International Conference on Gears 2023
FZG, Garching/Munich, Germany

September 13 - 15, 2023

Key topics:
- Sustainable gears with reduced carbon footprint and increased efficiency
- Optimization of gear design and geometry
- New test methods for endurance, efficiency and NVH behavior
- Numerical methods and multiscale simulation tools to improve gear performance
- Smart gears for condition monitoring systems and additional functions
- Life cycle assessment of geared drive systems

Associated organisations:

American Gear Manufacturers, USA
ARTEMA, France
ASSIOT, Italy
ASME
BAPT
British Gear Association
Chinese Mechanical Engineering Society
Canadian Society for Mechanical Engineering
CSVTS, Czechia
Drive Technology Research Association, Germany

Gear Research Institute, USA
Scientific Society of Mechanical Engineers, Hungary
IFToMM
Institution of Mechanical Engineers, United Kingdom
JSME
The Korean Society of Mechanical Engineers, Korea
Romanian Association of Mechanical Transmissions
Technical Chamber of Greece
WiGeP, Germany

Visit parallel conferences free of charge

Gear Production 2023
www.vdi-wissensforum.de/02TA411023

High Performance Plastic Gears 2023
www.vdiconference.com/02TA409023

An event organized by VDI Wissensforum
www.vdi-gears.eu
Program overview
International Conference on Gears and parallel conferences

1st Conference day
Wednesday, September 13th, 2023

Plenary lectures

08:15 Registration

09:30 Common welcome and opening of the
- International Conference on Gears 2023
- International Conference on High Performance Plastic Gears 2023
- International Conference on Gear Production 2023
Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

09:55 Welcome address by
a representative, TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

10:05 Welcome address by
Dr.-Ing. Burkhard Pinnekamp, Head of Central Technology, RENK GmbH, Augsburg; President, Research Association for Drive Technology (FVA), Frankfurt, Germany

10:15 Keynote session: Re-X: Recycle | Reuse | Reduce
From why to how: It is time for sustainability to move from the executive agenda into the real world
Dominik Leisinger, EMBA, Partner & Europe Lead Product Excellence (PERLab), A.T. Kearney (International) AG, Zurich, Switzerland
The need for global standards to define CO2 footprint in product specifications
Erik Claesson, M. Sc., Director, Automotive Segment & Group Business Intelligence, Ovako AB, Hofors, Sweden
Refurbishing tracked vehicle transmissions
Dr.-Ing. Burkhard Pinnekamp, Head of Central Technology, Sebastian Schießler, M. Eng., Head of Repair, Vehicle Mobility Solutions, RENK GmbH, Augsburg, Germany
Increasing air travel and the challenges to reduce emissions
Dr.-Ing. David Krüger, Design Engineer, R&T Project Manager, Transmissions, Rolls-Royce Deutschland Ltd & Co. KG, Blankenfelde-Mahlow, Germany
Efficiency-improvement with low-loss-gears by two different applications
Prof. i.R. Dr.-Ing. Dr. h.c. Bernd-Robert Höhn, TUM emeritus of excellence, Michael Geitner, M. Sc., Research Associate, Institute of Machine Elements, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

12:00 Time for working lunch – meet & greet in the exhibition area, poster presentation area and GearArena

Parallel sessions

International Conference on Gears

Lecture Room A
13:30 Tooth root load & carrying capacity
15:00 Coffee break – meet & greet at the exhibition area, poster presentation area and GearArena
16:00 Damage detection
17:30 Evening reception at the university

Lecture Room B
NVH: Impacts

Lecture Room C
Lubrication
Efficiency and friction

Lecture Room D
Sustainability
Tooth root strength

Lecture Room E
Innovations in gear production
Software in gear production

Parallel conferences – free of charge –
International Conference on Plastic Gears
www.vdi-wissensforum.de/02TA409023
International Conference on Gear Production
www.vdi-wissensforum.de/02TA411023
# Program overview
International Conference on Gears and parallel conferences

## 2nd Conference day
Thursday, September 14th, 2023

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<th>Lecture Room A</th>
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<tbody>
<tr>
<td><strong>08:30</strong> Load capacity</td>
<td><strong>08:30</strong> Planetary gears: Simulation and lubrication</td>
<td><strong>10:00</strong> Coffee break &amp; meet &amp; greet at the exhibition area, poster presentation area and GearArena</td>
<td><strong>11:00</strong> Planetary gears: NVH &amp; CFD: Applications</td>
<td><strong>14:00</strong> Design, application, standardization &amp; Planetary gears: Design &amp; Strength: Bevel, hypoid &amp; worm gears</td>
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<td><strong>14:00</strong> Planetary gears: Design &amp; Strength: Bevel, hypoid &amp; worm gears</td>
<td><strong>15:30</strong> Coffee break &amp; meet &amp; greet at the exhibition area, poster presentation area and GearArena</td>
<td><strong>18:00</strong> End of the lectures &amp; Dinner Speech: Dr.-Ing. Bernhard Bouché, Director of Research and Development Mechanics, Getriebebau NORD GmbH &amp; Co. KG, Bargteheide, Germany</td>
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</table>

### Lunchtime snack

**12:45** Awarding of the best presentation for young engineers by Prof. Dr.-Ing. Karsten Stahl, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

**12:45** Awarding of the best paper by Dr.-Ing. Franz Völkel, Sr. Vice President R&D Bearings, Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany

**14:15** End of the conferences

## 3rd Conference day
Friday, September 15th, 2023

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<tr>
<td><strong>08:30</strong> Planetary gears: Load distribution</td>
<td><strong>08:30</strong> Smart gears</td>
<td><strong>10:00</strong> Coffee break &amp; meet &amp; greet at the exhibition area, poster presentation area and GearLab</td>
<td><strong>11:00</strong> Load capacity</td>
<td><strong>12:30</strong> Closing remarks</td>
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| **10:00** Coffee break & meet & greet at the exhibition area, poster presentation area and GearLab | **11:00** Load capacity | **12:30** Closing remarks | **12:30** Closing remarks | **12:45** Awarding of the best presentation for young engineers by Prof. Dr.-Ing. Karsten Stahl, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

**12:45** Awarding of the best paper by Dr.-Ing. Franz Völkel, Sr. Vice President R&D Bearings, Schaeffler Technologies AG & Co. KG, Herzogenaurach, Germany

**14:45** End of the conferences

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**Gears 2023**

Europe invites the world!
Program

1st Conference day
Wednesday, September 13th, 2023

08:15 Registration

09:30 Common welcome and opening of the
• International Conference on Gears 2023
• International Conference on High Performance Plastic Gears 2023
• International Conference on Gear Production 2023

Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

09:55 Welcome address by
a representative, TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

10:05 Welcome address by
Dr.-Ing. Burkhard Pinnekamp, Head of Central Technology, RENK GmbH, Augsburg; President, Research Association for Drive Technology (FVA), Frankfurt, Germany

10:15 - 12:00 Keynote session: Re-X: Recycle | Reuse | Reduce
Moderation: Prof. Dr.-Ing. Karsten Stahl, (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

From why to how: It is time for sustainability to move from the executive agenda into the real world
• Determine emission baselines for product portfolio
• Prioritize levers to decrease emissions
• Achieve change through product design and business model adaptation
Dominik Leisinger, EMBA, Partner & Europe Lead Product Excellence (PERLab), A. T. Kearney (International) AG, Zurich, Switzerland

The need for global standards to define CO2 footprint in product specifications
• High performance and low emissions is no conflict for engineering steels
• Maximum CO2 and recycled content as properties in the steel product specifications
• Global initiatives vs. sustainability demands on the product
Erik Claesson, M. Sc., Director, Automotive Segment & Group Business Intelligence, Ovako AB, Hofors, Sweden

Refurbishing tracked vehicle transmissions
• Extended lifetime
• Upgrade and RE-use
• Increase share of re-used parts
Dr.-Ing. Burkhard Pinnekamp, Head of Central Technology, Sebastian Schießler, M. Eng., Head of Repair, Vehicle Mobility Solutions, RENK GmbH, Augsburg, Germany

Increasing air travel and the challenges to reduce emissions
• Future demand in air travel
• Emissions of air travel
• New engine architecture to reduce emission for medium and long range flights
Dr.-Ing. David Krüger, Design Engineer, R&T Project Manager, Transmissions, Rolls-Royce Deutschland Ltd & Co. KG, Blankenfelde-Mahlow, Germany

Efficiency-improvement with low-loss-gears by two different applications
• Low-loss-gears for a Wolfrom-transmission, reduced gear-mesh losses
• Wolfrom-transmission without carrier, no losses in the radial bearings for the planets
• Low-loss-gears for a normal planetary transmission (minus-type), efficiency-improvement in a special application
Prof. i.R. Dr.-Ing. Dr. h.c. Bernd-Robert Höhn, TUM emeritus of excellence, Michael Geitner, M. Sc., Research Associate, Institute of Machine Elements, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

12:00 Time for a working lunch – meet & greet in the exhibition area, poster presentation area and GearArena
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| **Tooth root load & carrying capacity**  
Moderation: Luc Amar, PhD, CETIM, France/Dr.-Ing. Rolf Doebereiner, AVL List GmbH, Austria | **NVH: Impacts**  
Moderation: Dr.-Ing. Bernhard Kohn, AUDI AG, Germany/Prof. Dr.-Ing. Jose I. Pedrero, Universidad Nacional de Educación a Distancia (UNED), Spain | **Lubrication**  
Moderation: Prof. Dr.-Ing. Gerhard Poll, Leibniz University Hannover, Germany/Prof. Dr. Datong Qin, Chongqing Jiaotong University, China |
| **13:30** Optimization of statistical and geometrical evaluation in the determination of tooth root endurance strength  
- Influence of asymmetrical clamping of a gear in pulsator tests  
- Evaluation of the real geometry of test gears  
Ahmad Alnahlaui, M. Sc., Research Assistant, Prof. Dr. Ing. Peter Tenberge, Full Professor, Chair of Industrial and Automotive Drivetrains (IFA), Faculty of Mechanical Engineering, Ruhr-University Bochum, Germany | **Acoustical behavior of periodic flank modifications under dynamic operating conditions**  
- Acoustic optimisation of gear flank geometry  
- Influence of dynamic operating conditions on periodic flank modifications  
Sebastian Sepp, M. Sc., Research Associate, Dr.-Ing. Michael Otto, Head of department Calculation and Verification of Transmission Systems, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany | **Lubricant free transmissions for food and beverage applications – a comparison**  
- Comparison of three different lubricant free transmission technologies  
- Magnetic transmissions, porous sintered materials, plastic gears  
Andrey Wallinger, M. Sc., Development Engineer, Research & Development, Dr.-Ing. Stefan Vonderschmidt, Managing Director, Dr.-Ing. Reiner Vonderschmidt, Shareholder, Georgii Kobold GmbH & Co. KG, Horb am Neckar, Germany |
| **14:00** The consequences of different methodologies for the elaboration of pulsator test results with respect to the load spectrum assessment of Gears  
- Statistical analysis of STBF (Single Tooth Bending Fatigue Test) data  
- Effect of the curve shape within the framework of load spectrum assessment  
Luca Bonaiti, M. Sc., PhD candidate in Mechanical Engineering, Prof. Ing. Carlo Gorla, Associate Professor, Department of Mechanical Engineering, Politecnico di Milano, Italy; Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany | **The influence of the wheel body design on airborne noise**  
- Describing how to quickly simulate a wheel body design  
- A combination of static and dynamic calculations is used  
Benjamin Abert, M. Sc., Head of Consulting and Service, FVA GmbH, Garching; Denis Werner, M. Eng., Calculation and Support Engineer, AVL Deutschland GmbH, Munich, Germany | **Analysis of load cycles and local wear of dry and solid-lubricated gears**  
- Analysis of the operational behaviour of dry and solid-lubricated gears  
- Analysis of the local wear of the solid lubricant on the tooth flank  
Sebastian Sklenak, M. Eng., Research Assistant, Gear Power Density, Prof. Dr.-Ing. Christian Brecher, Full Professor, Dr.-Ing. Jens Brimmers, M. Sc., Chief Engineer Gear Department, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering (WZL), Faculty for Mechanical Engineering, RWTH Aachen University, Germany |
| **14:30** Tooth bending strain rate analysis in a counter shaft drivetrain and implications on fatigue strengths  
- Dynamic tooth bending strain analysis  
- Material fatigue strength behaviour under variable strain rate  
Dr. Isaac Hong, Research Assistant Professor, Dr. David Talbot, Assistant Professor, Gear and Power Transmission Research Laboratory, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, USA | **Impact of manufacturing deviations on the NVH behavior of modern gear design concepts**  
- Deterioration of gear behavior due to manufacturing deviations  
- Influence of gear quality on gear mesh characteristics  
Dr.-Ing. Ulrich Kissling, President, KISSsoft AG, Bubikon, Switzerland | **Considerations on lubrication of high-speed rotating gear (first report) – relationship between the lubricating oil behavior and airflow on the tooth surface**  
- Behavior of the injection oil flow onto the rotating gear tooth surface  
- Behavior of airflow generated at the gear engagement  
Kensuke Suzuki, Development Engineer, Kazuki Sakai, Experiment Sec. Product Development Dept., Kaori Sakai, Product Design Sec. Product Development Dept, UNIVANCE CORPORATION, Kosai-City, Japan |
<p>| <strong>15:00</strong> Coffee break – meet &amp; greet in the exhibition area, poster presentation area and GearArena | | |</p>
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<td>Investigation of the electrical behavior of a spur gear pair by means of impedance measurements</td>
<td>Measuring instantaneous angular speed using a gear wheel as material measure to detect pitting damage during an endurance test</td>
<td>Pitting detection for prognostics and health management in gearbox applications</td>
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<td>- Measuring system for determining the electrical properties</td>
<td>- Influence of the transfer path</td>
<td>- Experimental study with predamaged gears</td>
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<td>- First results and behaviors of the impedance of a spur gear</td>
<td>- Comparing different measurement systems</td>
<td>- AI based damage detection</td>
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<td>Simon Graf, M. Eng., M. Eng., Research Assistant, Dipl.-Ing. Michel Werner, Research Assistant, Jun. Prof. Dr.-Ing. Manuel Geheber; Junior Professor for Mechanical Drive Technology, Chair of Machine Elements, Gears and Tribology (MEGT), Department of Mechanical and Process Engineering, Rheinland-Pfalzische Technische Universität Kaiserslautern-Landau (RPTU), Kaiserslautern, Germany</td>
<td>Yanik Koch, M. Sc., Research Assistant, Prof. Dr.-Ing. Eckard Kirchner, Director, Institute of Product Development and Machine Elements, Technische Universität Darmstadt; Julian Hirschmann, B. Eng., product engineer vibration analysis, SEW-Eurodrive GmbH, Bruchsal, Germany</td>
<td>Lisa Binanzer, M. Sc., Research Assistant, Drive Technology, et. al, Institute of Machine components (IMA), Universität Stuttgart, Germany</td>
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<td><strong>17:00</strong></td>
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<td>Asymmetric gear geometry</td>
<td>End of the first conference day</td>
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<td>Design optimization of multi-stage gear trains with asymmetric teeth under a broad range of torques by incorporating multimobility simulations</td>
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<td>- Asymmetric gear complex gear train design optimization with a wide range of torques</td>
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<td>- Multibody simulation for accurate gear contact analysis for NVH performance evaluation</td>
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<td>Daehyun Park, PhD, Senior Research Engineer, Ali Rezayat, PhD, Advanced Research Engineer, Motion Product Development, Siemens Industry Software NV, Leuven, Belgium; Yeohyeon Gwon, M. Sc., Senior Researcher, EV geartrain NVH, Hyundai Motor Company, Gyeonggi-Do, Korea</td>
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<td>Comparing the contact characteristics of involute gear/eccentric cycloidal gear calculated by various loaded tooth contact analysis models</td>
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<tr>
<td>- Compare results of involute gear from different models</td>
<td>- Implementation of an isogeometric contact penalty formulation</td>
<td>- Friction reduction and scoring prevention of gears facing loss of lubrication</td>
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<td>- Propose a new contact analysis approach for EC gears</td>
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<td>- Influence of superfinishing and coatings on loss of lubrication behavior</td>
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<td>Ling Chiao Chang, M. Sc., Research Associate, Dr.-Ing. Shi-yi-Jeng Tsai, Associate Professor, Department of Mechanical Engineering, National Central University, Taoyuan City, Taiwan, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany</td>
<td>Dipl. Ing. Christos Karampatakis, PhD Candidate, Laboratory of Machine Elements and Machine Design, Aristotle University of Thessaloniki; Prof. Christopher Provatis, Full Professor, School of Mechanical Engineering, National Technical University of Athens, Greece; Dr. Angelos Mantzaflaris, Research Faculty, Inria Sophia Antipolis, Université Côte d’Azur, Sophia Antipolis, France</td>
<td>Bernd Morhard, M. Sc., Research Associate, Dr.-Ing. Thomas Lohner, Head of Group EHL-Tribological-Contact and Efficiency, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany</td>
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**Get-together**
Enhance your personal network and use the relaxed and informal atmosphere for deeper-going conversations with other participants and speakers.
Thursday, September 14th, 2023

Lecture Room A

**Load capacity**

Moderation: Dr.-Ing. Carsten Gitt, Mercedes-Benz AG, Germany/Prof. h.c. Dr.-Ing. Aizoh Kubo, Research Institute for Applied Sciences, Japan

- 08:30 Crack growth based tooth root life prediction model
  - Crack growth based tooth root lifetime prediction model for very high cycle fatigue
  - Analysis of influencing factors on tooth root lifetime
  Johannes Lövenich, M. Sc., Research Associate, Moritz Zalfen, M. Sc., Group Leader Gear Power Density, Dr.-Ing. Jens Brimmers, M. Sc., Chief Engineer Gear Department, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering (WZL), Faculty for Mechanical Engineering, RWTH Aachen University, Germany

- 09:00 Experimental investigation of the increased tooth root load capacity of beveloid gears with optimized flank topography
  - Test bench to test the tooth root load carrying capacity of beveloid gears
  - Tooth root load carrying capacity for beveloids with intersecting axes
  Marius Willecke, M. Sc., Research Assistant, Prof. Dr.-Ing. Christian Brecher, Full Professor, Chair of Machine Tools, Dr.-Ing. Jens Brimmers, M. Sc., Chief Engineer Gear Department, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering (WZL), Faculty for Mechanical Engineering, RWTH Aachen University, Germany

- 09:30 Statistical analysis of the influence of inherent manufacturing errors in the mesh load factor in planetary gears
  - Application of the Monte Carlo method in the analysis of the planetary gear transmissions performance
  - Combination of the effects of different manufacturing errors
  Javier Sanchez-Espiga, PhD, Assistant Professor, Prof. Dr. Fernando Viadero, Full Professor, Prof. Dr. Alonso Fernandez-del-Rincon, Full Professor, Structural and Mechanical Engineering, University of Cantabria, Santander, Spain

Lecture Room B

**Planetary gears: Simulation and lubrication**

Moderation: Prof. Dr.-Ing. Berthold Schlecht, Technische Universität Dresden, Germany/Prof. Dr.-Ing. Michael Weigand, TU Wien, Austria

- 10:30 Simulation study on the tribological characteristics in the meshing contact in the context of the load carrying capacity calculation of internal gears with unbalanced sliding conditions
  - Internal gears with unbalanced sliding conditions
  - TEHL contact simulation
  Michael Geitner, M. Sc., Research Associate, Sebastian Preintner, M. Sc., Research Associate, Thomas Tobie, Head of Department, Load-Capacity Cylindrical Gears, Institute of Machine Elements, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

- 10:50 Thermal model for a planetary gear set using an isothermal approach
  - Power losses on a planetary gear train
  - Numerical study of oil temperature in a transient regime
  Wassim Rdamane, M. Sc., R&D Engineer/PhD Student, Cyril Chevrel–Fraux, PhD, Doctor/Engineer, Machine drives, REDEX Group, Ferrières-en-Gâtinais; Christophe Changanet, PhD, Researcher and Lecturer, Academic Research Department, ECAM La Salle, Lyon, France

Lecture Room C

**Efficiency: Gearbox**

Moderation: Prof. Dr.-Ing. Oliver Koch, Rheinland-Pfalzische Technische Universität Kaiserslautern-Landau (RPTU), Germany/Dr.-Ing. Bernd Pfeifer, Magna PT B.V. & Co. KG, Germany

- 10:00 On the reduction of windage power losses in gears by the modification of tooth geometry
  - Experimental investigation of 3D-printed pinions
  - Numerical CFD analysis related to modified tooth geometry
  Dr.-Ing. Michal Ruzek, Associate Professor; LaMCoS, INSa – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cedex, France; Rémy Brun, B. Sc., master level student, Dr. Yann Marchesse, Associate Professor, ECAM La Salle, Lyon, France

- 10:30 Efficient concepts for high ratio angular gearboxes
  - Comparison of the ratio-dependent efficiency of different angular gearings
  - Introduction of highly efficient W.9 angular gearboxes
  Dr.-Ing. Björn Sievers, Development Engineer, Dipl.-Ing. (FH). Michael Herberger, Development Engineer, Dipl.-Ing. Felix Rudolph, Development Engineer, SEW-EURODRIVE GmbH & Co. KG, Bruchsal, Germany

- 10:50 Holistic sustainability-assessment of gearboxes
  - Sustainability evaluation of gearboxes over life cycle
  - Assessment of ecological, economic and social aspects
  Prof. Dr.-Ing. Markus Klein, Professor for machine elements and sustainable product development, Department of mechanical, automotive and aeronautical engineering, University for Applied Sciences Munich, Germany

10:00 Coffee break – meet & greet in the exhibition area, poster presentation area and GearArena

10:30 – 10:50 Poster presentations in the poster exhibition area
11:00 Vibration reduction of planetary gear drive using mesh phasing: modelling and experimental validation
- Conceptual assessment on gears helps improving NVH performance: Gear mesh phasing, suppressing vibrations, operational deflection shapes
- Electric drive unit NVH performance optimization: High speed application, multibody simulation and correlation, evaluation of different planetary designs


11:30 Influence of axis misalignments in stepped planetary gear stages on the excitation behavior – Test rig development and simulative analysis
- Test rig for investigation of axis misalignments
- Multi body simulation of misaligned stepped planetary gears

Christian Westphal, M. Sc., Group Leader Gearbox NVH, Research Assistant, Prof. Dr.-Ing. Christian Brecher, Full Professor, Chair of Machine Tools, Dr.-Ing. Jens Brimmers M. Sc., Chief Engineer Gear Department, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering (WZL), Faculty for Mechanical Engineering, RWTH Aachen University, Germany

12:00 Excitation behavior of double helical planetary gear units – Influence of the apex point
- Validation of simulation method by developing and using a back-to-back planetary test rig
- Evaluation of influence of apex point tolerances on excitation behavior by applying the validated simulation method

Uwe Weinberger, M. Sc., Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

12:30 Time for a working lunch – meet & greet in the exhibition area, poster presentation area and GearArena

13:00 Poster presentations in the poster exhibition area
14:00 Review of different calculation approaches for the mean coefficient of friction in ISO 6336
- Analysis of approaches due to origin and validated ranges
- Exemplary comparative calculations for various applications
  **Niklas Blech, M. Sc.**, Research Associate, Dr.-Ing. Thomas Tobie, Head of Department, Load-Capacity Cylindrical Gears, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

14:30 Forward performance-driven design of gear parameters
- Multi-objective optimization design of gear parameters
- Universal design method of symmetric and asymmetric gears
  **Shuxin Chen**, Master Student, Prof. Changzhao Liu, PhD, Associate Professor, Prof. Datong Qin, PhD, Professor, State Key Laboratory of Mechanical Transmissions, Chongqing University, China

15:00 Analysis of quasi-static mesh characteristics of gear transmission considering system deformation
- LTCA method considering system deformation
- Coupling characteristics of multi-gearbox system
  **Dr. Jingyi Gong**, Prof. Dr. Geng Liu, Full Professor, School of Mechanical Engineering, Northwestern Polytechnical University; Director, Shaanxi Engineering Laboratory for Transmissions and Controls, Xi’an, China; Bing Yuan, PhD, Associate Professor, Xi’an Technological University, China

15:30 Coffee break – meet & greet in the exhibition area, poster presentation area and GearArena

15:45 -

16:00 Design and analysis of compound stepped planetary gear drives for better transmission performances
- Design rules for compound stepped planetary gear sets
- Effects of meshing-phase on transmission performances by LTCA
  **Ling Chiao Chang, M. Sc.**, PhD Candidate, Dr.-Ing. Shyi-Jeng Tsai, Associate Professor, Qi-Yau Zhuang M. Sc., PhD Candidate, Department of Mechanical Engineering, National Central University Taiwan, Taoyuan City, Taiwan

15:45 -

16:00 Evaluation of the effect of the rim thickness on the root stress cycle of helical planet gears with integrated rollers
- Stress analyses of planet-sun and planet-ring models
- Finite element modelling considering the rollers rigidity
  **Dr. Ignacio Gonzalez-Perez**, Full Professor, Department of Mechanical Engineering, Materials and Manufacturing, Universidad Politecnica de Cartagena, Spain; Alfonso Fuentes-Aznar, Professor, Rochester Institute of Technology, Rochester NY, USA; Jose Calvo-Irisarri, Engineer, Gamesa Energy Transmission S.A., Zamudio, Spain

16:00 Transferability of the scuffing load capacity of gear oils determined on spur gears to hypoid gears
- Comparison of test methods
- Transferability of test results from spur to hypoid gears
  **Alexander Drechsel, M. Sc.**, Team Leader Bevel Gears and Lean Management, Dr.-Ing. Josef Pellkofer, Head of Department of Worm gears and Bevel gears, Fatigue life analysis, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

16:00 Fatigue testing of large sized bevel gears
- Novel testing setup capable of fatigue tests with high power and large gears
- Proven capability to produce TFF failures in testing environment
  **Erkka Virtanen, M. Sc.**, (Tech), Doctoral researcher/PhD Student, Mikko Kanerva, Associate Professor, Faculty of Engineering and Natural Sciences, unit of Material Sciences, research group of Tribology and Machine Elements, Faculty of Engineering and Natural Sciences, Tampere University; Gabor Szanti, M.Sc., (Tech), Engineering and Development Manager, ATA Gears Oy, Tampere, Finland

16:00 Calculation method for wear of steel-bronze rolling-sliding contacts relating to worm gears
- Wear behavior of steel-bronze rolling-sliding contacts
- Wear calculation of steel-bronze pairings
  **Dipl.-Ing. (FH) Philipp Schnetzer, M. Sc.**, Research Associate, Dr.-Ing. Josef Pellkofer, Head of Department of Worm gears and Bevel gears, Fatigue life analysis, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

15:45 -

16:00 Poster presentations in the poster exhibition area
16:30 Scuffing load carrying capacity of high-speed gears with an isotropic superfinished surface
- Scuffing load carrying capacity of high-speed gears
- Improved method to calculate scuffing

Jakob Vorgerd, M. Sc., Research Assistant, Prof. Dr.-Ing. Peter Tenberge, Full Professor, Chair of Industrial and Automotive Drive Trains (IFAI), Faculty of Mechanical Engineering, Ruhr-University Bochum, Germany

17:00 On the testing of flank fracture calculations based on 3D-gears
- Calculation of flank fracture damage with different approaches
- Application of the calculation approaches on three dimensional gears

Dipl.-Ing. Thi Tra My Truong, Research Associate, Dr.-Ing. Stefan Schumann, Chief Engineer, Prof. Dr.-Ing. Berthold Schlecht, Full Professor and Head of Institute of Machine Elements and Machine Design, Faculty of Mechanical Science and Engineering, Technical University of Dresden, Germany

17:30 White Etching Cracks (WECs) on gears of E-Axle applications
- Premature tooth flank fatigue due to WECs
- Testing of oils concerning WEC-potential

Dipl.-Ing. (FH) Thomas Schmidt, Senior Specialist, Gears, Dr.-Ing. Benedikt Neubauer, Director Gears e-mobility, Schaeffler Technologies AG & Co. KG, Herzogenaurach; Dipl.-Ing. Daniel Merk, Senior Expert Bearing Technology, Validation Industrial, Schaeffler Technologies GmbH & Co. KG, Schweinfurt, Germany

Investigation of sound and vibration behavior of cylindrical gears
- Nonlinear frequency response analysis
- Determination of equivalent radiated power

Andreas Beinstingel, M. Sc., Chair of Vibroacoustics of Vehicles and Machines, Technical University of Munich (TUM), Garching & Computational Engineer, Renk GmbH, Augsburg; Dr.-Ing. Michael Heider, Head of Calculation Department, Renk GmbH; Prof. Dr.-Ing. Steffen Marburg, Chair of Vibroacoustics of Vehicles and Machines, TUM, Garching, Germany

Validation of an industrial gearbox model for predicting vibro-acoustic behavior
- Systematic experimental validation of the dynamics of an industrial gear unit
- The MBS model considers the measured gear flanks and profiles

Prateek Chavan, M. Sc., Development Engineer, Simulation Gear Units, Dipl.-Ing. Markus Lutz, Head of Department, SEW-EURODRIVE GmbH & Co. KG, Bruchsal, Germany

A comparison of time and frequency domain approaches for NVH
- Calculation approaches and major setting parameters
- Comparison of results regarding amplitudes and frequencies

Dipl.-Ing. Jürg Langhart, Senior Engineer – Global Sales, Prof. Dr.-Ing. Saeed EBrahimi, Software Developer, KISSsoft AG, Bubikon, Switzerland; Dipl.-Ing. Thomas Kelichauss, General Manager, FunctionBay GmbH, Munich, Germany

18:00 End of the lectures
- Switch to the plenary session

18:05 Dinner speech
What is the taste of gears like?
Dr.-Ing. Bernhard Bouché, Director of Research and Development Mechanics, Getriebewab NORD GmbH & Co. KG, Bargteheide, Germany

18:45 Organized bus transfer to the evening reception
You can look forward to a special evening event. Enhance your personal network and use the informal atmosphere for deeper-going discussions.

19:30 Evening reception at the “Löwenbräukeller” in Munich
### 3rd Conference day  
Friday, September 15th, 2023

<table>
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<tr>
<th>Lecture Room A</th>
<th>Lecture Room B</th>
<th>Lecture Room C</th>
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| **Planetary gears: Load distribution**  
Moderation: Prof. Dr.-Ing. Manfred Hirt, Past President, Research Association for Drive Technology (FVA), former board of Renk GmbH, Germany/ Prof. Almert Kahraman, The Ohio State University, Columbus, USA | **Smart gears**  
Moderation: Prof. Dr.-Ing. Oliver Koch, Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau (RPTU), Germany/ Prof. Dr. Geng Liu, Northwestern Polytechnical University; Shaanxi Engineering Laboratory for Transmissions and Controls, China | **Efficiency & friction**  
Moderation: Dr.-Ing. Ralf Möllendorf, Flender GmbH, Germany/ Dr.-Ing. Toni Weiss, Gear Consultant, ret. from RENK GmbH, now GanaCon – Gear analysis and Consulting, Germany |
| 08:30 Parametric system simulation of load sharing in planet stages  
- FE simulation of contact behavior in planetary stages to analyse load sharing  
- Influence of stiffness of structural components and of misalignments on load sharing  
**Dipl.-Ing. Jean-André Meis**, Head of Technology and Materials, Technology & Innovation, Flender GmbH, Bocholt, Germany | 09:00 Mesh load factor in multiple planetary stage gearboxes  
- System understanding of a gearbox with 3 planetary stages  
- Interaction of planetary stages and those impact on mesh load factor  
**Abdul Baseer, M. Eng.**, Simulation Engineer, Dr.-Ing. Björn Bauer, Head of Gearbox Development, Cong Wang, M. Eng., General Manager, DHH Germany GmbH, Bochum, Germany | 09:00 Simulation-based optimization of gearing efficiency using DLC coatings  
- Potential of tooth flank coatings for friction reduction  
- Impact of thermo-physical properties of a coating  
**Dipl.-Ing. Ronny Bellicke**, Project Engineer, Prof. Dr.-Ing. Dirk Bartel, CEO; Dr.-Ing. Lars Bobach, Software Developer, Tribotronics GmbH, Magdeburg, Germany |
| 09:00 Assessing gear mesh misalignment in a helical gear set by transmission error measurements  
- Indirect gear flank load distribution assessment  
- Gear transmission error versus flank load distribution  
**Nico De Bie, M. Sc.**, Gear Technology Engineer, Wim Smet, B. Sc., Gear Expert Engineer, Product Technology, Business Unit Wind Power Technology, Tom Van Der Kamp, B. Sc., Test Engineer, NWH & Loads, ZF Wind Power, Lommel, Belgium | 09:30 Assessing gear mesh misalignment in a helical gear set by transmission error measurements  
- Indirect gear flank load distribution assessment  
- Gear transmission error versus flank load distribution  
**Nico De Bie, M. Sc.**, Gear Technology Engineer, Wim Smet, B. Sc., Gear Expert Engineer, Product Technology, Business Unit Wind Power Technology, Tom Van Der Kamp, B. Sc., Test Engineer, NWH & Loads, ZF Wind Power, Lommel, Belgium | 09:30 Gearbox efficiency of eDrives: Correlation between measurement and calculation of load-dependent torque losses  
- Calculation of gearbox efficiency  
- Correlation between measurement and calculation  
**Dr.-Ing. Mustafa Yılmaz**, Development Engineer Gear Design, Gear Development, ZF Friedrichshafen AG, Friedrichshafen, Germany |
| 10:00 Helicopter drive system safety dissertation  
- Helicopter gearbox failure detection system design & testing  
- Loss of lubricant conditions: design & testing phase  
**Sergio Sartori, Eng.**, Head of Analysis & Innovation, Transmission Systems Design & Development, Leonardo SpA, Samarate, Italy | 10:30 High ratio gearbox with very low bearing loads  
- Smart gear system for health monitoring  
- Wireless health monitoring during operation  
**Dr. Daisuke Iba**, Professor, Department of Mechanical Engineering, Kyoto Institute of Technology, Kyoto, Japan | 10:30 Modifying gear surface to achieve higher efficiency  
- Modifying gear surface by superfinishing and coating  
- Quantifying efficiency gains by surface engineering  
**Jishan Zhang, PhD**, Senior Test Engineer, Design Unit, School of Engineering, Newcastle University, Newcastle upon Tyne, United Kingdom |
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<th>Lecture Room A</th>
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<td><strong>Load capacity</strong>&lt;br&gt;Moderation: Prof. Dr.-Ing. Karsten Stahl, Technical University of Munich, Garching, Germany</td>
<td><strong>NVH</strong>&lt;br&gt;Moderation: Dr.-Ing. Bernhard Bouché, Getriebebau NORD GmbH &amp; Co. KG, Germany</td>
<td><strong>Digitalization of the product development process</strong>&lt;br&gt;Moderation: Dr.-Ing. Burkhard Pinnekamp, RENK GmbH, Germany</td>
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<td>11:00 Review of the definition of the loads for spur and helical gears in standards and handbooks&lt;br&gt;• Gear load definition&lt;br&gt;• Teaching exercise&lt;br&gt;&lt;br&gt;Luc Amar, PhD, Research Engineer, Power Transmissions (TDP), CETIM (Technical Center for Mechanical Engineering Industries), Senlis Cedex, France; Dr.-Ing. Ulrich Kissling, President, KISSsoft AG, Bubikon, Switzerland</td>
<td>11:30 Hybrid models for the simulation of displacements and stresses in light-weight gears&lt;br&gt;• Modeling showing displacement and stress within the gear body&lt;br&gt;• Interaction between body stress and dynamic mesh force&lt;br&gt;&lt;br&gt;Dr.-Ing. Bérengère Guibert, Associate Professor, Prof. David Dureisseix, Full Professor, Prof. Dr.- Ing. Philippe Vélex, Full Professor, LaMCoS, INSA – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cédex, France</td>
<td>12:45 Opportunities arising from digital twins in gear development&lt;br&gt;• Photogrammetric mapping of 2D photo data onto a virtual 3D gear&lt;br&gt;• Automatic correction of the contact pattern for bevel gears&lt;br&gt;&lt;br&gt;Dipl.-Ing. Constantin van Oss, Research Associate, Dr.-Ing. Stefan Schumann, Chief Engineer, Prof. Dr.- Ing. Berthold Schlecht, Full Professor and Head of Institute of Machine Elements and Machine Design, Faculty of Mechanical Science and Engineering, Technische Universität Dresden, Germany</td>
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<td>12:00 Development of damage-based accelerated life test code for gearbox using genetic algorithm&lt;br&gt;• Methodology for mechanical component life test estimation&lt;br&gt;• Guarantee the mechanical components life within short period of time&lt;br&gt;&lt;br&gt;Jung-Ho Park, PhD Student, Biosystems engineering, Seoul National University, Seoul, Republic of Korea</td>
<td>12:30 Experimental investigation of influence of spacing errors on gear rattle&lt;br&gt;• Vibration impacts of gearshaving spacing errors under lightly loaded, operating conditions&lt;br&gt;• Gear set-up with external torque fluctuation capabilities and associated instrumentation&lt;br&gt;&lt;br&gt;Prof. Ahmet Kahrman, Professor and Director, Dr. Ata, Donmez, Postdoctoral Researcher, Gear and Power Transmission Research Laboratory, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, Ohio, USA</td>
<td>14:15 The impact of different reliability data on a cloud-based gearbox digital twin using telematic data&lt;br&gt;• Set up of a cloud-based digital twin using telematic data from vehicles&lt;br&gt;• Interpretation of different reliability data in this digital twin and its implications&lt;br&gt;&lt;br&gt;MA MEng CEng MIMechE, Barry James, Senior Technical Leader, Research and Innovation, Romax Technology, Ltd., Nottingham, United Kingdom; Dipl.-Ing. (FH) Detlev Runkel, Senior Solutions Strategist, Hexagon Applied Solutions Group, Garching, Germany</td>
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<td>12:30 Closing remarks</td>
<td>12:45 Awarding of the best presentation for junior engineers by&lt;br&gt;&lt;br&gt;Prof. Dr.-Ing. Karsten Stahl, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany</td>
<td>13:00 Awarding of the best paper by&lt;br&gt;&lt;br&gt;Dr.-Ing. Franz Völkel, Sr. Vice President R&amp;D Bearings, Schaeffler Technologies AG &amp; Co. KG, Herzogenaurach, Germany</td>
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<td>+ Lunchtime snack</td>
<td>14:15 End of the conference</td>
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The Gear Research Center (FZG) of the Technical University of Munich has comprehensive facilities for examination and testing of machine elements, such as gears, bearings, synchronizations and couplings. Based on the research results developed here during the past decades, FZG is the leading international research institute for gears and transmissions today. Development and validation of methods and tools of reliable determination of fatigue life, efficiency, and vibration characteristics of gears and transmission elements are in focus of research activities at FZG. Implementation of the research is carried out in close cooperation with industry and standardization organizations, funded either through public research grants or industrial collective and contract research.

International Conference on Gears 2023
Technical University of Munich
TUM School of Engineering and Design
Institute of Machine Elements
Gear Research Center (FZG)
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How to find us
Find all travel information at a glance!
P1 Modelling and analysis of the effect of root modification on load sharing and stress values in spur gears
Ali Imre Aydeniz, PhD, Mechanical Engineering, Istanbul Technical University (ITU), Istanbul, Turkey

P2 Exp. Campaign for Aviation Gears in Loss-of-Lubrication
Dipl.-Ing. Lorenz Braunmann, Research Engineer, Advanced Drivetrain Technologies GmbH, Vienna, Austria

P3 PVD deposition of Nb-MoS2 coatings on gear carburized steel
Angelo Carvalho, M. Sc., Research Assistant, Competence Center in Manufacturing, Aeronautics Institute of Technology, São José dos Campos, Brazil

P4 Testing and modelling of a 2.5 MW wind turbine gearbox: Influence of lubricant formulation
Carlos Fernandes, PhD, Assistant Professor, INEGI – Institute of Science and Innovation in Mechanical and Industrial Engineering, Porto, Portugal

P5 Improvement of the transmission efficiency in electric vehicles by using double staggered helical gears
Dr. Ignacio Gonzalez-Perez, Full Professor, Department of Mechanical Engineering, Materials and Manufacturing, Universidad Politécnica de Cartagena, Spain

P6 Method for calculating the tooth root nominal stress in worm gear shafts
Johannes Gründler, M. Sc., Research Assistant, Institute for Chemical, Material- and Product Development, Nuremberg Institute of Technology, Germany

P7 Developing CAE solutions for robotics gears: Cycloidal and Strain Wave Gear Drives. Leveraging more mature robust technologies from the automotive industry
Owen Harris, PhD, Research Department Manager, Research, Smart Manufacturing Technology, Nottingham, United Kingdom

P8 Development of simulation model considering various manufacturing errors of helical gear
Dongu Im, Student/PhD candidate, Researcher, Department of Biosystems Engineering, Design of Off-Road Equipment and Soil-Machine Systems, College of Agriculture and Life Sciences, Seoul National University, Korea

P9 A study on the efficiency prediction of a gear bearing drive by means of mathematical modelling
Bahadir Karba, PhD candidate, Transmission & Powertrain Design Engineer Lvl III., Research & Development, TR Transmission engineering Inc., Ankara, Turkey

P10 Backlash optimization via compatible gear couples on the assembly lines for planetary gearboxes
Bahadir Karba, PhD candidate, Transmission & Powertrain Design Engineer Lvl III., Research & Development, TR Transmission engineering Inc., Ankara, Turkey

P11 Classifying plastic beveloid gear quality considering manufacturing errors
Bahadir Karba, PhD candidate, Transmission & Powertrain Design Engineer Lvl III., Research & Development, TR Transmission engineering Inc., Ankara, Turkey

P12 Investigation of the electrical impedance of the gear mesh of a spur gear in an industrial gearbox
Prof. Dr.-Ing. Eckard Kirchner, Director, Institute of Product Development and Machine Elements, Technische Universität Darmstadt, Germany

P13 Development of optimal design program for planetary gear set macro-geometry using multi-objective optimization algorithm
Beom-Soo Kim, Lab. for Off-Road Equipment and Soil-Machine Systems Design, Department of Biosystems Engineering, Seoul National University, Seoul, Korea

P14 Test rig trials on transmissions for lubricant aging and analysis of the properties of used lubricants
Timo König, M. Eng., Research Assistant, Institute for Drive Technology Aalen, Hochschule Aalen – Technik und Wirtschaft, Germany

P15 Parameter based definition of eccentric cycloid gearings
Stefan Landler, M. Sc., Research Associate, Institute of Machine Elements, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

P16 Model based NVH design: E-bike application
Dr.-Ing. Herve Mahe, NVH Master Expert, NVH discipline manager, New Mobility Center, Valeo Transmissions, Amines, France

P17 Effect of overlap ratio on gear dynamic behavior and noise level
Joao Marafona, M. Eng., PhD Student, Tribology, Vibrations and Industrial Management Unit, INEGI – Institute of Science and Innovation in Mechanical and Industrial Engineering, Porto, Portugal

P18 Overview of gear mesh and bearing frequencies and their application in a heavy-duty industrial gearbox condition monitoring
Sebastjan Matković, M. Eng., Developer & Researcher, KISSsoft AG, Bubikon, Switzerland

P19 Influence of misalignment of large cylindrical gears on contact pattern in operation
Prof. Dr.-Ing. Aleksandar Miltenović, Professor, Department for mechanical design, development and engineering, Faculty of Mechanical Engineering, University of Niš, Serbia

P20 Gear geometry, size and material influences not captured in ISO 6336
Wim Smet, B. Sc., Gear Technology, ZF Wind Power Antwerpen N.V., The Netherlands

P21 Numerical simulation of low-temperature lubrication in gear models using MPS method
Chunhui Wei, PhD Student, School of Mechanical Engineering, Beijing Institute of Technology, China and INSA – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cédex, France

P22 Three-dimensional dynamic contact behaviors of gear pairs with various tooth fank errors
Dr. Bing Yuan, Professor, Xi’an Technological University, China

P23 Meshing limit line of offsetting ZC1 worm drive
Prof. Dr. Yaping Zhao, College of Mechanical Engineering and Automation, Northeastern University China, Shenyang City, China

P24 A novel dynamic modeling method of high-speed thin-rimmed gear transmission
Jiayu Zheng, M. Sc., PhD student, State Key Laboratory of Mechanical Transmissions, Chongqing University, China
5th International Conference on Gear Production 2023
September 13 - 15, 2023, Garching/Munich, Germany

Key topics:
• Sustainable gear production
• Inline quality inspection for gear production
• Additive manufacturing of gears
• Performance of new gear materials in gear manufacturing
• Hard finishing of high performance gears
• Innovative processes for gear manufacturing

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 Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

The conference will give you the answers to these questions:
• How do we manufacture high performance gears in the future?
• What are best practices for the additive manufacturing of gears?
• How do we increase sustainability in gear manufacturing?
• Which digital solutions drive gear production?
• What are the innovations in gear metrology?

Further details and the final program can be found here:
www.vdiconference.com/02TA411023

5th International Conference on High Performance Plastic Gears 2023
September 13 - 15, 2023, Garching/Munich, Germany

Key topics:
• Carbon footprint assessment of sustainable plastic materials
• Influence of manufacturing on gear quality and load capacity
• Recent calculation methods for load capacity and excitation behavior
• Recent test methods of plastic gears
• Optimizations of plastic gears

Presidency:
Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Center (FZG), TUM School of Engineering and Design, Technical University of Munich, Garching, Germany

Conference Board:
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Ingo Decker, M. Eng., Gear Development, Group Wide Components, Corporate Research & Development, ZF Friedrichshafen AG, Friedrichshafen, Germany
Dr.-Ing. Ulrich Kissling, President, KISSsoft AG, Bubikon, Switzerland
Dr.-Ing. Andreas Langheinrich, Development Drive Technology, Horst Scholz GmbH & Co. KG, Kronach, Germany

The conference will give you the answers to these questions:
• How can the carbon footprint of plastic gears be assessed and optimized?
• How can plastic gears be recycled?
• How can lubrication improve the performance of plastic gears?
• How can the NVH-behavior of plastic gears be evaluated and optimized?
• How does the manufacturing process impact gear performance and cost?

Further details and the final program can be found here:
www.vdiconference.com/02TA409023
Gears Interactive – New ideas, more added value for your business

**GearArena**

**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! You will find an on-site contact person from the exhibitor to answer all your questions.

**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 Center (FZG). Several guided tours with different 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.

**Speakers meetup**

**Do you still have unresolved questions?**
You can address your questions to the speakers right after the lecture during the coffee break. Take the chance to say hello to your favorite speaker and to connect with them. They will be available for at least 15 minutes after their session.

**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 on-site.

**Two gear community nights**

**Your networking hotspot for the international gear community!**
Enjoy the evening reception at the ‘Löwenbräukeller’ as well as another social event at the university. The ‘Löwenbräukeller’ is a restaurant with a long tradition offering modern Bavarian cuisine.
Both – the get-together at the FZG and the brewery visit – offer you an excellent opportunity to network with your peers and catch up on trends.
Presidency

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Prof. Ray Snidle, Emeritus Professor of Mechanical Engineering, Cardiff University, United Kingdom
Dr.-Ing. Toni Weiss, Gear Consultant, ret. from RENK GmbH, Augsburg, now GanaCon – Gear analysis and Consulting, Innin, Germany

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Prof. Dr.-Ing. Aleksandar Miltenović, Professor, Department for mechanical design, development and engineering, Faculty of Mechanical Engineering, University of Niš, Serbia

Robin Olson, M. Sc., Director of Applications Engineering, Engineered Gear, Regal Rexnord Corporation, Milwaukee, Wisconsin, USA

Prof. Dr.-Ing. Jose I. Pedrero, Full Professor, Department of Mechanics, Faculty of Engineering, Universidad Nacional de Educación a Distancia (UNED), Madrid, Spain

Prof. Dr. Datong Qin, Full professor, Distinguished professor and Honorary Dean of School of Mechantronics and Vehicle Engineering, Chongqing Jiaotong University, China

Prof. Dr.-Ing. Philippe Velex, Full Professor, LaMCoS, INSA – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cédex, France

Prof. Wenzhong Wang, School of Mechanical Engineering, Beijing Institute of Technology, China

Prof. Dr.-Ing. Michael Weigand, Full Professor and Head of Research Unit – Institute for Engineering Design and Product Development (IKP), Research Unit Machine Elements and Transmissions for Aviation, TU Wien, Vienna, Austria

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Schaeffler Digital Solutions GmbH
Smart Manufacturing Technology Ltd., UK
Stagnoli T.G. S.r.L.
Telemetrie Elektronik GmbH
Weißen und Griefßhaber GmbH
Winkelmann Flowforming

The participants – Your customers

Attendees in 2022

<table>
<thead>
<tr>
<th>Experts:</th>
<th>46 %</th>
<th>Research and Development:</th>
<th>40 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project manager:</td>
<td>25 %</td>
<td>University/research institutions:</td>
<td>18 %</td>
</tr>
<tr>
<td>Production engineer:</td>
<td>17 %</td>
<td>Construction and development:</td>
<td>17 %</td>
</tr>
<tr>
<td>Project management:</td>
<td>7 %</td>
<td>Production:</td>
<td>9 %</td>
</tr>
<tr>
<td>Others:</td>
<td>5 %</td>
<td>Sales:</td>
<td>9 %</td>
</tr>
</tbody>
</table>

Others: 7 %
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