSIONS, DRIVETRAINS FOR ICV AND HEV

E-AXLES, TRANSMISSIONS

11.00 Smart 48V DCT solutions for new CO₂ targets and moving customer preferences

- P2 hybrid DCT
 - 250 to 420 Nm torque range
 - Conventional, 48V and (P)HEV in same design
- Dr Alex Serrarens**, Manager Business Development, Punch Powertrain Nederland, The Netherlands

Development of the innovative rear axle transmission for the new Porsche Taycan

- Porsche-typical requirements for a rear-axle transmission in a battery-electric sports car
 - Concept phase
 - Implementation
- Michael Niko**, Manager Design BEV Transmissions, Transmission and Drivetrain, Dr. Ing. h.c. F. Porsche AG, Germany

11.30 Volkswagen's electrified drivetrains

Dr Karsten Bennewitz,
Head of Hybrid & Electric Drive System Development,
Volkswagen AG, Germany

BEV AWD primary and secondary eDU – Gear ratio selection for efficiency

- Gear ratio optimization and analysis
- Balance efficiency & performance through special selection of gear ratios and reduction of churning losses
- Matlab/Simulink vehicle drive cycle efficiency simulation analysis and comparison

Michael Schulte, Director Product Engineering-Torque Transfer, AAM – American Axle & Manufacturing, USA

12.00 48V hybrid manual transmission

- Hybrid manual transmission - purpose and benefits
- Concept definition and control strategy
- Simulation approach
- Fuel economy improvement and load spectrum

Konstantin Baron, Assistant Chief Engineer,
Transmission Engineering & Electrification,
Opel Automobile GmbH, Germany

E-FDU: an innovative double motor, disconnectable front electric drive unit for Ferrari sport car application

- Vehicle requirements for hybrid/EV Drive
- System specifications, layout, packaging and weight optimisation
- Vehicle control strategy overview
- Innovative disconnect system (EMA), controls and functional safety
- Industrialisation and project implementation into production

Fabio Irato, Project Engineer Hybrid Systems,
Product Development, Dana Graziano, Italy
Gianluca Quattromani, Powertrain Simulation Specialist,
Know-how and Simulation Department, Ferrari, Italy

12.30 LUNCH AND VISIT TO THE CTI SYMPOSIUM EXPO

1.30 START OF PRESENTATIONS IN SESSION K, N AND O

2.00 Concept of a 4-speed DHT with high efficiency

- A 4-speed dedicated hybrid transmission
- Compact and efficient concept design
- Deep motor integration for optimal electric support

Florian Stallforth, Director Research & Development,
GETEC Getriebe Technik GmbH, Germany

Innovative and integrated multi-speed electrical drive unit (EDU) development

- Development process and solutions for high power dense and torque dense EDU
- 3-in-1 system integration and optimisation with a special focus on NVH, EMC, efficiency and thermal management
- Multi-speed powershift development

Christopher Burbidge, Global Technical Expert-Transmission Control Software, Ricardo, China

2.30 Dual Flow Transmission (DFT), a modular concept open for hybrid and non-hybrid solutions

- Hybrid transmissions for transverse engines: comparison P0 to P4
- Modular and competitive transmission solutions with DHT-like compactness, but volumes of hybrid and non-hybrid applications
- Dual Flow Transmission - DFT: an innovative optimum concept regarding efficiency, comfort and performances

Wolfgang de Loth, Head of Research & Development,
Punch Powerglide Strasbourg SAS, France

Pushbelt variator module for electrified powertrains

- CVT pushbelt unit for electric drives leads to reduced energy consumption while providing higher performance
- Holistic system design of CVT based electric drive enables downsizing of electric motor and power electronics
- On demand energy supply for pushbelt variator control leading to minimized actuation energy need

Gert-Jan van Spijk, Director Transmissions,
Bosch Transmission Technology, The Netherlands

3.00 Benchmarking of Dedicated Hybrid Transmissions

Christian Sieg, TU Braunschweig Institut für Fahrzeugtechnik

A new planetary gear design for high-speed e-motor

- Highspeed e-motor
- Silent gear layout
- 2-speed gear system

Prof. Dr Peter Tenberge, Director, Institute for Industrial and Automotive Drivetrains, Ruhr-University Bochum, Germany

3.30 COFFEE BREAK AND VISIT TO THE CTI SYMPOSIUM EXPO, CHANGE TO PLENUM

5.30 END OF THE LECTURE PROGRAMME, DAY TWO

PARALLEL SESSIONS DAY TWO

K LAUNCH AND SHIFT ELEMENTS

L E-MOTOR, POWER ELECTRONICS

11.00 **Significant drag torque reduction and improved clutch dynamics by innovative, very compact separating springs for wet clutches**

- CO₂-reduction by >0,5 g/km (WLTP) due to lower drag torque
- Better controllability and reduced torque non-uniformity
- Improved shifting comfort by lower torque shocks in the pre-filling phase
- Higher clutch dynamics due to fast separation of the disc plates

Hüseyin Gürbüz, Research Engineer Advanced Engineering, Business Unit Transmission Springs, Mubea Tellerfedern GmbH, Germany

Supply chain implications of increasingly integrated EV drivelines

- Electric motor and power electronics market development
- Thermal system technology evolution
- Supply chain implications and opportunities

Claudio Vittori, Senior Analyst, Auto Supply Chain & Technology, IHS Markit, Italy

11.30 **Triple wet clutch e-module for P2 hybridisation**

- Hybrid architectures reminder
- P2 off-line module: coupling systems arrangement solutions
- Triple wet clutches off-line, CSC and piston actuation
- E-motors overview
- Actuation system, shift cylinders and park lock

Olivier Simon, R&D Director DCT and **Wilhelm Heubner**, Product Marketing Director, Valeo Powertrain Systems, France

An efficient and automated design strategy for multi-physics e-motor development

- Simulation-driven design for e-motors
- Optimisation and design exploration using DOE based strategies
- Improving total design balance of e-motors
- Possible reduction of design looks, firefighting and development costs

Torben Schulze, Mercedes-AMG GmbH, Germany
Dr Lars Fredriksson, Altair Engineering, Germany

12.00 **E-drive assisted dedicated hybrid transmission synchronisation – enabling real drive emissions (RDE)**

- E-drive assisted shifting and torque management
- Test results of active synchronisation with a high voltage starter generator
- Evaluation of gear shifts with actively synchronised dog clutches

Andreas Riedel, Project Manager Engineering, System & Innovation, Continental AG, Germany

Spring loaded rotor shafts as a new flexible shaft hub joint for e-rotors

- Requirements regarding shaft hub joints for rotors of electric traction machines
- Advantages of flexible shaft hub joints in comparison to rigid shaft hub joints
- Experimental verification up to high rotational speed and torque

Dr Benjamin Dönges, Representative Head Corporate Unit Research & Engineering, Mubea – Muhr und Bender KG, Germany

12.30 **LUNCH AND VISIT TO THE CTI SYMPOSIUM EXPO**

1.30 **Noise and pulsation reduction in automotive applications: ELIKA gear pump**

- Special patented tooth profile • Noise reduction • Pulsation reduction

Michelangelo Musiani, Product Engineer Designer, Technical Department, Marzocchi Pompe S.p.A., Italy

START OF PRESENTATIONS IN SESSION K, N AND O

2.00 **Innovative and highly efficient clutch system for multispeed BEV with highspeed powertrains – Tackling the efficiency and drag loss challenges through a novel latching and actuation system**

- Introduction consortium project "Highspeed Clutch"
- Clutch designs for shiftable highspeed transmissions with 30.000rpm
- Innovative mechanical latching system without energy consumption
- Novel plain bearing system for cost-efficient clutch actuation

Sascha Ott, Managing Director, Institute of Product Engineering, Managing Director KIT Center Mobility Systems, Karlsruhe Institute of Technology, Germany

Integration of an inductive rotor position sensor in a rolling bearing for electrical machines

- E-mobility / e-machine / actual value detection of the rotor position as an important element of the control path
- Types of rotor position detection / inductive position sensor
- Advantages of functional integration
- Test results

Alexander Schamin, Development Engineer, Product Development Transmission Component, Schaeffler Technologies AG & Co. KG, Germany

2.30 **New semi-wet friction solution for highly integrated active torque-controlled drives**

- Material development - from fiber to friction disc
- Requirements of semi-wet friction solution
- Test methods to evaluate NVH and friction performance
- MC650 as enabler for less drag torque

Volker Föge, Manager – R&D Wet Friction Division, Miba Frictec GmbH, Austria

Interaction of motor–transmission–inverter of an electric axle unit

- Integration of motor, gearbox and inverter
- High performance e-axle platform
- E-machine design measures to support wide power and speed range

Dr Yves Burkhardt, Head of Motor Electrical Engineering, Valeo Siemens eAutomotive Germany GmbH, Germany

3.00 **Solutions for increased power density at shifting clutches**

- New friction materials as enabler for increased power density
- New design solutions for friction components
- High torque low drag clutch module (HTLD) consists out of a friction plate clutch for synchronisation and a dog clutch to transmit high torque

Harald Merkel, Technical Specialist, BorgWarner Transmission Systems GmbH, Germany

Method for thermal modeling of electric traction machines for hybrid vehicle applications

- Semi-automatic creation and calibration of thermal networks for electric machines
- Test procedures for test bench and prototype cars for maximum transferability of results in-between
- Coupling of 1D-models and 3D CFD-/CHT-simulation to consider transient thermal cycles with maximum resolution

Dr.-Ing. Holger Hinrich, Simulation-Engineer, Digital Development Drivetrain, Dr. Ing. h.c. F. Porsche AG, Germany

3.30 **COFFEE BREAK AND VISIT TO THE CTI SYMPOSIUM EXPO, CHANGE TO PLENUM**

5.30 **END OF THE LECTURE PROGRAMME, DAY TWO**

PARALLEL SESSIONS DAY TWO

M DRIVETRAIN COMPONENTS, NVH, SENSORS

N OIL, LUBRICATION

11.00	<p>Next EV drive system – proposal to apply magneto strictive torque sensor in EV</p> <ul style="list-style-type: none"> • Applying concept for EV • Development of magneto strictive torque sensor • Improvement of magneto strictive sensitivity for torque sensor shaft • High sensor performance of sensitivity, repetition and responsibility, and compact size <p>Seigo Urakami, Manager, NSK Ltd, Japan</p>	<p>Innovative sensor technology revolutionises lubrication system analysis in transmissions</p> <ul style="list-style-type: none"> • Advanced analysis method for lubrication systems • Integrated sensor for quantification of lubrication condition • Improved analysis accuracy and speed • Applications in development and condition monitoring <p>Mario Theissl, Research Engineer, Graz University of Technology, Austria</p>
11.30	<p>Torque sensors for high volume production applications</p> <ul style="list-style-type: none"> • Recent achievements in magnetoelastic sensor technology • Magnetoelastic torque sensor for transmissions • Economic feasible torque sensor for series applications <p>Julius Beck, Engineering Manager MST, Europe, Methode Sensor Technologies, Methode Electronics International GmbH, Germany</p>	<p>Dedicated lubricants and greases solutions for the whole EV drivetrain including the thermal management of the batteries</p> <ul style="list-style-type: none"> • Environment and motivation for lubricants and greases in e-application • Performance criteria's and limitations of transmission fluids in reduction gears and e-axes • Performance and compromises to design new greases for BEVs • Concepts to optimise the thermal management of batteries in PEV and BEV application <p>Christopher Dobrowolski, E-Fluids Coordinator, Shell Global Solutions Deutschland GmbH, Germany</p>
12.00	<p>The rolling bearing in the electrified powertrain – requirements and solutions</p> <ul style="list-style-type: none"> • Megatrend "e-mobility" – challenges and need for paradigm shift • Novel application requirements and their impact on rolling bearing design • Proprietary software for product development and application engineering • Customised bearing portfolio as a toolkit for e-mobility <p>Thomas M. Wolf, Senior Application Engineer, SKF GmbH, Germany</p>	<p>Ultra-low viscosity synthetic eDF – how synthetic base oils can help novel formulation for e-mobility driveline fluids</p> <ul style="list-style-type: none"> • Driveline fluids • Electric and hybrid vehicles EV • Synthetic base oils • Low viscosity <p>Dr Babak Lotfi, Global Application Development - Driveline & EV, ExxonMobil Chemical Company, USA</p>
12.30	LUNCH AND VISIT TO THE CTI SYMPOSIUM EXPO	
1.30	<p>START OF PRESENTATIONS IN SESSION K, N AND O</p> <p>Software defined machine: a pragmatic approach for testing hybrid vehicle</p> <p>Lauren Brunel, Automotive Marketing Manager, DAM Group, France</p>	<p>Comprehensive approach of the lubrication for the electric powertrain based on an innovative multi-purpose fluid</p> <ul style="list-style-type: none"> • Overview of oil properties needed for an electric vehicle • New bench tests to assess oil key-properties • Numerical simulation of the cooling of an electric motor <p>Hakim El Bahi, R&D Scientist, TOTAL, France</p>
2.00	<p>Park by wire system for current electric drive units</p> <ul style="list-style-type: none"> • Functional safety and diagnostic concepts • Mechanical park lock concept • Park by wire concept <p>Dr Jan Nowack, Department Manager, FEV Europe GmbH, Germany</p>	<p>Advances in drivetrain lubricating fluid technology for hybrid & electric vehicles</p> <ul style="list-style-type: none"> • Advanced fluid technology for hybrid and electric vehicle application • Thermal and anti-corrosion properties of the fluid • New test development to evaluate the suitability for electrified hardware • Noise vibration and harshness (NVH) evaluation and minimisation <p>Dr Michael Gahagan, Technology Manager, Driveline, Lubrizol, UK</p>
2.30	<p>Simulation and countermeasure of rattle noise in a hybrid transaxle during engine shutdown</p> <ul style="list-style-type: none"> • Simulation model for rattle noise in a hybrid transaxle • Clarification of rattle noise mechanism • Derivation of optimal countermeasure <p>Hiroki Kuwamoto, Assistant Manager, Drivetrain-EHV Design Division, Toyota Motor Corporation, Japan</p>	<p>Multipurpose oil filter systems for innovative drivetrains and e-axes</p> <ul style="list-style-type: none"> • System reliability through high efficient filter media • Filter stability with 3D structure grid solution • Oil reconditioning for long life application • Oil management system for optimised assembly space use <p>Marius Panzer, Lead Product Engineer, Mann+Hummel GmbH, Germany</p>
3.00	<p>Quietly efficient – reducing EV powertrain noise without compromising efficiency</p> <ul style="list-style-type: none"> • Exploring system-level trade-off between efficiency and NVH • Evaluating NVH against other performance criteria • Avoiding expensive late-emerging NVH issues • Relaxing NVH component constraints to maximise efficiency <p>Markus Hose, Head of Mechanical Engineering, Drive System Design, UK</p>	<p>Realistic testing to assess how electrified transmission fluids will withstand ageing</p> <ul style="list-style-type: none"> • New test methods and results • Durability of Electrified Transmission Fluids (ETF) assessed • Friction and heat, copper and electrical properties • Key industry fluids and technology compared <p>Dr Harld Maelger, Senior Global OEM Manager, Afton Chemical, Germany</p>
3.30	COFFEE BREAK AND VISIT TO THE CTI SYMPOSIUM EXPO, CHANGE TO PLENUM	
5.30	END OF THE LECTURE PROGRAMME, DAY TWO	

PARALLEL SESSIONS DAY TWO

INNOVATIVE PRODUCTION PROCESSES AND LIGHTWEIGHT DESIGN

P TOOLS, TESTING

11.00 **Quality assurance of composite materials for powertrain applications**

- Terahertz measurement of unidirectional carbon fiber composite intermediates
- Mapping of fiber distribution and fiber content in carbon fiber tape and towpreg
- Non-contact non-destructive measurement of carbon fiber composite tape and towpreg

Dr Andrew Willett, Senior Researcher, Production Engineering Innovation, Toyota Motor Europe NV/SA, Belgium

Assessing the relative endurance capacity of hybrid drivetrain components in an early development stage with an indicator based on preceding drivetrain generations

- Drivetrain endurance capacity characterisation with drivetrain properties
- Relative endurance capacity estimation of hybrid drivetrains
- Estimation of expected necessary adjustments depending on drivetrain property changes

Jannick Fischer, Simulation Engineer, Daimler AG, Germany

11.30 **Innovative materials for battery boxes and their temperature control concept**

- Requirements of today's battery boxes
- New material concepts
- Temperature control concepts

Dr Thomas Hipke, Head Lightweight Design, Fraunhofer-IWU Chemnitz, Germany

Finite element modeling (FEM) and fatigue analysis of hypoid gears and laser welding joints installed in a power take-off unit (PTU)

- Power take-off unit (PTU)
- Hypoid gear
- Laser welding joint
- Finite element method
- Fatigue analysis

Kibok Lee, Researcher, Department of Powertrain Research, Hyundai-Wia (Hyundai Motors Group), Republic of South Korea

12.00 **Development and industrialisation of low-temperature fuel cell stacks**

- Motivation and application for LT fuel cells
- Challenges of development
- Balance between functional optimisation and cost-efficient manufacturability
- Production process for bipolar plates
- Production process for stacks

Thomas Hahn, Head of Fuel Cell Development & Production, WätaS Wärmetauscher Sachsen GmbH, Germany

Fast and accurate road interference compensation for objective drivetrain evaluation

- Influence of road disturbances in the longitudinal acceleration
- Elimination of unwanted oscillations in case of road interferences
- Virtual sensors for optimisation
- Real-time capable method

Martin Arntz, Project Manager AVL-DRIVE, AVL List GmbH

12.30 **LUNCH AND VISIT TO THE CTI SYMPOSIUM EXPO**

1.30 **Solution Forum**

Industry 4.0 applications for improved efficiency in EOL testing

- Predictive maintenance: early detection of deviations
- Big data: analyses for the optimization of test sequences
- REST API: access and integrate data easily

Ralph Heckmann, Vice President Sales Automotive, teamtechnik Maschinen und Anlagen GmbH, Germany

START OF PRESENTATIONS IN SESSION K, N AND O

2.00 **Machining process solutions of ring gears to achieve high NVH performance, compact gears**

- Highly accurate, compact gears after heat treatment
- High productivity process after heat treatment

Noritaka Fujimura, Project Manager, Mitsubishi Heavy Industries Machine Tool Co., Japan

Efficient CFD-simulation method for estimation of drag torque in wet multi-plate clutches in comparison to test rig results

- CFD-simulation: setup and modes of operation
- Sensivity analysis: mesh and parameters
- Experimental validation: test rig setup and evaluation method

Daniel Groetsch, Research Associate, Institute of Machine Elements, FZG, Technical University Munich, Germany

2.30 **Laser joining of copper-copper and copper-aluminium application in the e-mobility**

- New challenges for laser welding in series production
- Safe and reliable copper welding processes in stator production
- Challenge of copper-aluminium welding in battery-connectors

Stefan Mücke, Strategy Group E-Mobility, Scansonic MI GmbH, Germany

Load cycle development for an optimized powertrain development and testing

Joachim Trumpff, Director Engineering & Testing, GETEC Getriebe Technik GmbH

3.00 **Weight-optimization of clutch-housings for automatic transmission**

- Increasing the transmission capabilities of frictional connections in powertrain applications

Stefan Kaulfuß, Area Sales Manager, Leifeld Metal Spinning AG

Deployment of an Electric Drive Unit (EDU) transmission test catalog

- multispeed EDU (Electric Drive Unit)
- appropriate testing methodologies
- estimate the lifetime of an EDU transmission

Ralph Fleuren, Product Manager, FEV Europe GmbH, Germany

3.30 **COFFEE BREAK AND VISIT TO THE CTI SYMPOSIUM EXPO, CHANGE TO PLENUM**

5.30 **END OF THE LECTURE PROGRAMME, DAY TWO**



Prof. Dr Ferit Küçükay
 Director, Institute of
 Automotive Engineering,
 Technische Universität
 Braunschweig



Dirk Adamczyk
 Head of Corporate
 Research and
 Development,
 ZF Friedrichshafen AG



Georg Bednarek
 Director Regulations &
 Certification
 Opel Automobile GmbH



Dr Sven Beiker
 Founder and
 Managing Director,
 Silicon Valley Mobility;
 Lecturer in Management,
 Stanford Graduate School
 of Business



Dr Carsten Bündler
 Director Global Product
 Management,
 Magna Powertrain,
 Transmission Systems



Dr Ulrich Burr
 Senior Vice President –
 Testing, New Technologies
 and Development,
 Voith Turbo
 GmbH & Co. KG



Dr Klaus Denkmayr
 General Manager,
 Tech Center Steyr,
 AVL Commercial Driveline
 and Tractor Engineering
 GmbH



Dr Hartmut Faust
 Senior Vice President R&D
 Transmission Systems,
 Schaeffler Automotive Buehl
 GmbH & Co. KG.



Dr Martin Fischer
 President and
 General Manager
 Transmission Systems,
 BorgWarner Inc.



Prof. Dr Robert Fischer
 Executive Vice President
 Engineering and
 Technology Powertrain
 Systems,
 AVL List GmbH



Stefan Fuchss
 Chief Engineer
 Electric Drive Units,
 Jaguar Land Rover



Pascal Hervet
 Research &
 Development Director,
 Valeo Transmission Systems
 Product Group



Dr Andreas Kracke
 Head of Development
 Aggregate, Volkswagen
 Commercial Vehicles



Shuji Kurokawa
 President
 Jatco France SAS



Prof. Dr Arno Kwade
 Director, Institute for
 Particle Technology,
 Technische Universität
 Braunschweig



Jimmy Larsson
 Senior Manager,
 Head of Gearbox
 Development
 Scania CV AB



Dr Thilo Leineweber
 Head of Development,
 Robert Bosch GmbH



Prof. Jan Gang Lu
 Professor, PhD Director,
 Beijing Institute of
 Technology; CTO,
 Sanhua Automotive USA



Dr Holger Manz
 Head of Energy
 Management and
 High Voltage Systems
 Electric / Electronic
 Development
 Volkswagen AG



Berthold Martin
 Senior Manager
 Advanced Transmission
 Engineering,
 Fiat Chrysler
 Automobiles US LLC



Keith Michael



Dr Anke Müller
 Professor,
 Manufacturing Methods in
 Mechanical Engineering
 Hof University



Torsten Murr
 Global Technology
 Manager TM Fluids
 Shell Global Solutions,
 (Deutschland) GmbH



Rolf Najork
 President of the
 Executive Board,
 Bosch Rexroth AG



Prabot Nanua
 Director, Global
 Engine & Transmission
 Advanced Engineering
 General Motors



Wolfgang Nebe
 Global Head PL E-Motor,
 Valeo Siemens
 eAutomotive
 Germany GmbH



Konstantin Neiß
 Electric Drive Systems &
 Charging Systems,
 Daimler AG



Tatsuya Osone
 Vice President
 Advanced Technology
 Development and CTO,
 Jatco Co. Ltd



Sascha Ott
 Managing Director
 Institute of Product
 Engineering, Managing
 Director KIT Center
 Mobility Systems,
 Karlsruhe Institute of
 Technology



Stephan Rebhan
 Executive Vice President
 BU Transmission,
 Continental



**Prof. Dr Stephan
 Rinderknecht**
 Director, Institute for
 Mechatronic Systems in
 Mechanical Engineering,
 TU Darmstadt



Marc Ritter
 EMEA
 Automotive Partnerships,
 Google Germany GmbH



Gianpiero Saroglia
 Technical Director
 Transmission Engineering,
 FCA Italy S.p.A



Michael Schäfer
 Head of Transmission
 Development,
 Volkswagen AG



Raf Schuermans
 Technical Senior
 Manager – Advanced
 Powertrain
 Toyota Motor Europe



Dr Jörn Seebode
 Senior Vice President
 Commercial Vehicle
 Powertrain, MD-N
 Business Area Powertrain
 Mechatronics, IAV GmbH



Takashi Shibayama
 Fellow,
 Shin Nippon Tokki Co., Ltd



Gunnar Stein
 Chief Technology Officer,
 Senior Vice President
 Oerlikon Drive Systems



Dr Ingo Steinberg
 Vice President
 Transmission Systems,
 FEV Europe GmbH



Prof. Dr Peter Tenberge
 Director, Institute for
 Industrial and Automotive
 Drivetrains,
 Ruhr-Universität Bochum



Dr Renate Vachenaer
 Vice President
 Transmissions, Drive Train
 BMW Group



Dr Götz von Eisebeck
 Vice President,
 Technical Officer
 Electromobility, R&D,
 TRATON AG



Prof. Dr Burghard Voss
 Senior Vice President
 Transmission and
 Hybrid Systems,
 IAV GmbH



Michael J. Waterman
 Managing Director,
 Opportunity
 Management Inc.



Carsten Weber
 Manager, Engine &
 Powertrain Systems
 Research & Advanced
 Engineering,
 Ford Motor Company



Dr Michael Winkler
 General Manager,
 Head of Powertrain,
 Hyundai Motor Europe
 Technical Center GmbH



Prof. Dr Xiangyang Xu
 Executive Deputy
 Director of National
 Engineering Research
 Center for Passenger Car
 Automatic Transmissions,
 School of Transportation
 Science & Engineering,
 Beihang University



Prof. Dr Tong Zhang
 Director, National Fuel
 Cell Vehicle and
 Powertrain System
 Engineering Center,
 Clean Energy
 Automotive Engineering
 Center, Tongji University

**HONORARY
 MEMBERS**



Wolfgang Eng
 Automotive Consulting



Dr Wolfgang Reik
 Automotive Consulting



Georg Weiberg
 Automotive Consulting

CTI SYMPOSIUM EXPO

PREMIER PLACE TO FIND YOUR BUSINESS PARTNERS
10 & 11 DECEMBER 2019

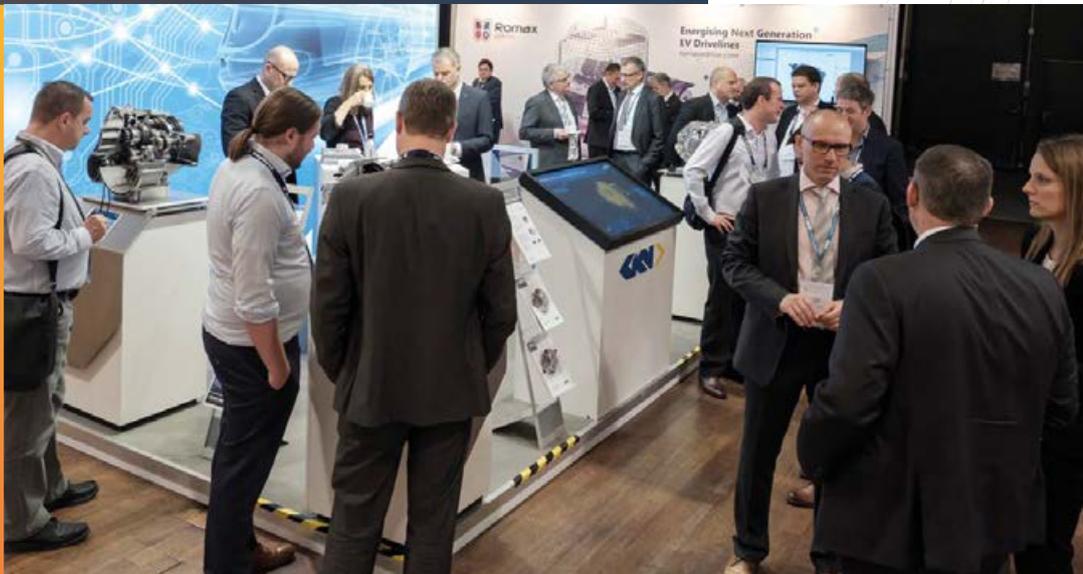
Join the world hub of R&D for automotive drivetrains, HEV and EV components.



YOUR CONTACT

Michael Follmann, Sales Director
+49 211 88743-3729
michael.follmann@car-training-institute.com

The platform to create unique opportunities and test new ideas. Talk directly with those deciding on budgets.



SPONSORS (Status August 2019)



AVL is the world's largest independent company for the development of powertrains (combustion engines, transmissions, control software, power electronics, electric motors and batteries). The development and integration is fully supported by simulation tools; instrumentation & test systems; as well as the methodology required for passenger cars, trucks and marine engines. AVL offers a complete service portfolio for OEMs and transmission suppliers which contains design, analysis, calibration, transmission control development, hybridization and manoeuvre-based testing. AVL is a leader in developing highly-efficient and flexible E-axels and Electrified Transmissions including Dedicated Hybrid Transmissions to be implemented in AT, 48V or HEV/PHEV systems.

AVL List GmbH | www.avl.com/transmission



Whether in a highly efficient combustion engine, an intelligent hybrid system or the very latest electric drive, **BorgWarner** is driving mobility for today and tomorrow.

BorgWarner | www.borgwarner.com



Magna Powertrain, an operating group of Magna International, is a premier supplier for the global automotive industry with full capabilities in powertrain design, development, testing and manufacturing. Complete system integration sets us apart from our competitors. To address increasing environmental pressures, many of Magna Powertrain's innovations focus on electronically controlled technologies, supporting the quest for improved efficiency and reduced emissions.

Magna Powertrain | www.magna.com



PETRONAS

PETRONAS Lubricants International (PLI) is the global lubricants manufacturing and marketing arm of PETRONAS, the national oil corporation of Malaysia. Established in 2008, PETRONAS Lubricants International manufactures and markets a full range of high-quality automotive and industrial lubricants products in over 80 markets globally. Headquartered in Kuala Lumpur, PLI has over 30 marketing offices in 23 countries, managed through regional offices in Kuala Lumpur (Malaysia), Turin (Italy), Belo Horizonte (Brazil), Chicago (USA) and Durban (South Africa). The Global Technology Center located in Turin, Italy, develops tailor made Transmission lubricants for several OEMs at global level, both for First Fill and for the Aftermarket same as high performance transmission oils for various motorsport applications (such as Formula 1 and DTM). PLI's portfolio offers a wide range of Manual Transmission Fluids (MTF), Automatic Transmission Fluids (ATF incl. DCTF) and Axle/Differential Fluids for global applications in the automotive sector (Passenger Car and Commercial Vehicles).

PETRONAS Lubricants International | www.pli-petronas.com



Valeo is an automotive supplier, partner to all automakers worldwide. As a technology company, Valeo proposes innovative products and systems that contribute to the reduction of CO₂ emissions and to the development of intuitive driving. In 2018, the Group generated sales of 19.1 billion euros and invested 13% of its original equipment sales in Research and Development. Valeo has 188 plants, 20 research centers, 39 development centers and 15 distribution platforms, and at June 3, 2019, employs 114,350 people in 33 countries worldwide. Valeo is listed on the Paris Stock Exchange.

Valeo | www.valeo.com

EXHIBITORS



AAM (NYSE:AXL) delivers POWER that moves the world. As a leading global tier 1 automotive supplier, AAM designs, engineers and manufactures driveline, metal forming and casting technologies that are making the next generation of vehicles smarter, lighter, safer and more efficient. Headquartered in Detroit, AAM has over 25,000 associates operating at nearly 90 facilities in 17 countries to support our customers on global and regional platforms with a focus on quality, operational excellence and technology leadership. To learn more, visit aam.com.

American Axle & Manufacturing, Inc. | www.aam.com



Welcome to the front-runner. Since 1995, **ACTech** has been setting new standards for rapid prototype production in terms of quality and speed. Employing innovative methods and technologies, partially developed in-house, in conjunction with perfectly organized workflows and complete internal management of processes. All casting and CNC machining takes place in-house, up to the ready-to-install part. The results are high precision casting prototypes, produced in record time.

ACTech | www.actech.de



Afton Chemical is the market leader for additives in Automatic and Dual-clutch Transmission Fluids, and is approved by Ford, Daimler, GM, VW and ZF for factory fill. We provide tailored solutions to customers that match their hardware needs, driving increased efficiency and enabling new engineering such as hybridization and e-mobility.

Afton Chemical | www.aftonchemical.com



Altair is a leading provider of enterprise-class engineering software enabling innovation, reduced development times, and lower costs through the entire product lifecycle from concept design to in-service operation. Our simulation-driven approach to innovation is powered by our integrated suite of software which optimizes design performance across multiple disciplines encompassing structures, motion, fluids, thermal management, electromagnetics, system modeling and embedded systems, while also providing data analytics and true-to-life visualization and rendering.

Altair | www.altair.de



Associated Spring is a pioneer, leader & innovator in the engineered spring & precision metal component manufacturing industry. With a wealth of engineering capability & manufacturing expertise, the Associated Spring Team solves customers' complex product and process design challenges, to help them achieve superior performance & competitive advantages in the automotive (ICE, Hybrid and EV) and industrial markets.

Associated Spring | www.asbg.com



Future-proof drivetrain testing for electric and hybrid drives

E-mobility is the future. At **ATESTEO**, the future is now. Our experience in testing of drivetrains with electric or hybrid drives and over 30 years of expertise in testing of drivetrains with combustion engines make us the leading testing service provider. With know-how from many years of testing electric motors, inverters, additional electric components, hybrid drives and battery systems and the reliability of 130 company-owned test benches, we support the automotive industry in developing visionary solutions.

ATESTEO GmbH | www.atesteo.com



AVL is the world's largest independent company for the development of powertrains (combustion engines, transmissions, control software, power electronics, electric motors and batteries). The development and integration is fully supported by simulation tools; instrumentation & test systems; as well as the methodology required for passenger cars, trucks and marine engines. AVL offers a complete service portfolio for OEMs and transmission suppliers which contains design, analysis, calibration, transmission control development, hybridization and manoeuvre-based testing. AVL is a leader in developing highly-efficient and flexible E-axels and Electrified Transmissions including Dedicated Hybrid Transmissions to be implemented in AT, 48V or HEV/PHEV systems.

AVL List GmbH | www.avl.com/transmission



Barnes Engineered Components (EC) is a world class supplier to key markets including: Automotive, Medical, Aerospace, HVAC/Refrigeration, High Tech/Telecom, HDT, Construction/Mining, Energy & General Industrial. EC spans global manufacturing and non-manufacturing strategic locations from North America to Europe, South America and Asia, with its dedicated employees collaborating with customers, adding value through innovation and state-of-the-art technologies. EC includes three world renowned brands: Associated Spring, Hänggi, and Seeger offering synergetic solutions to its customers. The EC Portfolio encompasses not only components but innovative Next Generation precision Light weight solutions for Hybrid/EV Powertrain, E-steering, E-Chassis & Autonomous Vehicles.

Barnes Engineered Components | www.bginc.com



BorgWarner Inc. (NYSE: BWA) is propulsion system leader for combustion, hybrid and electric vehicles with production plants and technical facilities at 32 sites out of a total of 67 locations in 19 countries. In support of creating solutions for a cleaner, more energy-efficient world, BorgWarner dedicates its passion and expertise to constantly improving the transportation of people and things, creating technologies to improve efficiency, emissions and performance of all types of vehicles.

BorgWarner | www.borgwarner.com



Mobility Solutions is the largest **Bosch Group** business sector. The Bosch Group is one of the leading automotive suppliers. Bosch provides technologies and solutions for the electronic and hydraulic control of all types of automated transmissions and offers key components for CVT.

Robert Bosch GmbH | www.bosch-mobility-solutions.com



The **brandgroup** is specialized in development and manufacturing of cold formed technical springs as well as wire formed parts. We are the leading producer of damping springs for powertrains in Europe. We offer innovative technology and efficient solutions for constantly increasing requirements. For decades our customers appreciate our reliability and knowhow regarding material, development and prototypes. Moreover, also our sophisticated manufacturing technologies and analytical capabilities. The brandgroup has several manufacturing sites in Europe and beyond so that we are able to offer products, services and solutions in various imaginable ways.

Brand KG | www.brand-group.com



Developer and manufacturer of casted and machined parts for the automotive, aerospace, railway and industry markets. Plants in France and Romania. Since 1927 the company has diversified its activity developing innovative solutions fully adapted to their customers.

HPDC (aluminum) casting | Gravity casting (copper-aluminum alloy) | Machining | Mechanical or welded assembly

Bronze ALU Group | www.bronze-alu.com



With decades of familiarity with the market and solid know-how, cb successfully designs flexibility creatively. Wherever disc springs, diaphragm springs and complete subassemblies for vane pumps are involved, we stand for the tightest of production tolerances while being consistently solution-driven. In addition to the DIN disc springs Bauer Springs, Inc. (our subsidiary in the USA) and cb also support you with tailored and customized developments.

Christian Bauer GmbH + Co. KG | www.christianbauer.com



CWST – since 1945 known as Metal Improvement Company – with more than 70 global business units is the market leader in the process “Controlled Shot Peening”. The implementation of Engineered Coating Services and the development of our Laser Peening Process expanded our product portfolio to a complete high quality package (One-Stop-Job) for our customers in the global Surface Technology sector.

Curtiss Wright/Metal Improvement | www.cwst.de



As special machines supplier, our knowledge and skills in mechanical, automation, hydraulic, pneumatic and software technologies are our key to success. We are providing test and measurement solutions and automatic assembly processes (conveyor, robot, fitting, marking, screwing, vision) to support global automotive key players’ industrialization and efficiency. Quality, creativity, robustness and agility are our assets.

DAM Group | www.dam.fr



Dana is a global leader in the supply of highly engineered driveline, sealing, and thermal-management technologies that improve the efficiency and performance of vehicles with both conventional and alternative-energy powertrains. Serving three primary markets – passenger vehicle, commercial truck, and off-highway equipment – Dana provides the world’s original-equipment manufacturers and the aftermarket with local product and service support through a network of nearly 100 engineering, manufacturing, and distribution facilities.

Dana Incorporated | www.dana.com



Drive System Design is an award-winning engineering consultancy, enabling customers to exploit the full potential of their driveline and powertrain systems through full system design, optimisation and integration. Working with global manufacturers and suppliers to define and design future driveline and motor technologies across the mobility, commercial, and off-highway industries.

Drive System Design | www.drivesystemdesign.com



Dynax is a specialist and manufacturer of wet friction materials used for torque couplings in the fields of automotive, construction, and agriculture. We show the spirit of challenge based on the idea of “Already in the future” and we research and develop, manufacture, and sell our products to exceed expectations. We are globally located with manufacturing in Europe, North America, and Asia. Our customers are worldwide most famous in the field of mobility. We are ready to work with you for meeting the future challenges for developing hybrid and electric vehicles, as well as optimizing your existing products. We look for to meeting you at CTI and supporting your wet friction needs.

Dynax Corporation



As the service provider in the strong community of the DVS group, **DVS Production GmbH** offers contract manufacturing equipped with everything that is required for a sophisticated series production. Our areas of expertise:

- Skiving of inside and outside diameter
- gear honing of inside and outside diameter
- machining before and after heat treatment
- milling of shifter stops and pockets
- bore honing
- precision machining
- Production of drive shafts
- level grinding of rotors and stators

In order to keep up with the increasing demands of drive technology, only the latest machine generations of the DVS group are used.

DVS Production GmbH | www.dvs-production.de



EJOT bietet eine breite Palette innovativer Verbindungselemente, insbesondere gewindefurchender Schrauben für Kunststoff und Metalle, technische Umformteile aus Kunststoff und Metall, ein Komplettdienstleistungsprogramm für die Befestigung der Außenhülle von Gebäuden, Befestigungslösungen für die Gebäudeinfrastruktur sowie das „ejotherm®“ Programm für die Befestigung von Wärmedämmverbundsystemen. EJOT erarbeitet partnerschaftlich mit den Kunden die Lösungen für deren Füge- und Befestigungsprobleme. Dabei werden wir davon geleitet, durch die Verwendung „intelligenter“ EJOT Produkte die Qualität der Verbindung sicherzustellen und die Systemkosten der Verbindung zu senken.

EJOT GmbH & Co. KG | www.ejot.com/industry



ekontrol Drive Technology GmbH is a global high-end EV/HEV drive system supplier in commercial vehicle industry. Our subsidiaries cover Europe and China. With strategic positioning of technology leadership, corporate value of "Tech drive joy of trip!" is ensured.

Our competitive product portfolio includes:

- EDS (EV Drive System)
- HEV (Hybrid EV System)
- CMS (Charging in Motion System)

ekontrol Drive Technology GmbH | www.auto-ekontrol.de



ElringKlinger is one of the leading international automotive suppliers capable of developing and manufacturing technologically sophisticated components for all types of drive systems, whether combustion engines or electric solutions. Specially designed Elring Klinger components for engine, transmission, exhaust system, underbody, and vehicle body applications are used by virtually all car and engine manufactures as well as many automotive suppliers worldwide.

ElringKlinger AG | www.elringklinger.de



ELTRO offers the heat treatment service and tailor-made systems for nitriding, nitrocarburizing and oxidation. Fullybautomatische systems, with the complete complement of supporting subsystems integrated into the manufacturing line, offer the best economy with highest quality. With full automation, parts can be continuously placed into a manufacturing line and then finally discharged by integrated handling and transport equipment.

ELTRO GmbH | www.eltropuls.de



EnginSoft is a premier consulting firm in Simulation Based Engineering Science with a global presence and has always been at the forefront of technological innovation. EnginSoft engineers show a great level of expertise in engineering simulation technologies across a broad range of industries to help customers get the most out of existing engineering simulation technologies.

EnginSoft GmbH | www.enginsoft.com/de



Erdrich Umformtechnik is a family-owned business that has been active for more than 50 years. As a leading manufacturer of metal forming parts, it is our mission to produce high-quality precision products. We are driven by the passion to create intelligent and smart solutions.

CORE COMPETITIONS:

- Development and production of complex deep drawing parts and assemblies.
- Experience in changing manufacturing processes.
- Intelligent solutions achieved by our development capability with state of the art equipment.

TECHNOLOGIES:

- Deep drawings
- Stampings
- Fine blanking parts
- Assemblies PLANTS: Germany, Czech Republic, USA, China

Erdrich Umformtechnik GmbH | www.erdrich.de



HES Hermann Erkert GmbH is a well established premium supplier of high precise machined components and subassemblies for gearboxes, steering systems and injection systems. With our highly automated and flexible Production we are able to meet the customer demands. Our customers are 1.Tier companies as well as OEM's

HES Hermann Erkert GmbH | www.erkert.de



ERNST GROB AG develops, designs and builds precision machines dedicated to the cold forming of splined and nonsplined workpieces. The manufacture of slotting machines for secondary and finishing operations on cold formed workpieces is yet another core competence of the company.

- Cold forming machines for sheet metal and solid components
- Slotting machines for sheet metal components
- Subcontracting
- Engineering

ERNST GROB AG | www.ernst-grob.com



Ernst Umformtechnik GmbH is a recognized, leading partner in the sheet metal forming industry. Core activities are the production of high precision stampings, deep drawn parts and assemblies as well as the development and production of prototypes. Complementary processes such as laser welding, machining and surface- / heat treatment complete the program. Product portfolio: components for synchronization-, clutch- and transmission systems, waste gas, automotive safety, automotive electronics and HVAC.

Ernst Umformtechnik GmbH | www.ernst.de



The European Powder Metallurgy Association, **EPMA**, formed in Brussels in 1989, has three key missions – Promoting, Representing and Developing Powder Metallurgy. The EPMA serves all types of corporate members, from component producers, metal powder manufacturers, equipment producers through to end-users, research centres, universities and individuals who have an interest in Powder Metallurgy (PM).

EPMA | www.epma.com



Feintool is a globally acting technology and market leader in the business area of fineblanking as well as a worldwide provider of high-quality and cost-effective fineblanked, formed steel components and stamped electro sheet metal products. As an innovation driver, Feintool consistently expands the boundaries of these technologies and develops smart solutions for its customers' requirements. On the one hand, Feintool offers complete production of precise fineblanked and formed components as well as stamped electro sheet metal products in high volumes for demanding applications in different industries such as automotive, industrial or energy. On the other hand, it provides complete process solutions in fineblanking and adjacent processes.

Feintool International Holding AG | www.feintool.com



The **FEV Group**, with its headquarters in Aachen, Germany, is an internationally renowned service provider in the area of vehicle development. The skill spectrum of FEV includes consulting and the development and testing of innovative vehicle concepts, all the way up to serial production. In addition to engine and transmission development, vehicle integration, and the calibration and homologation of modern vehicle powertrains, the development of hybrid and electric drive systems as well as alternative fuels is constantly increasing in importance. Another area of activity includes optimizing electronic control systems as well as the increasing connectedness of cars. In this context, one particular focus is the continued development of autonomous vehicles. The FEV Group employs over 5,300 highly qualified specialists at more than 40 locations on four continents.

FEV Europe GmbH | www.fev.com



FIUKA ranks among the renowned suppliers in the automotive industry. Development and production of metal parts based on 100% cold forming technology for Airbag, Chassis, Exhaust, Powertrain and E-Mobility is our core business. On forming presses up to 1600t, FIUKA produces high-precision parts from steel, stainless steel, aluminum and special materials. Components for conventional and electric powertrain are manufactured using fully automated production equipment including machining- and flow-forming operations.

Fischer und Kaufmann GmbH & Co. KG | www.fiuka.de



FunctionBay is the world's fastest-growing CAE software company developing 'RecurDyn' which is an engineering simulation software based on Multi-body-dynamics (MBD) with the most high-levelled cutting-edge technologies. FunctionBay has been providing many industry customers with various engineering solutions throughout its own software of RecurDyn as well as a cooperative CFD code of Particleworks developed by Prometech Software to help them resolve their engineering challenges in fields of automotive, ship-building, railway, robot, heavy industry, military equipment, and many other areas related to mechanical and electronic fields of engineering.

FunctionBay Inc. | www.functionbay.co.kr



Together with the best research institutes and leading drive technology companies, we transfer **FVA** research results into industrial practice.

Our services for drive technology:

- Simulation platform for efficient and precise gear design: FVA-Workbench
- Professional service and support
- Seminars and conferences

#FVADriveTechnology #FVASimulation #FVAWorkbench

FVA Software & Service | www.fva-service.de/en



GETEC Getriebe Technik is an independent engineering/testing service provider focusing on the powertrain development. We combine transmission knowledge for MT, AMT, AT, DCT, CVT, Hybrid, EV from the scratch, CAE, CAD, software and calibration up to serial production. Especially our Transmission Software will put your control development into pole position.

GETEC Getriebe Technik GmbH | www.getec-gmbh.com



Breakthrough new type of energy storage: high-power, fire-safe, carbon-neutral, delivering over a million of full-discharge cycles in the widest temperature range with specific energy up to lead-acid battery levels. Geysler Batteries offer direct economically efficient low-maintenance substitute to supercapacitors and high-power li-ion batteries, providing ideal energy storage solution for tough use cases like HV and 48V hybrids and distributed power supply.

Geysler Batteries oy | www.geyslerbatteries.com



GKN Automotive develops and integrates highly engineered, intelligent conventional and electrified driveline solutions, tuned to meet OEMs' specific requirements. From city to sports cars and advanced all-wheel drive to refined hybrids, GKN Automotive delivers the driveline systems that redefine vehicle segments and create new, brand-aligned driving experiences.

GKN Automotive | www.gknautomotive.com



A world class Leader in ultra-precision microstamping and fine-blanked applications. **Hänggi** offers unique solutions from engineering prototypes to serial production including some assemblies. They specialize in producing complex, precision metal stampings. By converting machined components into stamped parts, Hänggi offers significant efficiencies and superior value. Hänggi has unmatched engineering expertise and manufacturing disciplines to provide complex stampings, fineblanking, optimal lifecycle costs & superior quality and service for key industries including automotive (GDi, PFI, turbochargers, others) and industrial markets (medical/high-tech, others).

Heinz Hänggi Stanztechnik | www.hanggi.ch



The Haver & Boecker Wire Weavers produce woven wire cloth and process it into engineered woven wire products. They are used as customised solutions in a large range of applications. Our work is based upon experience, continuous research and development of our products, along with the knowledge and ability of our staff. The combination of tradition and innovation allows us to meet and exceed the high expectations of our customers.

HAVER & BOECKER OHG | www.diedrahtweber.com



Born from the merger of two historical brands, Herzog and miniGears, **hGears** is one of the world's leading manufacturers of precision turned parts, drive components, gear kits as well as complex system solutions. These components can be manufactured either with Powder Metal or Cut Metal technology. Based in Germany, Italy and China with more than 1000 employees, hGears works with customers to develop and engineer precision gears and components for automotive, motorcycle, power tools, outdoor products, ebike and other industrial applications.

hGears Holding | www.hgears.com



HOERBIGER is the first destination worldwide for drive train solutions. By offering technologically tailor-made system design, the Strategic Business Unit Drive Technology increases the efficiency of synchronizers and shift elements in transmissions, making a crucial contribution to sustainability and resource efficiency. The product spectrum includes synchronizer systems for transmissions, shift elements for drive trains, and comfort systems for passenger cars and commercial vehicles. HOERBIGER offers all services from one source: from development to the series application of components and complete systems.

HOERBIGER Antriebstechnik Holding GmbH | www.hoerbiger.com



We are the system supplier of efficient powertrain solutions in the fields of electrification, hybridization and internal combustion power. As an established and independent partner of the mobility industry, hofer powertrain has been providing pioneering technologies and products to companies worldwide for over 30 years. Accomplished by our experienced teams of experts specialized in the development, industrialization, and production of powertrain systems.

hofer powertrain GmbH | www.hofer.de



Höganäs is the world leader on the market for iron and metal powders with a yearly capacity of 500,000 tons. Together with our customers, we develop tomorrow's solutions for automotive components, brazing, electrical motors, additive manufacturing and water treatment. The company was founded in 1797 and is owned by Lindéngruppen and Wallenberg owned FAM.

Höganäs | www.hoganas.com



As one of world's leading producer of retaining elements **Hugo Benzing** is a Tier-1 supplier for almost every reputable automotive manufacturer. On more than 20.000 square meters we employ about 850 people. Over 22.000 different items are included within our product range of retainers, wire forms, precision stampings and complex designed assemblies. Benzing components are used in numerous applications for example in parking lock systems for torque converters and dual clutch transmissions.

Hugo Benzing GmbH & Co.KG | www.hugobenzing.com



HYCET Transmission is a company focusing on R&D, manufacturing and sales. The company is fully organized with an independent research institute, trial production plant, manufacture plants, vehicle test track and transmission and component test labs incl. environment chamber. The product range covers the whole spectrum of transmissions: MT, AT, HT, 4WD PTU and more. The development of a new transmission starts in-house with the concept design. The detailed design phase includes the development of mechanic, electric and hydraulic hardware, the software development and calibration, several bench and vehicle tests as well as the system integration and function optimization. Any customer requirements can be considered quickly and efficiently in the development work. HYCET Transmission is among the few qualified product/service supplier with abundant experience from concept design all the way to mass production.

HYCET Transmission Technology Hebei Co., Ltd | www.hycet.com



Employing more than 7,000 members of staff, **IAV** is one of the world's leading engineering partners to the automotive industry. The company has been developing innovative concepts and technologies for future vehicles for more than 35 years, generating turnover of around 900 million euros in 2018. The client base includes all renowned automotive manufacturers and suppliers worldwide. Besides vehicle and powertrain development, IAV has been involved in electromobility and autonomous driving from an early stage and is today one of the leading engineering providers in this fields.

IAV | www.iav.com



IBS Filtran GmbH leading manufacturer of filter system solutions for automatic transmissions and electric-drive applications. With our development centers and manufacturing plants in Germany, USA, China and Mexico, as well as cooperation partners in Japan and Korea, we are able to satisfy our global customers' requirements due to innovative system solutions.

IBS Filtran GmbH | www.ibs-filtran.com



JATCO is a dedicated manufacturer of automatic transmission for automobiles including the step automatic transmission (AT) and the continuously variable transmission (CVT) both for conventional and hybrid vehicles. In addition, JATCO is developing complete e-Axles for Electrified Vehicles.

JATCO | www.jatco.co.jp



Joma-Polytec is an international family-owned company with branches and partnerships in Europe, North-America, and Asia. Since 1958, we've been developing comprehensive solutions for our customers from prototype to series. As a manufacturer of high-quality injection-molded plastic parts, vacuum- and hydraulic pumps and extrusion profiles, we offer innovative and efficient solutions.

Joma-Polytec GmbH | www.joma-polytec.de/home



Jopp wants to remain a family-run company in the long run and continue to make decisions irrespective of financial investors and financiers. To this end, both products and production procedures need to be continuously advanced. It is the company's aim to offer solutions to customers which are valuable, reliable and innovative. Profitability is therefore JOPP's ultimate objective in its corporate actions. JOPP is convinced that this aim can only be achieved with competent and efficient employees who take on responsibility and work together beyond hierarchical and departmental boundaries, both within the company and with customers, suppliers and other partners.

JOPP Group | www.jopp.com



As a leading global company designing & producing automotive components, **JTEKT Corporation** is seeking to refine its advanced technologies to provide greater safety, security & comfort. Our best-in-class steering systems and driveline components, marketed under the JTEKT and TORSSEN brands, provide an amazing driving experience while contributing to CO2 emission reduction. Through our "Monozukuri" approach, placing innovation at the heart of our strategy, JTEKT stays one step ahead in perceiving the constantly changing needs of markets & customers."

JTEKT Corporation | www.jtekt.co.jp/e/index.html



KATE LLC is an independent transmission developer and manufacturer. Company specializes in research and development work as well as production of modern automatic transmissions and Hybrid/EV torque transfer solutions for a wide variety of automotive industry applications. With deep knowledge, classical technical experience and unique innovations we support our Customers during the complete way from concept to smart intelligent industrialization.

KATE LLC | www.katem.ru



KISSsoft AG is market leader in software for the design of all types of drivetrains in vehicles. The application of the software ranges from individual machine elements to the automatic design of complete gearboxes - with a fast and reliable evaluation of the overall efficiency of a system. KISSsoft/KISSsys offers engineers and designers extensive optimization possibilities for the entire dimensioning process as well as engineering services and know-how transfer.

KISSsoft AG | www.kisssoft.ag



The **H. Kleinknecht & Co. GmbH** has the complete competence in testing technology for electric drives and gearboxes. Our track record of experience over decades in automation and drives engineering and as a general contractor for turnkey systems, we provide standardized or customized solutions for numerous applications for our customers, such as: BEV Drive Train, DCT Double Clutch Transmission, Manual Transmission, Automatic Transmission, HEV Hybrid-Electric-Vehicle Transmission, Transfer Case Transmission, R&D Test Stand for BEV/HEV. As well as their components: Mechatronics (Valve Body), Power Packs, Hybrid Modules, Double Clutches, Valves for Powers Packs, Radial Shaft Seals. With the self-developed test bench automation system ATS-Advanced, the company has proven know-how in software engineering.

Kleinknecht & Co. GmbH | www.kleinknecht.de



Koki ist Entwicklungspartner und Produktionsunternehmen in einem. An drei Standorten in Sachen einem in Indien und einem Standort in China. Insgesamt gehören rund 1.300 Mitarbeiter zum KOKI-Team. Entwicklungspartner und Produktionsunternehmen in einem bedeutet: KOKI initiiert und begleitet Prozesse zur Entwicklung von Getriebesystemen und KOKI produziert die Komponenten dazu – Aktuell: Alles was zum inneren Getriebesystem gehört – Schaltgabeln, Schaltdome und Parksperrn.

KOKI TECHNIK Transmission Systems GmbH | www.kokitransmission.com



Kolektor is a global development and production company divided into three strategic business units. A part of the Mobility Components and Systems unit is the Electronics & Drives business unit competent for custom-made electric drive systems, ceramic pressure sensors, position sensors and new high-precision thermoset gear e-pumps for oil applications. Within other business units, we are focusing on the magnetics and complex hybrid components for automotive industry, such as connection units and plastic-bonded permanent magnets.

KOLEKTOR group | www.kolektor.com



Are you looking to increase efficiency without adding extra costs in your tribological system? Look no further. At **Konzelmann GmbH**, using global market experience and results from our test laboratory, we design each solution's polymer blend and geometry in order to optimize your application, with price and performance in mind. Our solutions include bushings, axial/radial bearings, thrust washers, seal rings, gears, guiding components, and more.

Konzelmann GmbH | www.konzelmann.com



Kößler technologie designs and produces complex precision parts and assemblies for the automotive and mobile hydraulics industries for more than 45 years. Our range of services includes commercial system solutions and customer-specific high-end developments for medium and large series. With our service concept, we are setting benchmarks in the branch and thus cover the entire development and production cycle - from the idea to production and delivery.

kößler technologie GmbH | www.koessler-technologie.com



Leifeld Metal Spinning AG is the global leader in the development and manufacturing of machine tools for chipless metal forming. In addition to manufacturing, our range of services includes research & development and customer service. Almost 200 employees work at our locations in Germany, the USA, China and Russia. We have numerous representatives in all important markets worldwide.

Leifeld Metal Spinning AG | www.leifeldms.com



Linamar is a diversified global manufacturing company of highly engineered powertrain products. Linamar has extensive product expertise in transmission modules, driveline components and complete AWD systems, including Hybrid e-Axle solutions. Linamar's manufacturing capabilities include Machining & Assembly, Forging, Light Metal Casting and Metal Forming.

Linamar Corporation | www.linamar.com



Lubrizol offers a wide range of automotive solutions for equipment manufacturers and suppliers. Learn how Lubrizol can help in bringing products to market quickly and efficiently, both now and in the future.

Lubrizol | www.lubrizol.com



Magna Powertrain, an operating group of Magna International, is a premier supplier for the global automotive industry with full capabilities in powertrain design, development, testing and manufacturing. Complete system integration sets us apart from our competitors. To address increasing environmental pressures, many of Magna Powertrain's innovations focus on electronically controlled technologies, supporting the quest for improved efficiency and reduced emissions.

Magna Powertrain | www.magna.com



Magnax is building next-generation electric motors based on axial flux technology. We have developed a unique, proprietary variant of yokeless axial flux machines, which can provide a step change in efficiency, weight, size, manufacturing and cost-effectiveness. The technology is used for electric vehicles with a high power density and efficiency requirement.

MAGNAX | www.magnax.com



MANN+HUMMEL is a leading global expert for filtration solutions. The company develops solutions for motor cars, industrial applications, clean air in interior spaces and the sustainable use of water. In 2017 the group achieved sales of approx. 3.9 billion euros worldwide with more than 20,000 employees at more than 80 locations

MANN+HUMMEL GmbH | www.mann-hummel.com/de/



Marzocchi Pompe S.p.A. is an Italian company dedicated since 1961 exclusively to the development, manufacture and sale of external gear pumps and motors. Marzocchi Pompe is a Tier 2 company that supports powertrain customers and electro-hydraulic power steering systems for both conventional and hybrid models.

Marzocchi Pompe S.p.A. | www.marzochipompe.com



Means Industries develops award-winning, transformational propulsion-system technologies like our Selectable One-Way Clutch through rigorous, innovative design and collaboration with global OEMs. Our manufacturing capabilities include complex propulsion systems and advanced Metal-Forming and Joining, while our emerging Dynamic Clutch technologies will serve as the new building blocks for efficient Propulsion Electrification.

Means Industries | www.meansindustries.com



Melecs Elektronikwerk Siegendorf (EWS), with sales revenue of 217 million euros, is the largest electronics manufacturing service provider (EMS) with Austrian roots and has more than 25 years of experience. All value creation stages from development, validation and industrialization to production and logistics are provided from a single source. Melecs EWS relies on innovative solutions tailored specifically to its customers, such as in the areas of all-wheel drive ECUs (Electronic Control Units) and LED lighting in vehicles.

Melecs EWS GmbH | www.melecs.com



Methode Electronics is a leading developer of custom engineered products using the latest technologies. Our contactless magnetoelastic sensors enable torque and other force measurements in high volume production applications that were previously unfeasible. We leverage the talents of our over 5,000 employees to serve three market areas: Automotive, Industrial and Medical.

Methode Electronics International GmbH | www.methode.com



Global presence, years of experience and ongoing technological progress distinguish the **Miba Group** as market and technology leader. Our mission is to reduce CO₂-emissions, increase efficiency of existing drive concepts and keep pace with the trend toward new alternative energy sources with pioneering technologies. Miba sintered components, friction materials and coatings make vehicles more efficient, more reliable and more environmentally friendly.

Miba AG | www.miba.com



Solutions and manufacturing expertise for custom magnet products

Together with approximately 600 employees, we continuously impress our customers with tailor-made magnet solutions based on individual requirements. We pool our combined knowledge and passion to create custom magnet products for companies in a wide range of industries: from the automotive industry to businesses specialising in electrical engineering and automation technology as well as those in the energy, environmental and medical sectors.

MS-Schramberg GmbH & Co. KG | www.ms-schramberg.de



Mubea Tellerfedern GmbH produces highly-stressed transmission springs and separating springs for modern automatic transmissions, CVT- and dual clutch transmissions. The transmission weight and drag torque losses can be reduced significantly by using Mubea transmission and separating springs. Further products in the transmission sector are light weight transmission shafts. The weight of these shafts can be reduced by up to 30 %.

Mubea Tellerfedern GmbH | www.mubea.com



Friction Systems, as part of the Oerlikon Group, is a global technology partner for innovative transmission synchronizers and sets the standard in the development and manufacture of high-performance Carbon friction linings and transmission components.

We offer the ideal solution for all applications in passenger and commercial vehicle transmissions with manual and dual-clutch gearboxes as well as for pioneering hybrid applications. Modern transmission synchronizers consist of precision-formed steel synchronizer rings with Carbon friction linings which meet the highest requirements for quick and smooth gear changes. In particular, the 2-layer EF® 8000 and EF® 5010 Carbon friction linings are market leaders in this industry.

Friction Systems' latest research and development has resulted in two innovative and patented all-in-one solutions.

The Segmented Synchronizer System, **S³**, replaces conventional multi-cone synchronizers and delivers higher efficiency and reduced weight and costs.

E Sync is an optimized, compact synchronization system which requires significantly less space and weights much less than conventional systems, making it the ideal solution for modern hybrid transmission systems.

Friction Systems has a presence at the key locations for the automotive industry around the world, offers local manufacturing and designs and develops synchronizers that meet customer requirements for specific applications.

Oerlikon Friction Systems (Germany) GmbH | www.oerlikon.com/metco



The **PMG group** covers the world's automotive markets as a leading manufacturer of powder metallurgical modules and components, as well as of soft magnetic powder composites (SMC) for electrical applications in various industries. PMG's structural PM steel components are tailored solutions for automated and manual transmissions as well as for shock absorbers. Soft magnetic composite materials are designed for the requirements of electrical applications.

PMG Group | www.pmgsinter.com



Precision Resource is a recognized leader in the development of fine blanking technology, producing millions of fully finished components for our customers every day – with facilities in the USA, Canada, Mexico, China, and Slovenia. Drivetrain applications include: components for transmissions, torque converters, turbochargers, valve timing, fuel systems.

Precision Resource | www.precisionresource.com



Profiroll Technologies is specialized in the development and manufacturing of thread rolling machines, spline rolling machines and cold ring rolling machines. The appropriate process techniques and rolling dies are completing the service.

Profiroll Technologies GmbH | www.profiroll.de



PUNCH Powerglide, formerly General Motors Strasbourg, brings in more than 50 years of expertise in the development and production of automatic transmissions. Besides its conventional 6-speed automatic variants, with or without “stop & start” option, PUNCH Powerglide product line includes also mild hybrid (BSG) and full hybrid driveline solutions. Its R&D teams are also working on new concepts (DHTs, e-drive). In addition to complete gearboxes, PUNCH Powerglide supplies various components for the automotive sector and offers also engineering services in the areas of testing, software programming, calibration and NVH analysis.

PUNCH Powerglide Strasbourg SAS | www.punchpowerglide.com



Punch Powertrain is an independent full system supplier of fuel efficient powertrains. With over 45 years of experience in the production of CVTs, Punch Powertrain also offers electric powertrains for New Energy Vehicles such as Hybrids (48V & PHEVs) and Electric Vehicles (EVs), as well as DCTs. Punch Powertrain is an international player, with a strong presence in Europe and China. In addition to the headquarter in Sint-Truiden, Belgium, the company runs 5 more R&D centers, located in Germany (2), France (1), the Netherlands (1) and China (1), allowing close cooperation with the customer and short communication lines. Economies of scale are achieved by concentrating production in 3 facilities in Belgium and China.

Punch Powertrain NV | www.punchpowertrain.com



Precision to move for 100 years!

Reich GmbH the leading manufacturer of turned parts, special ball bearings, components for injection systems, steering and automatic transmissions in large scale production. We turn, mill, grind, hone, broach and shape. Moreover we have our own heat treatment, ECM, TEM, barrel finishing and phosphating.

Reich GmbH | www.reich-gmbh.com



We are a global strategic engineering and environmental consultancy that specialises in the transport, energy and scarce resources sectors. Our work extends across a range of market sectors – including passenger cars, commercial vehicles, rail, defence, motorsport, energy and environment – and we are proud to possess a client list that includes transport operators, manufacturers, energy companies, financial institutions and government agencies. In addition to our technical consultancy services, we have in-house engineering capabilities that enable us to design and deliver high-quality prototypes and low-volume manufacturing of complex products and assemblies, including engines, transmissions, electric motors and generators, battery packs and fuel cell systems.

Ricardo | www.ricardo.com



ROLLAX – We'll keep you moving

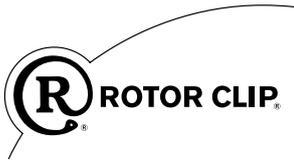
The international automotive industry has relied on Rollax systems and components since 1972. ROLLAX is synonymous with the highest quality in specialised bearings and mechanical motion technology. We conceptualize, design and manufacture vehicle chassis applications, gearbox, steering column and seating solutions, to your specifications. Highly qualified employees and dedicated in-house machine and tool manufacture as well as a vast number of patents, provide a sound foundation for our quality products and the desired flexibility in manufacturing. Creativity and expertise are our major competitive assets. Holistic thinking and challenging the boundaries of existing knowledge are integral to our company culture. You benefit, as an automotive industry customer, from our experience, gained over many years with renowned and influential OEM and first-tier suppliers. You also benefit from our mechanical motion solutions tailored specifically to your needs. Movement and mobility in automotive engineering are our core competences. No movement, no mobility – neither now nor in future.

ROLLAX | www.rollax.com/en



Romax Technology is an award-winning global leader in the development of software and services for rotating machinery and electro-mechanical systems. We count the world's major automotive, motorsport, aerospace and renewable energy companies as customers and close technology partners. We are also at the forefront of designing and delivering the next generation of energy efficient drive and power generation systems; including multi-megawatt wind turbines and electric vehicle powertrains. We take a 'whole solution' approach to help our clients solve their critical design and development challenges and get it Right First Time™.

Romax Technology | www.romaxtech.com



Rotor Clip is the leader in the manufacture of tapered, constant section and spiral retaining rings meeting DIN, Inch, ANSI Metric and JIS standards, as well as TRUWAVE wave springs, ROTOR CLAMP hose clamps and custom designs. We support the market with first class Engineering Know-How, expert advice, reliability of delivery and high quality products. Rotor Clip is certified to ISO 9001, IATF 16949, ISO 14001 and AS9100.

ROTOR CLIP s.r.o. | www.rotorclip.com



- Aluminum die-casting specialist since 1978, covering entire range of die-cast components for EV parts, IC engine, transmission and structural applications
- 53 die-casting machines from 350 to 3,550 tons
- Provides one-stop solutions to customer by operating along the entire value chain of die-casting industry
- ISO/TS 16949, ISO 14001 and OHSAS 18001 certified

Samkee Automotive Co., Ltd. | www.samkee.com



SCHERDEL, with its 32 locations and over 5000 employees worldwide, offers a full product range in the area of engineering springs, metal forming and joining technology. The value chain contains service, engineering and production as well as in-house tool and machine construction for products used for powertrain, body and interior applications.

SCHERDEL | www.scherdel.com



Seeger-Orbis is a world leading inventor & manufacturer of retaining and snap rings. Seeger-Orbis offers a large variety of industry custom engineered & standard products, specializing in specific items for customers' unique design applications. Utilizing state-of-the-art manufacturing processes and a wealth of experience, the Seeger team is able to design and manufacture precision ring solutions to fit individual requirements for both the automotive (ICE, Hybrid and EV) and industrial markets.

SEEGER-ORBIS | www.seeger-orbis.de



SELZER, your technology-partner for integrated solutions. From development over tool manufacture to production. SELZER has a multitude of manufacturing technologies for production of components and sub-assemblies for the automotive industry. Experience, know-how and the willingness to break new ground are crucial elements to how we think and act.

SELZER Fertigungstechnik GmbH & Co. KG | www.selzer-automotive.de



Shell is a global leader in the development of fluid solutions for the automotive industry. We work with OEMs and component manufacturers to deliver ATF, MTF and fluids for CVT, IVT, differentials and double-clutch systems for on- and off-road applications, continually improving friction durability, component life and fuel efficiency.

Shell Deutschland Oil GmbH | www.shell.de



Established in 2010, **Wuxi SHINDEN** aims to become a leader in the world's rapid manufacturing industry. Focusing on 3D CNC Milling Prototype, 3D Transparent Parts, 3D Print Sand Casting Parts manufacturing for more than 10 years. Our customer groups are becoming more and more abundant. Nearly 100 top 500 enterprises in the world and top domestic enterprises choose us to promote SHINDEN more intelligent and international.

WUXI SHINDEN INTELLIGENT TECHNOLOGY CO.,LTD | www.shinden-model.com



SHW Automotive is one of the leading European manufacturer for mechanical and electrical oil pumps for cooling, lubrication and actuation in transmissions and E-vehicles as well as sintered parts for transmissions and engines. SHW presents the latest developments of regulated concepts for oil pumps and E-Pumps. The division sinter production will give you an overview of new material as well as of the form parts for camphaser systems. SHW is also represented at the booth of the 'Powder Metal Gearbox Initiative'.

SHW Automotive GmbH | www.shw.de



Simerics Inc. develops, markets, and supports CAE software for the virtual simulation and testing of fluid pumps, valves, compressors, motors, and systems. Simerics is focused on providing tools that allow manufacturers to reduce expensive hardware testing and provide unique insight into their products. Founded in 2005, Simerics provides the advantage of the latest in simulation technology. Simerics offers two state-of-the-art CAE tools: Simerics-MP® and Simerics-MP+®. Simerics-MP is for Multi-Purpose applications and Simerics-MP+ includes all the capabilities of Simerics-MP with additional features such as streamlined setup procedures, automated mesh/re-mesh for key components especially moving components, and customized data reduction.

Simerics Inc | www.simerics.com



SKF is a leading global supplier of bearings, seals, mechatronics, lubrication systems, and services which include technical support, maintenance and reliability services, engineering consulting and training. SKF is represented in more than 130 countries and has around 17,000 distributor locations worldwide. Annual sales in 2017 were SEK 77,938 million and the number of employees was 45,678.

AB SKF | www.skf.com



SMT is an internationally trusted provider of cutting-edge drivetrain design, analysis and simulation software as well as technical consultancy services. SMT has in-depth experience in all industries that involve gear-shaft-bearing systems. Increasing development efficiency, reducing costs and driving innovation has been the core outcome from all of its global projects.

SMT | www.smartmt.com



As part of the Sodecia Group, **Sodecia Powertrain** is a well-known solution provider and manufacturer of precision powertrain products with manufacturing facilities in Europe and Asia Pacific. Our Product Competence Center with R&D, Prototyping and testing department is located in Germany where we design with different plastic / steel materials new applications for xEV and Ice's Current precision transmission products range from manual gearboxes up to dual clutch systems and our powertrain specialized products range from shift forks to park brake systems.

Sodecia | www.sodecia.com



Optimizing current solutions while innovating for the future? We help engineers overcome technological challenges by designing, developing and producing mechatronic solutions with the potential to set global standards. Our integrated value chain, including extensive in-house testing, ensures the best possible integration with your solution to reduce time-to-market and increase quality.

Sonceboz SA | www.sonceboz.com



Speed4E – Hyper-high-speed drivetrain for electric vehicles to achieve maximum ranges. The main goal of the joint project Speed4E is to design, manufacture and test an innovative drivetrain with maximum driving speeds of up to 50,000 rpm to increase the efficiency of tomorrow's EVs.

**Lehrstuhl für Maschinenelemente
Forschungsstelle für Zahnräder und Getriebbau (FZG)
Technische Universität München | www.speed4e.de**



teamtechnik is an internationally leading company for innovative production technologies. Over 950 highly qualified employees have been developing and building intelligent and reliable automation solutions for assembly and functional testing. In transmission- and E-Drive testing, the company supplies pre-series test benches, stand alone EOL test benches and fully automated EOL test lines. teamtechnik is market leader in modular and highly flexible test systems.

teamtechnik Maschinen und Anlagen GmbH | www.teamtechnik.com



Total international group is the world's fifth-ranked publicly-traded international oil company. More than 97,000 employees and over 130 nationalities are representing the workforce. Total Lubricants offers a wide range of products thanks to its diversified market segments: automotive, industrial market, marine.

Total Lubricants | www.lubricants.total.com



Welcome to **TREMEC**, a leading manufacturer of torque transfer solutions. From high performance vehicles to rugged-duty agricultural, vocational and line haul vehicles, TREMEC is a well-respected brand for world-class transmission assemblies and components. TREMEC torque transfer solutions include manual rear-wheel drive transmissions, dual clutch transmissions, hybrid & EV transmissions, gears, shafts, clutches, shift controllers, synchronizers, and mechatronic systems with integrated clutch systems and control software. TREMEC's products solve key challenges faced by the powertrain industry, including mandates for increased fuel efficiency, reduced emissions, lower weight, and compact size. Its technology addresses the industry's stringent requirements for reliability, cost, and quality - while providing fun-to-drive characteristics. Founded in 1964, TREMEC serves its global client base with over 1,450 employees and operations in North America and Europe. TREMEC is a wholly-owned business unit of Grupo KUO, S.A.B. de C.V., a diversified manufacturer of automotive, chemical and food products. Grupo KUO markets its products to over 70 countries and is headquartered in Mexico City, Mexico.

TREMEC | www.tremec.com



- Shift and launch comfort (objectification, documentation, automated application)
- Requirement engineering and representative load spectra (testing, simulation, requirements based on customer operation and test routes)
- Gearshift and selector lever actuation (objectification, optimization)
- Drivetrain efficiency (measurement, simulation and optimisation of drivetrain components)
- Energy and thermal management
- Electric and hybrid drives (analysis of drivetrain topologies, simulation, customer benefit, control strategy)

**Institute of Automotive Engineering | Member of Automotive Research Center Niedersachsen
| Technische Universität Braunschweig | www.iff.tu-bs.de**



Since 1971, UNICK has become one of the leading automobile component manufacturers of powertrain system that meets variable customer needs. We are now more focused on developing thermal management & hydrogen fuel cell system required to green vehicle in order to achieve humanity vision for next generation. From 2010, UNICK has developed hydrogen valves for hydrogen fuel cell stack system and high pressure control valve for hydrogen tank. We are also successfully producing battery coolant valves based on our valve manufacturing technologies for engine cooling. Our ultimate goal is being a company moving forward at offering total service from analysis to system evaluation with eco-technologies and contributing to clean mobility in the near future. We'd like to look forward to finding a successful business partnership with all of you. Thanks.

UNICK Corporation | www.unick.co.kr



Valeo is an automotive supplier, partner to all automakers worldwide. As a technology company, Valeo proposes innovative products and systems that contribute to the reduction of CO₂ emissions and to the development of intuitive driving. In 2018, the Group generated sales of 19.1 billion euros and invested 13% of its original equipment sales in Research and Development. Valeo has 188 plants, 20 research centers, 39 development centers and 15 distribution platforms, and at June 3, 2019, employs 114,350 people in 33 countries worldwide. Valeo is listed on the Paris Stock Exchange.

Valeo | www.Valeo.com



Victrex is a world leader in high-performance PAEK-based polymer solutions, supporting engineers for more than 40 years in developing cost-effective, durable powertrain applications enhancing efficiency, safety and driving comfort. With VICTREX™ PEEK polymer, APTIV™ film and VICTREX HPG™ Gears we provide innovative and cost-effective solutions for the most demanding powertrain components.

Victrex | www.victrex.com/automotive



Vitesco Technologies is a leading international developer and manufacturer of state-of-the-art powertrain technologies for sustainable mobility. With smart system solutions and components for electric, hybrid and internal combustion drivetrains, Vitesco Technologies makes mobility clean, efficient and affordable. The product range includes electrified drivetrain systems, electronic control units, sensors and actuators, and exhaust-gas aftertreatment solutions. In 2018, Vitesco Technologies, a division of Continental AG, recorded sales of EUR 7.7 billion and employs more than 40,000 employees at about 50 locations worldwide. Vitesco Technologies is headquartered in Regensburg, Germany..

Vitesco Technologies Germany GmbH



Walter Henrich
Metallverarbeitung

The middle-class family business **Walter Henrich GmbH** has specialized in the development and production of precisely cold-formed tubular shafts. The Walter Henrich GmbH offers you the following advantages:

- support in the development of new products
- optimization regarding development time and costs through the own manufacturing of samples and prototypes
- use of efficient production technologies for chipless and chipping processing

Walter Henrich GmbH | www.walter-henrich-gmbh.de



Winkelmann Powertrain Components GmbH & Co. KG is a Global Supplier of Powertrain and Driveline Components to the Automotive Industry. Product categories include Fuel Rails, Vibrational Torsional Dampers, Pulleys and Transmission Components. Manufacturing expertise includes Spin Forming, CNC Machining and Deep Draw Technology. Manufacturing Locations include Europe, Asia and North America.

Winkelmann Powertrain Components GmbH & Co. KG | www.winkelmann-automotive.de



YASA's revolutionary compact, lightweight and powerful electric motors and controllers enable vehicle hybridization and electrification when there is limited powertrain space. YASA supplies custom and off-the-shelf e-motors and generators to automotive OEMs from its headquarters and series production facility in Oxford, UK.

YASA Limited | www.yasa.com



ZF is a global technology company and supplies systems for passenger cars, commercial vehicles and industrial technology, enabling the next generation of mobility. In 2018, ZF achieved sales of €36.9 billion. The company has a global workforce of 149,000 with approximately 230 locations in 40 countries.

ZF | www.zf.com



Zoerkler – the spirit of precision

Zoerkler develops, manufactures and tests dynamic transmission prototypes for automobile manufacturers worldwide for use in cars, trucks and in the racing sector. Beginning with development and production of prototypes and ending with testing of mounted series production transmissions stands Zoerkler for highest precision, quality and safety.

Zoerkler Gears GmbH & Co KG | www.zoerkler.at



**SPACES ARE SELLING
OUT QUICKLY – APPLY NOW**

michael.follmann@car-training-institute.com



PROJECT MANAGEMENT CTI SYMPOSIUM



Sylvia Zenzinger
Managing Director CTI SYMPOSIA
+49 211 88743-3884
sylvia.zenzinger@car-training-institute.com



Sophia Tente
Project Assistant
+49 211 88743-3659
sophia.tente@car-training-institute.com

ORGANISATION



Lucas Linke
Conference Coordinator (Delegates)
+49 211 88743-3645
lucas.linke@car-training-institute.com



Cynthia Schütze
Conference Coordinator (Speakers)
+49 211 88743-3778
cynthia.schuetze@car-training-institute.com

MARKETING/PRESS, CUSTOMER SERVICE



Roman Irlinger
Marketing Director
+49 211 88743-3684
roman.irlinger@car-training-institute.com



Volker Altenbeck
Customer Service and Registration
+49 211 88743-3845
registration@car-training-institute.com

CTI SYMPOSIUM EXPO, SPONSORING & EXHIBITION



Michael Follmann
Sales Director
+49 211 88743-3729
michael.follmann@car-training-institute.com



Kai Kubitzki
Sales Manager
+49 211 88743-3252
kai.kubitzki@car-training-institute.com



Agyeman Baffour
Coordinator Sponsoring/Exhibition
+49 211 88743-3624
agyeman.baffour@car-training-institute.com

MEDIA PARTNERS

autelligence



Power Transmission
Engineering

engine
technology
INTERNATIONAL

gear
TECHNOLOGY

transmission
TECHNOLOGY INTERNATIONAL

cti symposium WORLD SERIES

AUTOMOTIVE DRIVETRAINS
INTELLIGENT
ELECTRIFIED

GERMANY

9 – 12 December 2019,
Berlin

USA

11 – 14 May 2020,
Novi, MI

CHINA

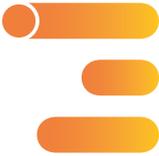
21 – 23 September 2020,
Shanghai

More Information: www.drivetrain-symposium.world

SAVE THE DATE



cti symposium


AUTOMOTIVE DRIVETRAINS
INTELLIGENT
ELECTRIFIED

International Congress and Expo | 9 - 12 December 2019, Berlin, Germany

www.drivetrain-symposium.world/tickets
registration@car-training-institute.com

PRICE	Package I 4,000 €* [P2300502M014]	Package II 3,450 €* [P2300502M013]	Package III 3,050 €* [P2300502M024]	Package IV 2,500 €* [P2300502M023]	Package V 1,400 €* [P2300502M100]
INTRODUCTORY DAY 9 December 2019	✓	✓			✓
SYMPOSIUM 10 - 11 December 2019	✓	✓	✓	✓	
TEST DRIVE 12 December 2019	✓		✓		

* excl. VAT per person
A substitute may attend in your place at no additional cost. The fee covers full conference documentation.

YOUR BENEFITS

As participant of a CTI event you receive the Handelsblatt business access free of charge for 3 months. This offer ends automatically. Handelsblatt GmbH will send you an email with all relevant access information. For this purpose we will make your contact details available to Handelsblatt GmbH. You may object to this free-of-charge service at any time.

WOULD YOU LIKE TO RESERVE A PRELIMINARY PLACE AT THIS CONFERENCE?

Please call us at **+49 211 88743-3845** or write us: registration@car-training-institute.com

You can find our terms and conditions online at: <http://cti.euroforum.de/en/agb>

Internet-PDF

www.drivetrain-symposium.world/de
 #CTI_sym | www.facebook.com/CTISymposium
 cti-symposium

Follow us on LinkedIn.
 Join our group:




INFOLINE

+49 211 88743-3845

For further information please contact:

CUSTOMER SERVICE AND REGISTRATION



Volker Altenbeck
 +49 211 88743-3845
registration@car-training-institute.com

CONCEPT AND CONTENT



Sylvia Zenzinger
 Conference Director CTI SYMPOSIA
sylvia.zenzinger@car-training-institute.com

SPONSORING AND EXHIBITION

For further information on sponsoring and exhibition opportunities please contact:



Michael Follmann
 Sales Director
michael.follmann@car-training-institute.com

YOUR VENUE

Estrel Hotel Berlin
 Sonnenallee 225, 12057 Berlin, Germany
 Reservation: +49 30 683 122 522

In the conference hotel, there is a limited allocation of rooms available at a reduced price. Please arrange the room reservation directly with the hotel quoting the reference "CTI SYMPOSIUM". In the evening of the first day of the event the hotel cordially invites you to a welcome drink.

NEED TO UPDATE YOUR CONTACT DETAILS?

Please call us or send an email:

+49 211 88743-3333,
info@car-training-institute.com

You have the right to object to the use of your data for the purpose of direct advertising at any time. In addition, you have the right to demand information from us regarding the data about you that we have stored as well as the right to demand correction of incorrect data and the right to demand deletion in the event of inadmissible storage of data. You can contact our Data Protection Officer at

Datenschutzbeauftragter c/o Euroforum Deutschland GmbH, Toulouser Allee 27, 40211 Düsseldorf, Germany

In addition, you have the right to file a complaint with the supervisory authority.

THE WORLD'S LEADING PUBLICATIONS AND EXHIBITION FOR ADVANCED AND NEXT-GENERATION POWERTRAIN AND DRIVETRAIN TECHNOLOGIES



www.enginetechnologyinternational.com



www.ukimediaevents.com/transmission



JUNE 17, 2020
Messe Stuttgart, Germany

PICK UP YOUR FREE COPY

AT THIS YEAR'S CTI SYMPOSIUM IN GERMANY

ENGINE TECHNOLOGY INTERNATIONAL
FREE APP NOW AVAILABLE

GO TO THE APP STORE **NOW** TO DOWNLOAD THE APP FOR YOUR TABLET



DOWNLOAD NOW!

