International Conference on Gears 2019
FZG, Garching/Munich, Germany

Key topics:
- Optimization of gear design and geometry
- System-modelling, -simulation and -calculation of gears
- New calculation methods for load carrying capacity, strength and more efficiency
- NVH behavior and noise reduction of transmission systems
- Condition monitoring and damage detection
- Lubrication and TEHL

Associated organisations:

- American Gear Manufacturers, USA
- ARTEMA, France
- ASSIO, Italy
- BAPT
- British Gear Association
- Chinese Mechanical Engineering Society
- Canadian Society for Mechanical Engineering
- Drive Technology Research Association, Germany
- Gear Research Institute, USA
- Scientific Society of Mechanical Engineers, Hungary
- Institution of Mechanical Engineers, United Kingdom
- Japan Society of Mechanical Engineers
- Koninklijk Instituut van Ingenieurs, The Netherlands
- The Korean Society of Mechanical Engineers, Korea
- Romanian Association of Mechanical Transmissions
- WiGeP, Germany

Visit parallel conferences free of charge

Gear Production 2019
www.vdi-wissensforum.de/gearproduction

High Performance Plastic Gears 2019
www.vdi-wissensforum.de/plasticgears

An event organized by VDI Wissensforum
www.vdi-gears.eu
## Program overview

### International Conference on Gears and parallel conferences

### 1st Conference day

**Wednesday, September 18th, 2019**

### Plenary session

**09:30** Common welcome and opening of the
- International Conference on Gears 2019
- International Conference on High Performance Plastic Gears 2019
- International Conference on Gear Production 2019

**Prof. Dr.-Ing. Karsten Stahl**, FZG, Technische Universität München (TUM), Garching, Germany

**09:45** Welcome address by

**Matthew E. Croson**, President, American Gear Manufacturers Association (AGMA), Alexandria, USA &

**Dr.-Ing. Arbogast M. Grunau**, FVA, Frankfurt a. M. & Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany

**10:00** Keynote session: From system to atom – digital twins on all scales?

- Looking into small scale drives driving technology
  **Dr.-Ing. Arbogast M. Grunau**, FVA, Frankfurt a. M. & Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany

- Challenges in modeling multi-scale physics in gear contact problems
  **Prof. Ahmet Kahraman**, The Ohio State University, Columbus, USA

- Atomistic simulations in tribology: potentials, perspectives and limitations
  **Dr. Gianpietro Moras**, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany

**11:45** Time for a working lunch – meet & greet at the exhibition area, poster presentation area and GearLab

### Parallel sessions

#### International Conference on Gears

<table>
<thead>
<tr>
<th>Lecture Room A</th>
<th>Lecture Room B</th>
<th>Lecture Room C</th>
<th>Lecture Room D</th>
<th>Lecture Room E</th>
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</thead>
<tbody>
<tr>
<td>13:15 Flank strength</td>
<td>NVH</td>
<td>Efficiency</td>
<td>Loaded tooth contact analysis</td>
<td>Tooth flank load capacity</td>
</tr>
<tr>
<td>15:15 Coffee break – meet &amp; greet at the exhibition area, poster presentation area and GearLab</td>
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<tr>
<td>16:00 Tooth root strength</td>
<td>Condition monitoring</td>
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<tr>
<td>18:15 Organized bus transfer to the evening reception</td>
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</table>

#### Parallel conferences - Free of charge -

- **International Conference on Plastic Gears**
  www.vdi-wissensforum.de/plasticgears

- **International Conference on Gear Production**
  www.vdi-wissensforum.de/gearproduction

- **International Conference on Industry 4.0**
  www.vdi-wissensforum.de/industry4.0

- **Measurement technology**
  www.vdi-wissensforum.de/measurementtechnology

### 1st Conference day summary

- **13:15** Flank strength
  - NVH
  - Efficiency
  - Loaded tooth contact analysis
  - Condition monitoring
  - Tooth flank load capacity

- **15:15** Coffee break – meet & greet at the exhibition area, poster presentation area and GearLab

- **16:00** Tooth root strength
- **18:15** Organized bus transfer to the evening reception

- **19:00** Evening reception at Paulaner am Nockherberg
  **Dinner Speech:** **Dr.-Ing. E. h. Manfred Wittenstein**, Chairman of the Supervisory Board, WITTENSTEIN SE Igersheim, Germany
## 2nd Conference day
Thursday, September 19th, 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Lecture Room A</th>
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<th>Lecture Room C</th>
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<th>Lecture Room E</th>
</tr>
</thead>
<tbody>
<tr>
<td>08:30</td>
<td>Strength</td>
<td>Transmission error</td>
<td>Bevel and hypoid design and manufacturing</td>
<td>Strength evaluation</td>
<td>Gear soft machining</td>
</tr>
<tr>
<td>10:00</td>
<td>Coffee break – meet &amp; greet at the exhibition area, poster presentation area and GearLab</td>
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<tr>
<td>10:45</td>
<td>Geometry, quality</td>
<td>Dynamic</td>
<td>Bevel and hypoid endurance</td>
<td>Strength evaluation</td>
<td>Gear skiving</td>
</tr>
<tr>
<td>12:45</td>
<td>Time for a working lunch – meet &amp; greet at the exhibition area, poster presentation area and GearLab</td>
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<tr>
<td>14:15</td>
<td>Lubrication, EHL</td>
<td>Worm and crossed axis helical gears</td>
<td>Bevel and hypoid transmission error</td>
<td>NVH/condition monitoring</td>
<td>Bevel gear production</td>
</tr>
<tr>
<td>16:30</td>
<td>Lubrication, flank strength</td>
<td>Calculation/standard</td>
<td>Dynamics and planetary gears</td>
<td>Application</td>
<td>Gear honing &amp; grinding</td>
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<tr>
<td>18:30</td>
<td>Evening reception at the conference venue</td>
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### Dinner Speech: Prof. Dr. Changle Xiang, Professor, Vice President, Beijing Institute of Technology, Director, National Key Lab of Vehicle Transmission, China

## 3rd Conference day
Friday, September 20th, 2019

<table>
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<tr>
<th>Time</th>
<th>Lecture Room A</th>
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<tbody>
<tr>
<td>08:30</td>
<td>Elastic gear deformation</td>
<td>Application</td>
<td>Gear material</td>
<td>Tooth profile geometry</td>
<td>Materials processing &amp; heat treatment</td>
</tr>
<tr>
<td>10:30</td>
<td>Coffee break – meet &amp; greet at the exhibition area, poster presentation area and GearLab</td>
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<tr>
<td>11:15</td>
<td>Profile modifications</td>
<td>Diagnosis, damage detection</td>
<td>Multi body systems, control</td>
<td>Special applications</td>
<td>Manufacturing related product properties</td>
</tr>
<tr>
<td>13:15</td>
<td>Closing remarks</td>
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<tr>
<td>13:30</td>
<td>Awarding of the best presentation for junior engineers in the main hall by the conference president Prof. Dr.-Ing. Karsten Stahl + Lunchtime snack</td>
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<tr>
<td>15:00</td>
<td>End of the conferences</td>
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**Gears 2019**

**Europe invites the world!**
1st Conference day
Wednesday, September 18th, 2019

08:30 Registration

Plenary lectures

09:30 Common welcome and opening by the president of the International Conference on Gears 2019
Prof. Dr.-Ing. Karsten Stahl, FZG, Technische Universität München (TUM), Garching, Germany

09:45 Welcome address by
Matthew E. Croson, President, American Gear Manufacturers Association (AGMA), Alexandria, USA &
Dr.-Ing. Arbogast M. Grunau, FVA, Frankfurt a.M. & Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany

10:00 Keynote session: From system to atom – digital twins on all scales?
Moderation: Prof. Dr.-Ing. Karsten Stahl, FZG, Technische Universität München (TUM), Garching, Germany

Looking into small scale drives driving technology
Dr.-Ing. Arbogast M. Grunau, President of the Managing Board, Research Association for Drive Technology (FVA), Frankfurt a. M., Principal Expert Bearings, Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany

Challenges in modeling multi-scale physics in gear contact problems
Prof. Ahmet Kahraman, Winbiger Professor and Director, Gear and Power Transmission Research Laboratory and Pratt & Whitney Center of Excellence in Gearbox Technology, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, USA

Atomistic simulations in tribology: potentials, perspectives and limitations
Dr. Gianpietro Moras, Deputy Group Leader, Multiscale Modelling and Tribosimulation, Prof. Dr. rer. nat. Michael Moseler, Group Leader, Multiscale Modelling and Tribosimulation, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany

11:45 Time for a working lunch – meet & greet at the exhibition area, poster presentation area and GearLab

Every participant gets a voice – you will be involved by digital polls during the speeches.
13:15 Influence of gear surface roughness on pitting and micropitting life
- In situ measurement of the gear flank in FZG pitting test
- Comparison of gears with super finished and ground surface
  Edwin Bergstedt, M. Sc., Ph. D. student, Department of Machine Design, KTH Royal Institute of Technology, Stockholm, Sweden
  Jiachun Lin, Ph. D., Associate Professor, Department of Instrument Science and Technology, Beijing University of Technology, China
  Per Lindholm, Ph. D., Simulation specialist, Contact mechanics, ABB Corporate Research, Västerås, Sweden

13:45 Influence of stressed volume of tooth flank on the surface durability
- Introduction of big influencing factor on the surface durability of dedendum tooth flank of pinion
- Improvement of tooth flank durability calculation for pinion of small tooth number
  Prof. Dr.-Ing. h. c. Aizoh Kubo, Manager of R&D, President of Research Institute for Applied Sciences, Kyoto, Japan

14:15 Transfer of the tooth flank stress into an analogy test concept to provoke the damage pattern tooth flank fracture
- Analogy test rig to investigate tooth flank fractures
- Double pulsator: Tooth flank fracture, load capacity, experimental investigation
  Fabian Goergen, M. Sc., Research Assistant, Dr.-Ing. Dipl.-Wirt.-Ing. Christoph Lopenhaus, Chief Engineer Gear Technology, Gear Department, Prof. Dr.-Ing. Christian Brecher, Full Professor, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University, Germany

14:15 Effect of surface characterization induced by fine shot peening on scuffing of steel roller
- Influence of surface characterization on scuffing
- Improvement of scuffing resistance
  Yuya Omiya, Ph. D., Assistant Professor, Masahiro Fujii, Ph. D., Professor, Graduate School of Natural Science and Technology, Okayama University, Japan

14:45 Bionic tooth root: fatigue strength and potential on gear units
- Reduction of tooth root stress by bionic toothing
- Potentials of bionic toothing - acoustic
  Dipl.-Ing. Florian Lubos, Design Engineer, TTM: Systems & Special Topics, Dipl.-Ing. Zsolt Roth, Developing Engineer, Centre of Competence Toothing & Bearings, J.M. Voith SE & Co. KG | VTA, Heidenheim, Germany

15:15 Planetary gears: excitation modes, noise and modifications
- Vibration behavior of planetary gears
- Influence of modifications
  Dr.-Ing. Michael Heider, Calculation engineer, Andreas Beinstingel, M. Sc., Ph. D. student, Dr.-Ing. Burkhard Pinnekamp, Head of Central Technology, Renk AG, Augsburg, Germany

15:15 Windage power loss reductions in high-speed gear pairs
- Winage power loss of a pinion and pinion-gear pair compared
- Numerical CFD and experimental approach
  Prof. Dr.-Ing. Philippe Velex, Full Professor, LaMCoS, INSA – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cedex,
  Dr. Yann Marchesse, Academic Researcher, Department of energy, EcoAM Lyon, France

15:15 Power loss analysis of different high power density gearbox typologies: CFD analysis and experimental measurements on a cycloidal gear set
- Efficiency calculation of cycloidal gearbox
- CFD simulations of churning and lubricant fluxes
  Franco Concli, Ph. D.-Ing., Assistant Professor, Ing. Lorenzo Maccioni, Faculty of Science and Technology (FaST), Free University of Bolzano,
  Ing. Carlo Gorla, Associate Professor, Department of Mechanical Engineering, Politecnico di Milano, Italy

15:15 Analysis of the efficiency of a coaxial hyperbolic gearbox
- Calculation and conjugation of worm and hyperbolic gear
- Comparison of calculated and measured efficiency
  Florian Eigner, M. Sc., Research Assistant, TU Chemnitz, Germany

15:15 Experimental study of the whining noise for a railway gearbox
- Vibroacoustic behavior of a true railway gearbox
- Experimental measurements and numerical simulations
  Karl Landet, M. Sc., Ph. D. student, Joël Perret-Liaudet, Associate Professor, Emmanuel Rigaud, Associate Professor, LITDS - Laboratoire de Tribologie et Dynamique des Systèmes, Ecole Central de Lyon, Écully, France

15:15 Scaling of planetary gear stages according to gear loss similarity
- Possibility to investigate high power gearboxes with limited testing capability
- Reducing size and power of a test gearbox by keeping similarity regarding load dependent gear losses
  Felix Siglmüller, M. Sc., Research Associate, Gear Research Centre (FZG), Technische Universität München, Garching, Germany

15:15 Noise characteristics induced by micro-pitting formed on particle-based parkerized gears
- Influence of surface treatment on micropitting
  Ryohel Saito, Development Manager, Hardware System Development Department, Dr.-Ing. Yoshimoto Suzuki, Engineering Management Department, IATCO Ltd., Kanagawa, Dipl.-Ing. Koui Matsuo, Hardware System Development Department, IATCO Ltd., Shizuoka, Japan

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16:00 Optimized tooth root strength by controlled shot peening
- Variation of shot-peening parameter and surface after shot peening
- Influence of shot peening on the fatigue behavior of gears
  Dr.-Ing. Jürgen Hoffmeister, Head of Materials Technology, Dr.-Ing. Jörg Hermes, Managing Director, Innovation Mechanics, SEW-Eurodrive GmbH & Co. KG, Bruchsal, Germany

16:30 Optimisation of spur gear tooth fillet for maximum bending strength using Bezier curves
- Minimization of tooth-root stresses
- Modified tooth root geometry using Bezier Bernstein polynomials
  Georgios Vasileiou, M. Sc., Nikolaos Rokkas, M. Sc., both PhD candidate/research assistant, Prof. Dr. Vasiliou, Full Professor, School of Mechanical Engineering, National Technical University of Athens, Greece

17:00 Simulation of the tooth root strength under consideration of material quality, finishing process and size effects
- Prediction of the tooth root reliability
- Comparison to ISO-6336-3 / -5 and test data
  Dipl.-Ing. Jean-André Meis, Head of Simulation and Data Analytics, Technology and Innovation, Flender GmbH, Bocholt, Germany

17:30 Flank load capacity of hard-sof gear pairings
- Pitting damages on through hardened gear flanks
- Influence of lubrication and wear on gear failures
  Dipl.-Ing. Andreas Dobler, Team Leader Geometry and Lubrication, Dr.-Ing. Thomas Tobie, Head of Department, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

18:15 Organized bus transfer to the evening reception

19:00 Evening reception at the Paulaner am Nockherberg
You can look forward to a special evening event. We cordially invite you to our evening reception at the Paulaner am Nockherberg, one of the most traditional breweries in Munich. Enhance your personal network and use informal atmosphere for deeper-going discussions.

Dinner speech
Dr.-Ing. E. h. Manfred Wittenstein, Chairman of the Supervisory Board, WITTENSTEIN SE, Igersheim, Germany
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<td><strong>Bevel and hypoid design and manufacturing</strong></td>
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<td><strong>Moderation:</strong> Dr.-Ing. Ulrich Knödel, GETRAG, Germany/ Prof. Dr. Eng. Ichiro Moriwaki, Kyoto Institute of Technology, Japan</td>
<td><strong>Moderation:</strong> Prof. Dr. D. Houser, Professor Emeritus, Ohio State University, USA/Dipl.-Ing. Dirk-Olaf Leimann, former ZF Wind Power Antwerpen, Belgium</td>
<td><strong>Moderation:</strong> Prof. Dr. Alfred J. H. Schoo, Westfälische Schule Gelsenkirchen Bocholt Recklinghausen, University of Applied Sciences Bocholt, Germany/ Dr.-Ing. Joachim Thomas, ZG Hypoid, Germany</td>
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<tr>
<td>08:30 Investigations on non-metallic inclusion crack area characteristics in case carburized and shot-peened high strength gears of different sizes made of high-quality steels</td>
<td>09:00 Wear prediction for double helical gears ground by forming method</td>
<td>Optimization of hypoid gear macro/micro geometries for high efficiency drives, taking into consideration of NVH and strength</td>
</tr>
<tr>
<td>▪ Crack area characteristics of non-metallic inclusions</td>
<td>• Impact of residual stress on double helical gears</td>
<td>• Effect of hypoid gear macro geometries and micro geometries on friction loss</td>
</tr>
<tr>
<td>▪ Degree of cleanliness</td>
<td>• Influence of the helix angle</td>
<td>• Evaluation of side effects on strength and noise</td>
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<tr>
<td>Daniel Fuchs, M. Sc., Research Associate, Dr.-Ing. Thomas Tobie, Head of Department, Gear Research Centre (FZG), Technische Universität München, Garching, Dr.-Ing. Stefan Schurer, Subproject Manager, Department of technology development of gear parts, MAN Truck &amp; Bus AG, Munich, Germany</td>
<td>Michael Geitner, M. Sc., Research Associate, Dr.-Ing. Thomas Tobie, Head of Department, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany</td>
<td>Dipl.-Ing. Kazuhiro Takaki, Powertrain production engineering Manager, Masaki Sugimoto, Expert Leader, Powertrain Planning Department, Nissan Motor Co., Ltd., Kanagawa, Japan</td>
</tr>
<tr>
<td>09:00 Investigations on the pitting load capacity of internal spur and helical gears</td>
<td>09:30 Experimental and numerical investigation of helical gear transmission error under gear misalignments</td>
<td>Design and CnC manufacturing of face milled beveloid gears</td>
</tr>
<tr>
<td>▪ Flank load carrying capacity of internal gears</td>
<td>▪ Influence of the gear misalignment on transmission error</td>
<td>• Novel alternative to “conventional” cylindrical and beveloid gears using disk type face mill cutters</td>
</tr>
<tr>
<td>▪ Influence of the helix angle</td>
<td>▪ Comparison of dynamic analysis over experimental data</td>
<td>• Allows easy and fast manufacturing on 5 axis CnC machines, with closed loop and reverse engineering</td>
</tr>
<tr>
<td>Michael Geitner, M. Sc., Research Associate, Dr.-Ing. Thomas Tobie, Head of Department, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany</td>
<td>Daehyun Park, Ph. D., Research Engineer Advanced, Research and Technology Development, Siemens Industry Software NV, Leuven, Belgium</td>
<td>Prof. (ret.), Claude Gosselin, Ph. D., CEO, Involute Simulation Softwares Inc., Quebec, Canada, Eberhard Fritz, Manager Product Development, Lucas Seiler, CMM &amp; CNC, ESA Eppinger GmbH, Denkendorf, Germany</td>
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<tr>
<td>10:00 Coffee break – meet &amp; greet at the exhibition area, poster presentation area and GearLab</td>
<td>Changjiang Zhou, Ph. D., Professor, Hongbing Wang, Ph. D. candidate, Xiumen Wen, Postgraduate, College of Mechanical and Vehicle Engineering, Hunan University, Changsha, China</td>
<td>Analytical design method for beveloid gears with a small shaft angle and offset</td>
</tr>
<tr>
<td>10:00 Coffee break – meet &amp; greet at the exhibition area, poster presentation area and GearLab</td>
<td>Experimental and numerical investigation of helical gear transmission error under gear misalignments</td>
<td>• Main gearing data of involute gears with skew axes</td>
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<td>▪ Influence of the gear misalignment on transmission error</td>
<td>• Centred contact pattern with predefined gear backlash</td>
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<td>▪ Comparison of dynamic analysis over experimental data</td>
<td>Daniel Marino, M. Sc., Research Assistant, Institute for Engineering Design and Industrial Design, Prof. Dr.-Ing. Hansgeorg Binz, Head of Institute, Dipl.-Ing. Matthias Bachmann, Team Leader, IKTD, University of Stuttgart, Germany</td>
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<td>Time</td>
<td>Title</td>
<td>Speakers</td>
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<tr>
<td>10:45</td>
<td>Optimization of asymmetric gear tooth root generated with protuberance hob</td>
<td>Dr. Alex Kapelevich, President, Yuriy Shekhtman, Senior Reseurcher, AKGears, LLC, Shoreview, USA</td>
</tr>
<tr>
<td>11:15</td>
<td>DIN Q6 meets DIN Q10 - needs of modern internal gear production</td>
<td>Dipl.-Ing. Thomas Kleiber, Senior Specialist Gear Development, Dipl.-Ing. (FH) Andreas Hofmann, Team Coordinator, Dr.-Ing. Benedikt Neubauer, Head of Department, Product Group Gearing, Schaeffler Technologies AG &amp; Co. KG, Herzogenaurach, Germany</td>
</tr>
<tr>
<td>11:45</td>
<td>Prediction of transmission accuracy lifetime of Rot Vector (RV) gearbox</td>
<td>Chang Liu, Ph. D., Student, Mechanical Engineering, Dr. Wankai Shi, Professor, Automotive Engineering, Chongqing University, China, Dr. Francesca Maria Curà, Professor, Mechanical and Aerospace Engineering, Politecnico di Torino, Italy</td>
</tr>
<tr>
<td>12:15</td>
<td>Parametric study of 3D trochoidal reducer model with involute profile</td>
<td>Tommy Pinel, M. Eng, Engineer R&amp;D, Moving Magnet Technologies S. A., Besancon, Prof. Dr.-Ing. Philippe Velux, Full Professor, LaMCoS, INSA – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cedex, France</td>
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<td></td>
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</tbody>
</table>
14:15 Tribo-dynamics model of a spur gear pair with gyroscopic effect and flexible shaft
- Coupling effect of gear dynamics and lubrication
- Influence of the gyroscopic effect on gear lubrication

Bo Hu, Ph. D., Student, Changjiang Zhou, Ph. D., Professor, College of Mechanical and Vehicle Engineering, Hunan University, Changsha, China

14:45 Calculation of mixed friction conditions in large-scale rolling-sliding contacts for different surface structures
- Introduction of a lubricant boundary condition for the contact problem of the elastic half-space
- Validation of calculation by different Striebeck-Curves

Dieter Mevissten, M. Sc., Research Assistant, Dr.-Ing. Dipl.-Wirt.-Ing. Christoph Loppenhaus, Chief Engineer Gear Technology, Gear Department, Prof. Dr.-Ing. Thomas Bergs, Full Professor, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University, Germany

15:15 White etching crack bearing failure: identification of high risk lubricant compounds using artificial neural networks
- Classifying WEC risk of oils based on constituting compounds
- Identifying influential compounds on WEC risk classification

Baher Azzam, M. Sc., Research Assistant, Wind Farm Development, Center for Wind Power Drives, RWTH Aachen University, Germany

15:45 Coffee break – meet & greet at the exhibition area, poster presentation area and GearLab

16:30 Defining wear limits for rack and pinion for offshore jacking applications
- Rack and pinion life assessment
- Impact of plastic deformation to the life expectation

Dipl.-Ing. (FH) Adrian Nowoisky, Senior Product Engineer, Design Engineering, Dana Incorporated, Lafayette, USA

ISO Standard method for determining a global in-operation dynamic factor KAV in gears subjected to variable velocity and loading conditions
- Global dynamic factor determination in ISO Standard environment
- Bending fatigue of gears

Francesca Curà, Associate Professor, Mechanical and Aerospace Engineering, Politecnico di Torino, Italy

A methodology for measurement of loaded transmission error of hypoid gear pair with misalignments
- Application of controlled misalignments to hypoid gears
- Measurement of the resulting loaded transmission error

Hugo Blettery, Research Engineer, Dr. David Talbot, Research Assistant Professor, Prof. Ahmet Kahraman, Winbigler Professor and Director, Gear and Power Transmission Research Laboratory and Pratt & Whitney Center of Excellence in Gearbox Technology, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, Ohio, USA

Dynamic modeling and analysis of a star-wheel reducer
- Modelling for an analytical elastodynamic model considering the manufacturing/assembling errors
- Tests for experimental modal and vibration

Prof. Jun Zhang, Ph. D., Doctoral advisor, School of Mechanical Engineering and Automation, Fuzhou University, China
Program

17:00 Determination of S-N curves for pitting based on local damage analysis
- Damage data acquisition by optical measurement technique
- Damage evaluation with local tooth contact simulation
Dipl.-Ing. Felix Müller, Research Assistant, Dr.-Ing. Stefan Schumann, Oberingenieur, Prof. Dr.-Ing. Berthold Schlecht, Full Professor, Institute of Machine Elements and Machine Design, Faculty of Mechanical Science and Engineering, Technical University of Dresden, Germany

17:30 Minimizing gear friction with water-containing gear fluids
- Results on superlubricity with water-containing gear fluids at the efficiency gear test rig
- Evaluation of losses and temperatures for a wide range of loads, velocities and oil temperatures
Mustafa Yilmaz, M. Sc., Research Associate, Dr.-Ing. Thomas Lohner, Head of Department, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

18:00 Hydrogen assisted rolling contact fatigue in thrust roller bearings
- Hydrogen evolution due to lubricant degradation in bearings
- Comparison of damage effects with H-content of the bearing
Dr.-Ing. Dominik Kürten, Tribology, Dr. rer. nat. Andreas Kailer, Group leader, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany

17:00 Reusable Engineering Exchange Standard (REXS) – standardized gear unit model
- Exchange CAE models via open, standardized interface
- Provide digital twin in transmission development
Dr. rer. nat. Moritz Keuthen, Head of Modelling and Simulation, FVA Software Service GmbH, Garching, Germany

17:30 Wolfrom gearboxes for lightweight, human-centered robotics
- Requirements in wearable robotics versus traditional industrial robots
- Suitability and potential of Wolfrom planetary gearboxes
Pablo Lopez Garcia, M. Eng., Ph. D. Research Fellow, Mechanical Engineering Department (MECH), Vrije Universiteit Brussel, Belgium

18:00 Investigation of the potential of using surrogate models in gear design process
- Optimisation using surrogate models
- Faster design space exploration using surrogate models
Jens Brimmers, M. Sc., Team Leader Gearbox NVH, Dr.-Ing. Dipl.-Wirt.-Ing. Christoph Lüpenhaus, Chief Engineer Gear Technology, Prof. Dr.-Ing. Christian Brecher, Professor, Gear Department, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University, Germany

18:30 Impact of tooth profile modification on the whining noise emitted by a planetary gear set: experimental validation of a computational scheme
- Dynamic simulation of planetary gear set
- Experimental measurement of different test cases
Jessica Neufond, Research Engineer, Ph. D. student, Numerical simulations, VibraTec SA, Ecully, France

18:30 Influence of tooth profile modification on planetary gear sets dynamic
- Dynamic model of planetary gear set
- Method of modelling the influence of tooth profile modification on transmission error
Dmitry Kalinin, Head of Aviation drives department, Prof. Jury Temis, Professor, Head of department Mathematical Modelling, Central Institute of Aviation Motors (CIAM), Moscow, Russia

18:00 Graph-based design language for single speed gear system concepts
- Holistic approach for modelling gear systems with state of art tools
- Automated gears system design and spatial positioning of components
Kevin Holder, M. Sc., Development Engineer Rail Drive Systems, ZF Friedrichshafen AG, Prof. Dr.-Ing. Corinna Salander, Chair for Railway Vehicle Technology, Institute of Machine Components (IMA), Priv.-Doz. Dr.-Ing. Stephan Rudolph, Institute of Aircraft Design, University of Stuttgart, Germany

18:30 Dinner speech
Prof. Dr. Changlie Xiang, Professor, Vice-President, Beijing Institute of Technology, Director, National Key Lab of Vehicle Transmission, China

You are invited!

We are pleased to invite you to our evening reception at the end of the second conference day. Enhance your personal network and use the relaxed and informal atmosphere for deepening talks with other participants and speakers.

Source: Uli Benz/TUM
<table>
<thead>
<tr>
<th>Lecture Room A</th>
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<td><strong>Elastic gear deformation</strong></td>
<td><strong>Application</strong></td>
<td><strong>Gear material</strong></td>
<td><strong>Tooth profile geometry</strong></td>
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<tr>
<td><strong>Moderation:</strong> Dipl.-Ing. Norbert Haefke, FVA, Germany/ Prof. Dr. Changlie Xiang, National Key Lab of Vehicle Transmission, China</td>
<td><strong>Moderation:</strong> Dr.-Ing. Ralf Hess, Flender, Germany/ Prof. h. c. Dr.-Ing. Aizoh Kubo, Research Institute for Applied Sciences, Japan</td>
<td><strong>Moderation:</strong> Dr.-Ing. Jörg Hermes, SEW-EURODRIVE, Germany/ Prof. Dr.-Ing. Michael Weigand, Vienna University of Technology, Austria</td>
<td><strong>Moderation:</strong> Dr.-Ing. Jörg Börner, ZF Friedrichshafen, Germany/ Prof. Dr. Eng. Ichiro Moriwaki, Kyoto Institute of Technology, Japan</td>
</tr>
<tr>
<td>08:30 Investigation of the influence of elastic gear body structures on the operational behavior of gears</td>
<td>Experimental and theoretical study of load mesh factor for different boundary conditions in wind gearbox planetary stages</td>
<td>Conventional high-strength nodular graphite iron as a substitute for austempered ductile iron (ADI)</td>
<td>Tooth contact analysis of non-circular gears with non-involute tooth profiles: Application to horological spur gears</td>
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<tr>
<td>• Calculation method for including elastic gear body structures in the tooth contact analysis</td>
<td>• Load share in relation to number of planets</td>
<td>• Mechanical and microstructural characterization of GJS</td>
<td>• Contact detection procedure</td>
</tr>
<tr>
<td>• Influence of elastic gear body structures on the operational behavior of gears</td>
<td>• Simulation correlation with testing</td>
<td>• Investigation of the influence of graphite and matrix structure</td>
<td>• Reduction of torque variations</td>
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<tr>
<td>09:00 Consideration of elastic deformations of gear bodies using reduction on a fourier series</td>
<td>A study of gear oil performances contributing to wind turbine lifetime extensions</td>
<td>Japanese standardization for gear steel qualification via evaluation of HV-scattering</td>
<td>Derivation of tooth stiffness of asymmetric gears for loaded tooth contact analysis</td>
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<td>• Effect of gear body deformations on flank line load distribution of cylindrical gears</td>
<td>• The lubricants properties of protecting gears assuming a severe use</td>
<td>• Scattering of micro-Vickers’ hardness and gear steel quality</td>
<td>• Adaption of Weber/Banaschek stiffness calculation and comparison and discussion of effects onto gear results due to asymmetry of teeth</td>
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<td>• Approach to consider elastic deformations of gear bodies in a coupled shaft system calculation</td>
<td>• Derivation of promising oil for long time use of wind turbine</td>
<td>• Preparation of input data to AI-system for steel quality judgement</td>
<td>• Verification of results with FEM</td>
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<tr>
<td>Markus Raabe, Director, MESYS AG, Zürich, Switzerland</td>
<td>Sho Yokoyama, Master, Development Engineer, Industrial Lubricants Group, Lubricants Research Laboratory, Idemitsu Kosan Co., Ltd., Ichihara, Japan</td>
<td>Dr.-Ing. h. c. Dr.-Ing. Jürgen Hoffmeister, Head of Department, Dr.-Ing. Masahiro Nagae, President of Institute, Dr.-Ing. Kazuhiro Kawasaki, Board member, Research Institute for Applied Sciences, Kyoto, Japan</td>
<td>Benjamin Mahr, MAS B. Eng., Head of Development/Development Engineer, KISSsoft AG, Bubikon, Switzerland, Dr.-Ing. Aljaz Pogacnik, Gear consultant, Bauhar s.p., Bled, Slovenia, Dr.-Ing. Andreas Langheinrich, Development Drive Technology, Horst Scholz GmbH &amp; Co. KG, Kronach, Germany</td>
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<tr>
<td>09:30 A gear load distribution model for planetary gear set with a flexible carrier</td>
<td>Optimized electrified drivetrains and duty cycle testing methods related to future autonomous driving vehicle concepts</td>
<td>Modelling high power geared transmissions, introduction of a filling material</td>
<td>Tooth root bending capacity – an analysis of stress and strength</td>
</tr>
<tr>
<td>• Planetary Gear Set Load Distribution</td>
<td>Prof. Dr. Ralf Wörner, Professor, hofer powertrain GmbH, Dr. rer. nat. Dipl.-Phys. Mathias Lutz, hofer-pdc Gmbh, Technical Management/Head of System Analysis, Stuttgart, Lino Pott, Scientific Assistant, University of Applied Sciences, Esslingen a. N., Germany</td>
<td>• Influence of dissipative properties of material on gears</td>
<td>• Not captured effects by the standard on tooth root bending stress</td>
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<tr>
<td>• Flexible Carrier</td>
<td>• Hybrid-dynamic substructure model</td>
<td>• Hybrid-dynamic substructure model</td>
<td>• Suggestions for further development of the load capacity calculation</td>
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<td>Lokaditya Ryali, Graduate Research Associate, GearLab, Dr. David Talbot, Research Assistant Professor, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, Ohio, USA</td>
<td>Cyril Chevre-Fraux, Ph. D. student, Dr. Jérôme Bruyère, Associate Professor, Prof. Dr.-Ing. Philippe Velux, Full Professor, LaMCoS, INSa – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cedex, France</td>
<td>Cyril Chevre-Fraux, Ph. D. student, Dr. Jérôme Bruyère, Associate Professor, Prof. Dr.-Ing. Philippe Velux, Full Professor, LaMCoS, INSa – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cedex, France</td>
<td>Prof. Dr.-Ing. habil. Heinz Linke, Emeritus Professor, Institute of Machine Elements and Machine Design, Faculty of Mechanical Science and Engineering, Technical University of Dresden, Germany</td>
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**3rd Conference day**

Friday, September 20th, 2019
11:15 Conjugate tooth profile of circular spline to involute flex gear in strain wave gearing
- Describing a geometrical model of tooth meshing in strain wave gearing
- Effects of flex-gear geometry on conjugate profiles of circular spline
\textbf{Souta Doi}, Mechanical Engineering, Kyoto Institute of Technology, Japan

11:45 Load sharing model for high contact ratio spur gears with long profile modifications
- New load sharing model considering tip relief and extended contact
- Optimization of load capacity with long profile modification
\textbf{Prof. Dr.-Ing. José I. Pedrero}, Full Professor, Dr.-Ing. Miguel Pleguezueros, Associate Professor, Dr.-Ing. Miryam B. Sánchez, Associate Professor, Department of Mechanics, UNED, Madrid, Spain

Two-speed transmission based on energy-efficient MRF-coupling elements and power split mechanics
- Energy-efficient MRF-based coupling elements
- Two-speed transmission based on a mechanical power split
\textbf{Christian Hegger, M. Sc.}, Research Assistant, Prof. Dr.-Ing. Jürgen Maas, Principal of Mechatronic Systems Laboratory, Technische Universität Berlin, Germany

Ring gear tooth cracks detected using instantaneous angular speed: wind turbine application
- Correction of the encoder geometric error to estimate IAS
- Comparison to classical vibration analysis
\textbf{Hugo Andre, Ph. D.}, Assistant Professor, Halil Ibrahim Cakar, Ph. D., Yasmine Hawwari, M. Sc., LASPI, Université Jean Monnet de Saint Etienne, Université de Lyon, Roanne, France

Use of multi-body simulation during the gear unit development process
- Optimal modelling depth for each phase of development
- Fully automated model generation allows for wide use of MBS
\textbf{Dipl.-Ing. Markus Lutz}, Development Engineer, Development Gear Units – Department Technical Acoustics, Dr.-Ing. Jörg Hermes, Managing Director, Innovation Mechanics, SEW-Eurodrive GmbH & Co. KG, Bruchsal, Germany

Application of pre-calculated gear mesh stiffness on elastic gear bodies in multi-body simulation
- Modelling strategy for elastic gear bodies in multi-body simulation
- Application of pre-calculated gear mesh stiffness
- Use of multi-body simulation during the gear development
\textbf{Faysal Andary, M. Sc.}, Research Scientist, Dr.-Ing. Joerg Berroth, Chief Engineer, Univ.-Prof. Dr.-Ing Ge- org Jacobs, Director, Institute for Machine Elements and Systems Engineering, RWTH Aachen University, Germany

Gear design beyond current standards
- Systematic Mapping of gear material fatigue performance
- Implementing increased material fatigue performance in gears

Experimental verification of improvements in static and fatigue bending capacity of spur gear tooth root design optimization
- Numerical predictions and verification by measurements of tooth root strains/stress
- Experimental investigation of single tooth bending fatigue lives
\textbf{Dr. Nihat Yıldırım}, Department of Mechanical Engineering, Faculty of Engineering, Gaziantep University, Prof. Mustafa Yasar, Lecturer, Department of Industrial Design Engineering, Karabuk University, Fatih Erdogdu, Mechanical Engineer, AeroGDT Power Trans. Inc., Ankara, Turkey
12:15 A study on tooth profile modification of cycloid planetary gear drives with tooth number difference of two
• A new design approach for flank modification of cycloid profile
• Influence of the flank modification on the contact characteristics
Ling-Chiao Chang, M. Sc., Ph. D. student, Dr.-Ing. Shyi-Jeng Tsai, Associate Professor, Ching-Hao Huang, Ph. D. Candidate, Department of Mechanical Engineering, National Central University, Taoyuan City, Taiwan

Sensorless evaluation of the ideal timing for oil-change
• Digital twin: Continuous oil-temperature calculation
• Ideal oil-changing time calculation
Dipl.-Ing. Jan Lotz, Calculation Engineer, Dr. Bernhard Bouché, Director of Research & Development, Dr. Reiko Thiele, Head of Calculation Department, Getriebebau NORD GmbH & Co. KG, Bargteheide, Germany

Analysis of manufacturing variability on the transmission error of an internal gear pair using a multibody framework
• Assessment of manufacturing variability of the tooth topography on transmission error
• Validation of gear contact models in a multibody framework
Ali Rezayat, Ph. D., Research Engineer, Siemens Industry Software N. V., Leuven, Belgium

High speed driven tool for machine tools using magnetic transmission technology
• Simulation of eddy-currents in magnets: 2d eddy current simulation, magnetic losses, high revolution speeds
• Reduction of eddy-currents in magnets: lamination, low losses, high efficiency
Dr.-Ing. Stefan Vonderschmidt, Managing Partner, Annika Ott, M. Sc., R&D engineer, Dipl.-Psych. Andreas Vonderschmidt, B. Sc., Managing Partner, Georgii Kobold GmbH & Co. KG, Horb, Germany

12:45 Research on dynamic drum shape modification of helical gear pair
• The distributed meshing nonlinear dynamics model of the helical gear pair is established
• The drum shape modification method of helical gear pair is proposed
Prof. Hui Liu, Professor, Vehicle Research Center, Beijing Institute of Technology, Beijing, China

Transferring knowledge about gear systems to machines in order to improve diagnosis efficiency
• Geared systems diagnosis: gear fault, bearing fault, shaft fault
• Machine Learning: features engineering, features extraction
Dr.-Ing. Alexandre Carbonelli, Research Engineer, Numerical simulations, Vibratec, Ecully, France

Robust force control of series elastic actuator using disturbance observer
• Eliminate the effect of friction, backlash and torque ripple of series elastic actuator
• The solution for high performance force control is based on combinations of feedforward, PID, model-based, and DOB to address stability issues and improve force tracking accuracy
Xing Du, Student, Dr. Bingkui Chen, Professor, The State Key Laboratory of Mechanical Transmission, Chongqing University, Xinping Shan, Master, CEO, Hangzhou Seenpin Robot Technology Co. Ltd, China

Study on the contact characteristics of threaded surfaces in a planetary roller screw mechanism
• Contact model and meshing characteristics of threaded surfaces
• Distribution of contact position and contact deformation
Shangjun Ma, Ph. D., Associate researcher, School of mechanical engineering, Linping Wu, Master degree candidate, Project Team Member, Study on dynamics of planetary roller screw mechanism, Shaanxi Engineering Laboratory for Transmissions and Controls, Northwestern Polytechnical University, Xi’an, China

13:15 Closing remarks
Closing remarks
Closing remarks
Closing remarks
Closing remarks

13:30 Awarding of the best presentation for junior engineers in the main hall by the conference president
Prof. Dr.-Ing Karsten Stahl, FZG, Technische Universität München (TUM), Garching, Germany
Awarding of the best paper by
Dr.-Ing. Arbogast M. Grunau, Principal Expert Bearings, Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany
+ Lunchtime snack

15:00 End of the conference

Location/Venue

International Conference on Gears 2019
Technische Universität München
(Technical University of Munich)
Institute of Machine Elements
Gear Research Centre (FZG)
Boltzmannstr. 15
85748 Garching, Germany

How to find us
Find all travel information at a glance!
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| **P1** Effect of installation errors on beveloid gears’ precision ground by cone-shape worm wheel  
Bing Cao, B. Sc., Research Assistant, Chongqing University, China |
| **P2** Evaluation method of measuring software based on virtual gear measuring center  
Prof. Chunxia Lu, School of Mechatronic Engineering, Xi’an Technological University, China |
| **P3** Index hobbing for asymmetrical gears  
Pierre Falbriard, R&D Manager, Sales, Louis Bélet SA, Vendelcourt, Switzerland |
| **P4** Micro-hobbing or when module below 0.1 becomes possible  
Pierre Falbriard, R&D Manager, Sales, Louis Bélet SA, Vendelcourt, Switzerland |
| **P5** Analysis of manufacturing costs for powder metallurgy (PM) gear manufacturing processes: a case study of a 4th drive gear  
Babak Kianian, Ph. D. candidate, Department of Mechanical Engineering, Division of Production and Materials Engineering, Lund University, Sweden |
| **P6** Visualization of phase differences between tooth helix deviations using graph theory  
Hidekatsu Noa, Student, Mechanical Engineering, Kyoto Institute of Technology, Japan |
| **P7** Proposal of linear mapping model among machining processes for gear tooth surface using graphic analysis  
Hiroki Noborio, Student, Graduate School of Engineering, Tottori University, Japan |
| **P8** Multisensory measurement of the base circle radius as a fundamental shape parameter of large gears  
Marc Pillarz, M. Sc., Research Assistant, Bremen Institute for Metrology, Automation and Quality Science, University of Bremen, Germany |
| **P9** Measurement of gear racks with variable transmission ratio  
Dipl.-Math. Heinz Rühr, Software Developer, Hexagon Metrology GmbH, Wetzlar, Germany |
| **P10** An adaptive geometric meshing theory for face-milled generated spiral bevel gears  
Shenghui Wang, Master student, Mechanical and Electrical Department, Central South University, Changsha, China |
| **P11** A novel worm dressing approach for the manufacturing of face gear in a helical gear CNC grinding machine tool  
Wujie Zhang, Master student, Mechanical and Electrical Department, Central South University, Changsha, China |
| **P12** Design and analysis of Plastic PEEK and PEEK spur gears with comparison under static load condition using FEA  
Vallabh Bhoyar, B. Eng., Student Researcher, Mechanical Engineering, G.H. Raisoni College of Engineering, Nagpur, India |
| **P13** Investigation on dynamic behavior of differential gearing with herringbone teeth  
Master Kun Liu, Student, The State Key Laboratory of Mechanical Transmission, Chongqing University, China |
| **P14** Vibration of thin rim spur gears with elastic foundation and discrete tangential stiffnesses  
Fuchun Yang, Associate Professor, School of Mechanical Engineering, Shandong University, Jinan, China |
| **P15** Increasing the bending strength of involute spur gear with an optimised hob tool  
Prof. Minggang Du, Leader of technical innovation, Science and Technology on Vehicle Transmission Laboratory, China North Vehicle Research Institute, Beijing, China |
| **P16** The analysis on grease lubrication at two tapered bodies contact considering surface roughness  
Zhenghai Wu, M. Sc., Ph. D. Postgraduates, School of Mechatronical Engineering, Northwestern Polytechnical University, Xi’an, China |
| **P17** 2-stage gearbox optimization to minimize weight and maximize gear mesh efficiency considering the gear ratio for high speed gear  
Master Sanggon Moon, Development Engineer, Department of Smart Industrial Machinery Mechanical Systems, Korea Institute of Machinery & Materials (KIMM), Daejeon, Korea |
| **P18** Loaded tooth contact analysis of bevel gears with complex gear body  
Dipl.-Ing. Frederik Mieth, Research Assistant, Chair of Machine Elements, Technical University of Dresden, Germany |
| **P19** Geometric transmission precision analysis theory and experimental study on new type FT pin-cycloid reducer  
Liang Xuan, Ph. D., Associate Professor, University Teacher, School of Electromechanical and Architectural Engineering, Jianghan University, Wuhan, China |
| **P20** Mode shift process analysis and model predictive control strategy for electro-mechanical transmission system  
Dr. Qingdong Yan, Professor, School of Mechanical Engineering, Beijing Institute of Technology, China |
| **P21** Study of translational and torsional vibration distribution in two-stage planetary gears based on energy flow analysis  
Hongcai Li, Associate Professor, Department of Vehicular Engineering, Beijing Institute of Technology, China |
| **P22** Efficiency modelling and analysis for a novel double-arc bevel gear nutation transmission system for pure electric vehicles  
Nianhong Wan, Ph. D. candidate, School of Mechanical Engineering and Automation, Fuzhou University, China |
| **P23** An effective semi-analytical approach to predicting the surface contact temperature of the face gear drives  
Jun Wen, Master student, Mechanical and Electrical Department, Central South University, Changsha, China |
| **P24** Life extension for gearboxes through predictive maintenance  
Dipl.-Ing. Stefan Bill, Managing Director, REWITEC GmbH, Lanau, Germany |
| **P25** Test stand for internally cooled metal gears  
Dr.-Ing. Hans-Jörg Dennig, Senior lecturer, School of Engineering, Zurich University of Applied Sciences, Winterthur, Switzerland |
| **P26** Optimization of gearing induced noise emissions in railway applications by implementation of high gear profile  
Dipl.-Ing. Marek Kubis, Head of gearbox design, Rolling Stock and Equipment – Drives, BOMBARDIER Transportation, Vienna, Austria |
3rd International Conference on Gear Production 2019
September 18-20, 2019, Garching/Munich, Germany

Key topics:
- Novel manufacturing and measurement systems for gears
- Potentials in digital gear manufacturing
- Increasing productivity and flexibility in the production process
- Improving gear running and NVH behavior via manufacturing parameters
- Approaches for manufacturing-oriented gear design
- New solutions for modeling of gear manufacturing processes

Presidency:
Prof. Dr.-Ing. Thomas Bergs, Full Professor, Laboratory for Machine Tools and Production Engineering (WZL), Chair of Manufacturing Technology, Faculty for Mechanical Engineering, RWTH Aachen University, Germany
Prof. Dr.-Ing. Christian Brecher, Full Professor, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering (WZL), Faculty for Mechanical Engineering, RWTH Aachen University, Germany
Prof. Dr.-Ing Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

With experts from:
ALD Vacuum Technologies GmbH | Central South University | Fraunhofer-Institute for Physical Measurement Techniques IPM | HAW Hamburg | Hefei University of Technology | Hexagon Metrology GmbH | Hirschvogel Automotive Group | IATCO Ltd. | Karlsruhe Institute of Technology (KIT) | KISSsoft AG | Louis Belet SA | Mitsubishi Heavy Industries Europe Ltd. | OptoSurf GmbH | Otto-von-Guericke University Magdeburg | Physikalisch-Technische Bundesanstalt | Profilator GmbH & Co. KG | RWTH Aachen University | SEW-EURODRIVE GmbH & Co. KG | Small Innovation Enterprise “Mechanic” Ltd. | Technical University of Dresden | Technische Universität München (TUM) | University of Applied Sciences and Arts Hanover | University of Stuttgart | Werkzeugmaschinenfabrik Waldrich Coburg GmbH | Xi’an Technological University

Further details and the final program can be found here:
www.vdi-wissensforum.de/gearproduction

3rd International Conference on High Performance Plastic Gears 2019
September 18-19, 2019, Garching/Munich, Germany

Key topics:
- Potentials for NVH improvements using plastic gears
- Novel tooth geometry and applications in various industries
- High-performance polymers for gears
- Analysis of thermo-elastohydrodynamic (TEHL) contacts of thermoplastic gears
- Methods for simulation and calculation of plastic gears

Presidency:
Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Conference Board:
Dr.-Ing. Armin Kunz, Senior Vice President, Chassis Systems Control, Project Modular Braking Systems, Robert Bosch GmbH, Abstatt, Germany
Dr.-Ing. Ulrich Kissling, President, KISSsoft AG, Bubikon, Switzerland
Dr.-Ing. Andreas Langheinrich, Development Drive Technology, Horst Scholz GmbH & Co. KG, Kronach, Germany
Dipl.-Ing. Robert Seidler, Vice President, Head of R&D, ZF Japan Co. Ltd., Japan

With experts from:
Albis Plastic GmbH | Bauhar s.p. | Chair of Composite Engineering (CCe), Technische Universität Kaiserslautern | Chair of Industrial and Automotive Drivetrains, Ruhr-University Bochum | DSM Engineering Plastics B.V. | DuPont Specialty Products USA, LLC | Gear Research Centre (FZG), Technische Universität München (TUM) | AAV Antriebstechnik GmbH | IIMS Gear SE & Co. KG | Institute of Micro Technology and Medical Device Technology (MIMED), Technische Universität München (TUM) | Institute of Polymer Technology (LKT), University Erlangen-Nuernberg | KISSsoft AG | Kyoto Institute of Technology | Orbitless Drives Inc. | Robert Bosch GmbH | SABIC Innovative Plastic B.V. | University of Ljubljana | Victrex Europa GmbH | ZF Friedrichshafen AG | Zuerich University of Applied Sciences

Further details and the final program can be found here:
www.vdi-wissensforum.de/plasticgears
Gears Interactive – new ideas, more added value for your business

**Gather hands-on experience in the transmission world!**

Take a look at individual gear components, gain an insight into how the different components interact and compare design and workmanship! The following transmissions will be exhibited, stripped down into sub-assemblies:

- Horst Scholz GmbH & Co. KG
- Schaeffler Automotive Buehl GmbH & Co. KG

**Speakers meet up**

Still have unresolved questions?

You can address your questions to the speakers right after the lecture during the coffee break. You will be able to meet them just in front of the lecture room. They will be available for at least 15 minutes.

**Two gear community nights**

Your networking hotspot for the international gear community!

Enjoy the evening reception at the Paulaner am Nockherberg as well as another social event on the second conference day at the university. The Paulaner am Nockherberg is one of the most traditional breweries in Munich and cradle of the Paulaner Brewery since 1627. Both – the get-together at the FZG and the brewery visit – offer you the opportunity to network with your peers and catch up on trends.

**FZG lab tours**

Get the chance to visit innovative laboratory facilities!

Seize the opportunity and visit the nearby test and laboratory facilities at the Gear Research Centre (FZG). Several guided tours with different and new core topics offer opportunities of gaining deeper insights into a variety of innovative gear test rigs and laboratory equipment.

For registration meet at the FZG information desk during the conference.

**Poster exhibition with impulse talks**

The poster exhibition is combined with a 5-minute talk.

The compact style of presentation called the ‘5-minute rapid’ presentation, will provide you with all information in a clear, succinct manner. Poster presentations are scheduled during the coffee breaks. Presentation times will be announced in the Event App.
Presidency

Conference president
Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Vice presidents
Dr.-Ing. Bernhard Bouché, Director of Research and Development Mechanics, Getriebebau NORD GmbH & Co. KG, Bargteheide, Germany

Prof. Dr.-Ing. Bernd Robert Höhn, TUM emeritus of excellence, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Conference Board
Dr.-Ing. Arbogast M. Grunau, President of the Managing Board, Research Association for Drive Technology (FVA), Frankfurt a. M., Principal Expert Bearings, Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany

Dr.-Ing. Burkhard Pinnekamp, Head of Central Technology, Renk AG, Augsburg, Germany

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<table>
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<tr>
<th>Function</th>
<th>2017 Attendees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and Development</td>
<td>46 %</td>
</tr>
<tr>
<td>University/research institutions</td>
<td>40 %</td>
</tr>
<tr>
<td>Construction and development</td>
<td>18 %</td>
</tr>
<tr>
<td>Production</td>
<td>17 %</td>
</tr>
<tr>
<td>Production engineer</td>
<td>25 %</td>
</tr>
<tr>
<td>Project management</td>
<td>17 %</td>
</tr>
<tr>
<td>Project management</td>
<td>7 %</td>
</tr>
<tr>
<td>Sales</td>
<td>9 %</td>
</tr>
<tr>
<td>Others</td>
<td>5 %</td>
</tr>
<tr>
<td>Others</td>
<td>7 %</td>
</tr>
</tbody>
</table>
Please register for (price per person plus VAT):

<table>
<thead>
<tr>
<th>Early bird price until June 21st, 2019</th>
<th>From June 22nd, 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>EUR 1490.00</td>
<td>EUR 1590.00</td>
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</tbody>
</table>

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