13th International Congress and Expo | 13 – 16 May 2019, Novi, MI, USA

PLENARY SPEAKERS

Mayank Agochiya
Managing Director,
FEV Consulting, Inc., USA

Mike Duhaime
Global Head of Powertrain Electrification Technology and Architecture, FCA, USA

750 DELEGATES | 80 EXHIBITORS | 20 COUNTRIES

PANEL DISCUSSION

Truck electrification in US market: is it needed and how?

www.drivetrain-symposium.world/us

#CTI_sym | www.facebook.com/CTISymposium
Hybrid, electrified and conventional ICE powertrains are all competing on the road to the future. Transmissions will still be a key element, but how are OEMs and suppliers coping with growing drive diversity? At the 13th CTI SYMPOSIUM USA, the full range of intelligent, electrified drive solutions will be up for discussion.

Dr Hamid Vahabzadeh

EVENT OVERVIEW

13 – 14 MAY 2019 Introductory seminar
14 MAY 2019 Pre-check-in and welcome reception
15 – 16 MAY 2019 Conference program, test drives, exhibition
INTRODUCTORY SEMINAR
BASICS AND PRACTICE OF HYBRID AND ELECTRIC DRIVES, AUTOMOTIVE TRANSMISSIONS

OBJECTIVE
Newcomers and beginners will get an overview of the basics of hybrid, electric and conventional drives during the Introductory Seminar. Based on road resistance, propulsion systems and auxiliaries HEV and EV concepts will be compared, the role of launch devices, transmissions and other drivetrain elements will be defined.

AUTOMOTIVE POWERTRAIN AND DRIVETRAIN CONCEPTS
Tasks and characteristics of powertrain, drivetrain and transmissions
- Requirements on automotive propulsion systems based on vehicle characteristics
- Characteristic maps of electric 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

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

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

TRANSMISSIONS AND ALL-WHEEL-DRIVES
Transmission concepts and components
- Launch elements: clutch, e-clutch, torque converter, electric motor
- Design layouts
- Transmissions Concepts
  - Manual Transmission (MT)
  - Automated Manual Transmission (AMT)
  - Double Clutch Transmission (DCT)
  - Automatic Transmission (AT)
  - Continuously Variable Transmissions (CVT)
- Efficiency of transmissions
- Comparison of transmission concepts

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.

Drivetrain management
- Mechatronics of automated transmissions
- Shift strategy, calibration

Details about the timetable and speakers: please visit www.drivetrain-symposium.world/program

ADVISORY BOARD

John Juriga, Director of Powertrain, Hyundai-Kia America Technical Center, Inc.
Ramasunder Krishnaswami, Director Transmission and Driveline Engineering, Ford Motor Company
Teizo Kuwabara, President, JATCO USA, Inc.
Joseph Lemieux, Global Chief Engineer, Advanced Electrified Architectures, Fiat Chrysler Automobiles US LLC
Isabelle McKenzie, Vice President Global Engineering, BorgWarner Transmission Systems Inc.
Edward Perosky, Vice President for Powertrain Engineering, Aisin Technical Center of America
David Petrovski, Principal Analyst, NA Powertrain Forecasting, IHS Automotive
Shaun Mepham, Chief Engineer Electric Vehicles – Bus, AxleTech International

IN COOPERATION WITH

John Zalewski, Product Manager – eDrives, Magna Powertrain of America, Inc.
Prof. Dr Ferit Küçükay, Director, Institute of Automotive Engineering, Technische Universität Braunschweig
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<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tr>
<td>7.45</td>
<td>Check-in and welcome coffee in the CTI SYMPOSIUM EXPO</td>
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<td>8.40</td>
<td>Welcome address by CTI and the chairman</td>
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<td>9.00</td>
<td><strong>The Ford MHT:</strong> reinventing what is possible in a hybrid vehicle...</td>
<td>Dave Filipe, VP Global Powertrain Engineering, Ford Motor Company, USA</td>
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<td>9.20</td>
<td>The electric truck: why?</td>
<td>Alexander Edwards, President, Strategic Vision, USA</td>
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<td>9.40</td>
<td>Electrification transformation</td>
<td>Steven A. Tarnowsky, Director, Electric Vehicle &amp; Charging Infrastructure, General Motors, USA</td>
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<td>10.00</td>
<td>Topic to be announced</td>
<td>Mike Duhaime, Global Head of Powertrain Electrification Technology and Architecture, Fiat Chrysler Automobiles, USA</td>
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<td>10.20</td>
<td>Q &amp; A</td>
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<td>Coffee break in the CTI SYMPOSIUM EXPO</td>
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<td>11.30</td>
<td><strong>PANEL DISCUSSION</strong></td>
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<td>Truck electrification in US market: is it needed and how?</td>
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<td>The audience is invited to pose questions to the panel.</td>
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<td><strong>CHAIRMAN OF THE PANEL DISCUSSION:</strong></td>
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<td>Larry Nitz, Executive Chief Engineer, Electrified Propulsion, General Motors, USA</td>
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<td><strong>PANELISTS:</strong></td>
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<td>Mike Duhaime</td>
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<td>Steven A. Tarnowsky</td>
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<td>Gary Horvat, Vice President, eMobility, Navistar, USA</td>
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<td>Alexander Edwards</td>
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<td>Coffee break in the CTI SYMPOSIUM EXPO</td>
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<td><strong>PARALLEL SESSIONS</strong></td>
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<td>5.15</td>
<td>8(H)P 4th generation – development of a future-proof modular transmission kit</td>
<td>Dr Stefan Kilian, Project Manager Product Line Automatic Transmissions, ZF Friedrichshafen AG, Germany</td>
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<td>5.45</td>
<td><strong>END OF THE LECTURE PROGRAM, DAY ONE</strong></td>
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<td>6.00</td>
<td>Departure to the CTI NETWORKING NIGHT</td>
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Coordinated torque control strategy for EV and powersplit DHT's during shifts and mode transitions
Dr Darrell Robinette, Assistant Professor, Mechanical Engineering-Engineering Mechanics, Michigan Technological University, USA

Variable spring absorber – system integration in prototype vehicle and NVH performance results
Florian Schneider, Senior Engineer, Advanced Product Engineering, BorgWarner Drivetrain Engineering, Germany

Virtual calibration of shift strategy
Björn Wultsch, BSc, Technical Expert Driving Strategy Calibration, Transmission, Hybrid and E-vehicle calibration, AVL List GmbH, Austria

Fuel economy and application results of a new torque converter CVT in a mid-range SUV
Gert-Jan Vogelaar, Strategic Marketing Director, Punch Powertrain N.V., Belgium

Torque sensors for high volume production applications
Julius Beck, Engineering Manager MST, Europe, Methode Sensor Technologies, Methode Electronics International GmbH, Germany

Coating technology as a design element for friction reduction and wear protection
Dr Mahdi Amiriyari, Surface Engineer/Coating Expert, Surface Technology, Schaeffler Group USA

Development and calibration of a parametric loss model for electrified drive units
Goro Tamai, GM Technical Fellow, Trans/ Electrification, Global Product Group, General Motors, USA

CVT, extended possibilities for powertrain electrification
Gert van Spijk, Manager Transmission Development, Bosch Transmission Technology, The Netherlands

Novel control strategy for change of mind shifts in DHTs
Muammer Yolga, Manager, Transmission Software & System, AVL List GmbH, Austria

Advanced friction materials for next generation drivetrains
Dr Feng Dong, Technical Specialist, Advanced Friction Materials, BorgWarner Transmission Systems LLC, USA

Range vs cost: an intelligent approach to electric vehicle powertrain architecture selection
Al Jean-Francois, Transmission Engineer, Drive System Design, USA

Experimental investigation of chain forces in a CVT test stand
Dr Craig Reynolds, Advanced Component Engineer, Advanced Components and Subsystems, General Motors, USA

Evaluation of trends in hydraulic controls of automatic transmissions
Jeff Waterstredt, Senior Technical Specialist, Transmission Systems – Hydraulic Controls, BorgWarner, USA

Thermal-hydrodynamic characteristics of wet clutch plates with linear grooves
Dr Moshen Behzad, Senior Advanced Simulation Engineer, Transmission Systems, BorgWarner, USA

Advanced methods for e-drive development
Andreas Volk, Manager Simulation & Testing, PTE/DTDV, AVL List GmbH, Austria

Conceptual design and optimization of PHEV all-wheel drives
Axel Sturm, Research Assistant, Institute of Automotive Engineering, Technische Universität Braunschweig, Germany

The real-world impact of RDE legislation – is it enough, fast enough? What is the impact for European & North American markets?
James Hobday, Business Development Director, Emissions Analytics, UK

Actuation synthesis for customized, high efficient clutch actuation systems
André Uhle, Team Manager, Actuation System Development, Transmission and Hybrid Driveline, IAV GmbH, Germany

Dedicated low viscosity lubricants for electrified transmission concepts
Torsten Murr, Global Technology Manager, Shell Global Solutions, Germany

AWD battery electric performance SUV with dual e-motor control method providing optimal efficiency
David Crecelius, Director Product Engineer – Electrification, AAM, USA

Energy-efficient cooperative adaptive cruise control
Dr Stephen Jones, Principal Product Manager Systems, System Eng. & Powertrain Electrification, AVL List GmbH, Austria

Manual DCT for UTVs
Nicholas Caruso, Project Engineer, Driveline and Transmission, Ricardo Inc., USA

Application of a new pump technology in positive displacement machines
Klemen Petrić, Product Manager, R&D – BU Electronic and Drives – ePumps, Kolektor Group, Slovenia

Vehicle dynamics improvements enabled by 48 V rear axle
Felix Tigges, Research Assistant, Institute of Automotive Engineering, Technische Universität Braunschweig, Germany
CTI NETWORKING NIGHT @ HENRY FORD MUSEUM

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.

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GERMANY & CHINA

9 – 12 December 2019, Berlin, Germany
23 – 25 September 2019, Shanghai, China

www.drivetrain-symposium.world/callforpapers
CTI TEST DRIVE

TECHNOLOGY IN REAL LIFE

During 15 AND 16 MAY 2019 you have the opportunity to experience the latest transmission and drive technology in series and demonstrator cars. Project engineers will be introducing the special characteristics and advantages of the technologies shown and answer your personal questions.

SHOWCASE YOUR LATEST TECHNOLOGY

Do you have a demonstrator car to show your work in practice? We strongly encourage you, your colleagues, managers, marketing to participate in the CTI TEST DRIVE.

GET IN TOUCH

Anna Hofmann
Project Assistant CTI SYMPOSIA
+49 (0)211.88743-3452
anna.hofmann@car-training-institute.com

Driving slots are limited. Information about available vehicles will be updated online.
8.00 Opening of the CTI SYMPOSIUM EXPO

8.30 Welcome address by the chairman

8.40 The e-mobility eco-system as the differentiator

Stephan A. Tarnutzer, President, AVL Powertrain Engineering, USA

9.00 New mobility concepts and its impact on transmissions

Mayank Agochiya, Managing Director, FEV Consulting, Inc., USA

9.20 Jatco’s approach to developing electric powertrains

Eiji Ogawa, Vice President, Corporate Business Office, Jatco Ltd, Japan

9.40 The evolution of commercial vehicle drivetrains in an increasingly connected and electrified world

Prof. Giorgio Rizzoni, Director, Center for Automotive Research, The Ohio State University, USA

10.00 Q & A

10.20 Coffee break in the CTI SYMPOSIUM EXPO

11.00 PARALLEL SESSIONS

12.00 Lunch break in the CTI SYMPOSIUM EXPO

11.30 High performance hybrid 8-speed transverse DCT

Howard Marshall, Chief Programme Engineer, Driveline & Transmission, Ricardo, UK

12.00 LUNCH BREAK IN THE CTI SYMPOSIUM EXPO

13.00 5,500 lbs in 4 seconds – performance hybridization for full-size pickup trucks

Erik Schneider, Senior Vice President Transmission & Hybrid Driveline, IAV GmbH, Germany

13.30 H-RAM: hybrid rear axle module An innovative hybrid differential for P3 and P4 applications

Sergio De Santis, Project Engineer, Dana Incorporated, Italy

14.00 COFFEE BREAK IN THE CTI SYMPOSIUM EXPO

14.30 Design, build and test of a dedicated hybrid magnetic transmission

Dr Stuart Calverley, Chief Engineer, Magnomatics Limited, UK

14.30 Efficient & compact electric propulsion systems enabled by integrated electric controllable clutches

Carl Beiser, Technical Business Manager, Engineering, Means Industries, USA

15.00 SUMMARY, CLOSING CTI SYMPOSIUM USA

Digital takes the driver’s seat

Mamatha Chamarthi, Chief Information Officer, Fiat Chrysler Automobiles (FCA), USA

15.30 Q & A

16.00 Summary by the chairman

Closing of the 13th CTI SYMPOSIUM USA
1.00
Approach for eAxle development with focus on a global usage and full portfolio coverage
Martin Ackerl, Lead Engineer System Development On-Road, System Engineering, AVL Commercial Driveline & Tractor Engineering GmbH, Austria

1.30
New developments for electrified powertrains for heavy duty commercial vehicles
Rico Resch, Project Manager, Transmission and Hybrid Driveline, IAV GmbH, Germany

2.00
Marketable electric drivetrain concepts for small tractors
Dr Stephan Hammes, Skill Team Leader Powertrain Integration, AVL Tractor Engineering Germany GmbH, Germany

2.30
Electric drive development for a parcel delivery van
Joris Bronckaers, Product Architect, Punch Powertrain N.V., Belgium

3.15
The role of fuel cells in the technology landscape
Luke Rippelmeyer, Senior Engineer, Toyota Motor North America, USA

3.45
Power split hybrid transmission for commercial vehicles
Matthew Thorington, Systems Engineer Principal, Robert Bosch LLC, USA

4.15
Deep groove ball bearing for EV rotor support
Mike Johns, Consultant, Advanced Engineering, JTEKT, USA

4.45
Variable flux technology can open the door of e-motor performance design
Taichi Kitamura, Supervisor-Engineering, Development Headquarters, Exedy Corporation, Japan

5.00
SUMMARY AND CLOSING OF THE 13TH CTI SYMPOSIUM USA
CTI SYMPOSIUM EXPO – THE INDUSTRY’S MUST-ATTEND US EVENT

YOU HAVE PRODUCTS THAT ARE READY TO MARKET – WE WILL HELP YOU TAKE THE NEXT STEPS.

Position your applications and solutions as a leader in drive technology and build new connections within the CTI drivetrain community. Apply now – spaces are selling out quickly.

750 VISITORS IN THE EXPO | 80 EXHIBITORS

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We will bring you together with authoritative industry experts who come to the show not only for pure business reasons but who also want to source inspiration, discover new products and benefit from the networking opportunities available.

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Together with our customers, Schaeffler is shaping the mobility for tomorrow – today. As a global technology partner to the automotive industry, Schaeffler is creating new paths to develop ideas, and thinking beyond barriers to innovate technologies and systems for the entire vehicle drivetrain, as well as chassis systems and accessory components. High-precision products from Schaeffler help lower fuel consumption and emissions without sacrificing, safety, performance or driving comfort. The company’s expansive product portfolio encompasses energy-efficient solutions for conventional drivetrains with internal combustion engines, innovative products for hybrids and cutting-edge components for electric vehicles. With generated sales of approximately [EUR 14.2 billion] in 2018, 92,500 employees and about 170 locations in over 50 countries, Schaeffler is one of the world’s largest family-owned companies. From its worldwide network of manufacturing locations, research and development facilities, and sales companies, Schaeffler is able to serve the vital North American automotive market.

Staying true to its motto “In the Region, For the Region,” Schaeffler has a strong North American presence with its regional headquarters in Fort Mill, S.C. and manufacturing facilities located in South Carolina, Missouri, Ohio, Canada and Mexico. It also operates a 78,000-sq.-ft. Automotive Technical Center in Troy, Mich., where more than 250 engineers and technicians drive product development using state-of-the-art testing equipment, computational tools and CAD systems.

Schaeffler | www.schaeffler.us

ZF

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

ZF Friedrichshafen | www.zf.com
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Allegheny Performance Plastics is globally recognized as a preeminent supplier of exotic and high performance thermoplastics components. We provide high value engineering solutions to improve wear resistance, lower friction, functional part performance, and enhanced thermal capabilities which meet the needs of customers in the automotive, aerospace, and general industrial markets.


GFM Radial Forging technology provides many technical advantages. Material improvements, weight savings, greater material utilization, hollow part processing and tight tolerances are possible in a hot, semi-hot or cold forging process. The GFM SKK model Radial Forging Machine is well suited for many EV, automotive transmission and driveline applications.

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As a premier supplier to the automotive industry, A.J. Rose is well known for perfection in medium- to high-volume production of precision-engineered stampings and flowformed parts. Our dedication is to product and process integrity. Our focus is on our customers’ success. For more information on A.J. Rose, our capabilities and how we can support your success, visit us at www.ajrose.com or call us at 440-934-7700.

A.J. Rose Manufacturing Company | www.ajrose.com

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
AVL is the world's largest independent company for development, simulation and testing of powertrains (hybrid, combustion engines, transmission, electric drive, batteries and software) for passenger cars, trucks and large engines. The company offers combined solutions of powertrain engineering, simulation software, and testing and instrumentation systems.

AVL North America | www.avl.com

Barnes Engineered Components (EC) is a world class manufacturer, supplier and distributor to key markets including: Automotive, Medical, Aerospace, HVAC/Refrigeration, High Tech/Telecom, HDT, Construction/Mining, Energy & General Industrial. EC spans 20+ global manufacturing and non-manufacturing strategic locations, with approximately 1,500 employees dedicated to 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.

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BorgWarner Inc. (NYSE: BWA) is a global product leader in clean and efficient technology solutions for combustion, hybrid and electric vehicles. With manufacturing and technical facilities in 66 locations in 18 countries, the company employs approximately 29,000 worldwide. For more information, please visit borgwarner.com

BorgWarner Inc. | www.borgwarner.com

The Bosch Group is a leading global supplier of technology and services. It is divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT company, Bosch offers innovative solutions for smart homes, smart cities, connected mobility, and connected manufacturing. Bosch strategic objective is to deliver innovations for a connected life.

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

Bourns designs, develops and manufactures an extensive range of innovative and cost-effective automotive position, speed and torque sensors in its world-class facilities positioned throughout the globe. The company’s research and development combined with its close collaboration with customers ensures Bourns customized products meet the strict requirements set for the automotive industry.

Bourns Sensors GmbH | www.bourns.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 know-how 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

**Brose** is one of the top 40 automotive suppliers in the world supplying electric motors and mechatronic systems for driveline and powertrain, focusing on excellence in customer support, product quality and manufacturing. Brose’s powertrain actuators are integrated in stop-start, disconnect systems, and torque vectoring using the modular construction kit approach.

Brose North America, Inc. | www.brosen.com

**Bühler Motor** is an independent, globally-active company focused on the development and production of mechatronic drive solutions and electric pumps. A leading supplier in the Automotive industry, with more than 1,750 employees at eleven locations worldwide, we are committed to offering world-class products to help to improve the drivetrain efficiency and performance.

Bühler Motor, Inc. | www.buehlermotor.com

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

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CCTY USA BEARING COMPANY | www.cctybearing.com

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- Experience in changing manufacturing processes.
- Intelligent solutions achieved by our development capability with state of the art equipment.

Technologies:
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- Fine blanking parts
- Stampings
- Assemblies

Plants: Germany, Czech Republic, USA, China

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

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ERNST Metal Technologies LLC | www.ernst.de

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Felss Systems develops and builds machines at two locations in Germany. As experts in lightweight design, we realize optimal solutions and processes for our customers – from product development to the machine. With our locations in Koenigsbach-Stein and Nesselwang, we cover all technology segments of the Felss Group in mechanical engineering.

FELSS GROUP GMBH | www.felss.com

For more than 40 years, FEV has been a global leader in the development of mobility solutions for the transportation industry. Our team of experts is passionate about advancing this space through the design, development, integration and validation of vehicle and powertrain technologies.

We specialize in designing, building and benchmarking the latest gasoline, diesel and alternative-fuel powertrains, and have positioned ourselves as a leader within the connected vehicle space. We’ve expanded our engineering capabilities to cover the entire vehicle and to meet future challenges, such as cybersecurity, autonomous driving and hybridization.

FEV’s global footprint spans four continents and includes more than 42 technical facilities, 200 engine and powertrain test cells, and 5,800 employees. Partner with FEV to create an intelligent, more efficient future mobility solution.

FEV North America, Inc. | www.fev.com

GGB helps create a world of motion with minimal frictional loss through plain bearing and surface engineering technologies. With global R&D, testing and production facilities, GGB partners with transmission customers worldwide on customized tribological design solutions that are efficient and environmentally sustainable.

GGB Bearing Technology | www.ggbearings.com

Established as part of the Söhner group in 1997 – GRW Technologies Inc. is the main engineering and manufacturing facility for the NAFTA region. We’ve been able to establish ourselves as a strong partner of the major Tier 1 suppliers for the automotive industry by using our high precision stamping, complex molding, and assembly processes. Anchored in the company’s core values is its commitment to the environment, quality and energy management.


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
HORIBA, the long-standing global leader in motor exhaust gas analysis, is the first choice for chassis, powertrain, transmission, and drive-line systems. In addition to providing the whole test system (inclusive of automation, control, and data management) HORIBA also offers dynamometer-based testing on a contract basis for a variety of powertrain and driveline components and systems, including E-Motors/E-Drives. Test applications now include, characterization, efficiency, endurance, performance and durability. The laboratory has recently added complete/simulated 4 Wheel Drive/All Wheel Drive Full Vehicle testing.

Horiba | horiba.com

Hugo Benzing a world leading producer of retaining elements is a Tier-1 supplier for almost every reputable automotive manufacturer. On more than 20,000 square meters in Germany and 4000 square meters in the USA we employ about 800 people. Our product range consists of retainers, wire forms, precision stampings as well as complex assemblies for torque converters and dual clutch transmissions. A vast product portfolio of more than 26,000 different parts supports the needs of our customers, in multiple industries and countless applications.

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

Hutchinson designs and produces customized materials and connected solutions to respond to the needs of its global customers, on land, in the air and at sea. A global leader in vibration control, fluid management and sealing system technologies, our Group stands out with a multiple market offering spanning multiple areas of expertise and delivering synergies and value-added. Hutchinson reported revenues of €4.115 billion in 2017 and has 43,049 employees in 24 countries. Our ambition is to contribute to safer, more comfortable and more responsible mobility for the future.

Hutchinson | hutchinson.com

IMA Automation North America designs and builds turn-key assembly and test solutions for the transmission clutch, electronics and other select industries. Our engineered solutions support your projects at every stage of the product life cycle – from concept to commercialization.

IMA Automation has the experience and knowledge to help you achieve your production goals.

IMA Automation North America | ima.it/automation/

Intertek is more than a testing and certification laboratory – we are a partner, helping our clients to meet the necessary requirements for any regulatory environment or global market. Throughout our network of 1000+ accredited laboratories, Intertek offers a variety of automotive, electric vehicle and Automated/Connected vehicle services including assurance, testing, inspection, certification and consulting. Intertek performs testing around the world for most major OEMs and Tier Suppliers to ensure they meet all applicable standards and can get to market quickly and with confidence. We help our customers to meet end users’ expectations for safety, sustainability, performance, integrity and desirability.

Intertek Group plc | www.intertek.com
Jatco Ltd. is the world’s No. 1 Continuously Variable Transmission (CVT) manufacturer, with research and development facilities in Japan, United States, France, and Korea.

Manufacturing plants are located in Japan, Mexico, China, and Thailand, producing over 5 million CVT and conventional automatic transmissions per year.

We continue to develop advanced products which reflect the needs of our customers.

JATCO USA, Inc. | www.jatco.co.jp

Klingelnberg | www.klingelnberg.com

Kolektor is a development and production partner for various Motor Components and Subsystems and due to innovative technology offers key solutions for Motors, Brakes, Gear boxes and Electronics.

Through production locations on the European, Asian and the U.S. market, Kolektor utilizes its full technological and developmental potentials to ensure customer satisfaction.

Kolektor group, d.o.o. | www.kolektor.com

Konzelmann GmbH, we tailor each solution to your application environment to optimize performance and cost effectiveness of the overall system. We have the ability to design, prototype, test, manufacture and ship worldwide tribological parts such as bushings, axial/radial bearings, thrust washers, seal rings, gears, guiding components, and more.

Konzelmann GmbH | www.konzelmann.com

KOSTAL is a world leader in transmission connector applications. Utilizing extensive experience, KOSTAL’s connection solutions are able to meet the severe performance requirements of transmissions. KOSTAL provides its customers with comprehensive expertise for contact and housing systems from design to production.

Kostal Group | www.kostal.com

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.marzocchipompe.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 a turnover of 262 million euros, is the largest electronics manufacturing service provider (EMS) with Austrian roots. In 2011, Melecs EWS expanded and opened a branch in Györ, Hungary. In 2015, an electronics factory was acquired in Lenzing. In 2016, a production site in Wuxi/China was built to serve global customers. The market entry into North America took place in 2018 with the opening of a new sales office in Auburn Hills, Michigan. In addition, Melecs EWS became 70% majority shareholder of Prettl Electronics Queretaro, S.A. de C.V at the end of 2018 and takes over the entrepreneurial leadership of this company in Mexico.

Melecs Elektronikwerk Siegendorf | 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

MFC is an award winning innovative industry leader in flowforming/coldforming and post machining of powertrain products for the automotive and off-road industries. MFC’s unique processes in Ohio and Michigan provide weight reduction, complex cross sections, component consolidation and cost saving opportunities that have been advancing the global powertrain industry for more than 65 years.

MFC Corporation | www.mfcnetform.com

Michigan Spring and Stamping has been a partner with OEM’s for 70-years, specializing in Powertrain and Transmission applications. Our Cradle-To-Grave philosophy focuses investment in Design / FEA / Prototype / Testing-Verification, providing a globally competitive manufacturing process that deploys high-volume automated efficiency with -0- defect delivery. Specific competency in the components of: spring pack assembly; detent assembly; technical springs, precision stampings and wire forms. Now, with (3) plants serving our global customer partners: Muskegon MI; El Paso TX, Wuxi China.

Michigan Spring & Stamping, LLC | www.msands.com
Minnesota Rubber and Plastics leverages experience across a broad range of high-performance elastomers, fluoroelastomers and thermoplastics to provide integrated multi-material components that are manufactured globally. Precision molding, bond quality and chemical compatibility are key product features. MR&P also offers on-site compounding, design and analysis capabilities for our customers.

Minnesota Rubber and Plastic | www.mnrubber.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. ESync is an optimized, compact synchronization system which requires significantly less space and weighs 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 (US) Inc. | www.oerlikon.com/metco

PatSnap is the leading provider of Intellectual Property Analytics, for analysing tech trends, driving innovation, market planning, competitor intelligence and maximising return on IP assets. With a database of over 134 million patents, augmented by economic, legal and company data, PatSnap is used by R&D, business and IP professionals in the automotive industry worldwide.

PatSnap | www.patsnap.com

Precision Resource is a recognized leader in the development of fineblanking 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 Inc. | www.precisionresource.com
Punch Powertrain is an independent Tier1 developer and manufacturer of CVTs, DCTs, electric and hybrid powertrains for passenger cars. Optimal performance, minimal fuel consumption, low emissions and driving pleasure are key topics in development.

Punch Powertrain nv | www.punchpowertrain.com

Ricardo is a world class independent engineering services company with niche manufacturing capability. Extensive experience of designing and developing an extremely wide range of driveline and transmission systems on a global basis, from cost-optimized MT’s to advanced DCT’s and AT’s and on to high performance e-axles and hybrid transmissions.

Ricardo | www.ricardo.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 14001and AS9100.

Rotor Clip Company | www.rotorclip.com

Saint-Gobain Performance Plastics L+S GmbH specializes in design, testing and manufacturing of seal rings, thrust washers and radial plain bearings. In line with the global trends in automotive and transmissions developments, our innovative solutions are designed to increase efficiency by reducing leakage, drag losses and component wear. In addition these engineered components can be used where their compact installation, low mass and easy assembly allow their high performance to be combined with economic efficiency.

sealsmarketing@saint-gobain.com

Saint-Gobain Performance Plastics L+S GmbH | www.seals.saint-gobain.com
Together with our customers, **Schaeffler** is shaping the mobility for tomorrow – today.

As a global technology partner to the automotive industry, Schaeffler is creating new paths to develop ideas, and thinking beyond barriers to innovate technologies and systems for the entire vehicle drivetrain, as well as chassis systems and accessory components.

High-precision products from Schaeffler help lower fuel consumption and emissions without sacrificing, safety, performance or driving comfort. The company’s expansive product portfolio encompasses energy-efficient solutions for conventional drivetrains with internal combustion engines, innovative products for hybrids and cutting-edge components for electric vehicles.

With generated sales of approximately [EUR 14.2 billion] in 2018, 92,500 employees and about 170 locations in over 50 countries, Schaeffler is one of the world’s largest family-owned companies. From its worldwide network of manufacturing locations, research and development facilities, and sales companies, Schaeffler is able to serve the vital North American automotive market.

Staying true to its motto “In the Region, For the Region,” Schaeffler has a strong North American presence with its regional headquarters in Fort Mill, S.C. and manufacturing facilities located in South Carolina, Missouri, Ohio, Canada and Mexico. It also operates a 78,000-sq.-ft. Automotive Technical Center in Troy, Mich., where more than 250 engineers and technicians drive product development using state-of-the-art testing equipment, computational tools and CAD systems.

**Schaeffler** | [www.schaeffler.us](http://www.schaeffler.us)

**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 GmbH | [www.scherdel.com](http://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](http://www.seeger-orbis.de)

**SHW Automotive** is a global leader in the design and manufacturing of Engine components and Engine /Transmission oil pumps. SHW provides products that make a substantial contribution to reducing fuel consumption and, consequently, to lowering CO₂ emissions.

SHW Pumps & Engine Components Inc. | [www.en.shw.de](http://www.en.shw.de)
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

Solvay manufactures semi-aromatic polyamides for solenoids, shift levers, clutch cylinders, housings, and shift forks; aromatic ultra polymers for seal rings, bearings, cages, bushings, and balls; fluororelastomers for O-rings, bonded pistons, and oil seals; fluorinated fluids for lubrication, bearing grease, and additives; sulfone polymers for pump pistons; and customized films for bushings and bearings.

Solvay | www.solvay.com

Swoboda is a worldwide leader in the technologically complex area of molding elements (high-precision metal-plastic composite parts) for the automotive industry that form the interface between mechanical and electronic components. Swoboda develops and manufactures components and assemblies in Germany, Czech Republic, United States, China, Romania, and Mexico.

Swoboda Inc. | www.swoboda.de

Teamtechnik is an internationally leading company for innovative production technologies. Over 1000 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 Maschinen und Anlagen GmbH, Germany | www.teamtechnik.com

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THORS, LLC – eLearning Solutions | www.thors.com

TOYO Corporation is a Japanese technology company headquartered in Japan. Since its founding in 1953, TOYO has become the leading distributor of advanced measurement instruments and systems in Japan. TOYO also engages in original product designs and develops advanced solutions for many of markets that its serves including automotive, sustainable energy, and cyber security industries.

Toyo Corporation | https://toyotechus.com
Torque transfer solutions from **TREMEC** are found in products ranging from supercars and high-performance sports cars to severe duty, vocational and commercial vehicles worldwide. The portfolio of products includes manual transmissions, dual clutch transmissions, EV & HEV drivetrain solutions, gears, shafts, clutches, friction materials, synchronizers, mechatronic systems, transmission control units, and control software.

**TREMEC** | www.tremec.com

**Victrex**, the innovative world leader in high-performance PAEK polymer solutions, supports engineers in developing cost-effective, durable transmission components enhancing fuel efficiency and driving comfort. For more than three decades, the industry has specified VICTREX™ PEEK-based solutions for demanding powertrain applications. VICTREX™ Gear Solutions enable enhanced efficiency and reduced NVH. In EV/HEVs, APTIV™ films deliver cost-efficient and reliable electrical insulation solutions with higher energy density.

**Victrex USA, Inc.** | www.victrex.com

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

**Yinlun** is a World Class developer and supplier of automotive and commercial vehicle thermal and exhaust after-treatment components and systems. Headquartered in China, Yinlun’s global footprint includes North America and Europe. We serve World Class customers with World Class service and products.

**Yinlun TDI, LLC** | www.yinluntdi.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
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**PRICE**

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<th>Early bird price until 14 April 2019</th>
<th>Regular price from 15 April 2019</th>
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