

VDI



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the world
October 5–7, 2015

International Conference on Gears 2015

WITH EXHIBITION

ASSOCIATED ORGANISATIONS



American Gear Manufacturers
Association AGMA, USA



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Canadian Society for
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Romanian Association of
Mechanical Transmissions



Scientific Society of
Mechanical Engineers, Hungary



The Institution of
Engineers, India



The Korean Society of
Mechanical Engineers, Korea



The Society of Instrument and
Control Engineers, Japan

DATE AND VENUE

October 5–7, 2015

Technische Universität München (TUM),
Garching (near Munich), Germany



HIGHLIGHTS

- + Panel discussion on "Gears 4.0"
- + Exchange of knowledge in five simultaneous tracks with more than 130 speakers
- + Two social evening events for excellent networking with colleagues

+ ACCOMPANYING VDI CONFERENCES

October 5–6, 2015

- » International Conference on Gear Production 2015
- » International Conference on High Performance Plastic Gears 2015



PRESIDENCY

Conference President:

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

Vice President:

Dr.-Ing. Bernhard Bouché, Technical Director, Getriebbau NORD GmbH & Co. KG, Bargteheide, Germany

Vice President:

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

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Dr.-Ing. Harald Naunheimer, Executive Vice President Research and Development ZF Group, ZF Friedrichshafen AG, Friedrichshafen, Germany

PROGRAMME COMMITTEE – NATIONAL MEMBERS

Prof. Dr.-Ing. Dr. h. c. Albert Albers, Full Professor and Head of IPEK – Institute of Product Engineering, Department of Mechanical Engineering, Karlsruhe Institute of Technology (KIT)

Dr.-Ing. Jörg Börner, Expert for Gearing Fundamentals and Software, Gear Development, ZF Friedrichshafen AG

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Dr.-Ing. Hartmut Faust, Senior Vice President R&D Transmission Systems, LuK GmbH & Co. KG, Bühl

Dr.-Ing. Hubert Gröhllich, Head of Development Dual Clutch Transmission, Volkswagen AG, Wolfsburg

Dipl.-Ing. Bernhard Hagemann, Deputy Managing Director, Research Association for Drive Technology (FVA), Frankfurt/Main

Dr.-Ing. Ralf Hess, Senior Key Expert, Drive Technology, Mechanical Drives, Siemens AG, Bocholt

Dr.-Ing. Jörg Hermes, Head of Development, Standard Gear Units, SEW-EURODRIVE GmbH & Co. KG, Bruchsal

Prof. Dr.-Ing. Georg Jacobs, Full Professor, Institute for Machine Elements and Machine Design, Faculty for Mechanical Engineering, RWTH Aachen University

Dr.-Ing. Uwe Keller, Director Transmission and Drivetrain Mercedes-Benz Cars, Daimler AG, Stuttgart

Martin Korff, Manager Gear Dev., Process & Tooling, GETRAG FORD Transmissions GmbH, Köln

Prof. Dr.-Ing. Erhard Leidich, Director, Institute of Design Engineering and Drive Technology, Department of Mechanical Engineering, Technical University of Chemnitz

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

Prof. Dr.-Ing. Gerhard Poll, Director, Institute for Machine Design and Tribology, Leibniz University Hannover

MONDAY, OCTOBER 5TH, 2015, 1ST CONFERENCE DAY

08:30 Registration

PLENARY LECTURES

09:30



Welcome and opening by the conference president

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

09:40



Keynote speech

Prof. Dr. Dr. h.c. mult. Wolfgang A. Herrmann, President, Technische Universität München (TUM), Germany

10:00



Keynote speech: I 4.0 changes gears

Dr.-Ing. E. h. Manfred Wittenstein, Chairman of the Supervisory Board, WITTENSTEIN AG, Igersheim, Germany

PANEL DISCUSSION: "GEARS 4.0"

10:20



MODERATION: Ken Fouhy, B.Eng., Editor in Chief, VDI nachrichten, Düsseldorf, Germany



M.M.E. Giuliano Spaggiari, Managing Director, Brevini Power Transmission S.p.A., Reggio Emilia, Italy



Dr.-Ing. E. h. Manfred Wittenstein, Chairman of the Supervisory Board, WITTENSTEIN AG, Igersheim, Germany



Dr. Eng. Masahiko Mori, President, DMG MORI SEIKI CO., LTD., Nagoya City, Japan



Dr.-Ing. Jianhui Gou, Managing Director & President, NGC Gears, Nanjing, China



Francois Barthel, Vice President Manufacturing GETRAG Operations, GETRAG Getriebe- und Zahnradfabrik, Hermann Hagenmeyer GmbH & Cie KG, Untergruppenbach, Germany



Joe T. Franklin, Jr., President, AGMA, Alexandria, Virginia, USA



Dr. Eng. Makoto Fujishima, Senior Executive Officer, DMG MORI SEIKI CO., LTD., Nagoya City, Japan

11:40



Information and invitation to the FZG lab tours

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

11:45 Lunch break and visit to the exhibition and poster presentations

Conference will continue in parallel sessions, First Section 13:15–15:15

Lecture Room A

WIND

Dr.-Ing. Arbogast M. Grunau, Research Association for Drive Technology (FVA) and Schaeffler Technologies GmbH & Co. KG, Germany / **Prof. Dr. Eng. Ichiro Moriwaki**, KIT Liaison Center, Kyoto Institute of Technology, Japan

13:15

High ratio gearbox with very low bearing loads

- Performance optimisation for the vehicle transmission
- Influence of the optimised lubricant fluid technology

Prof. Dr.-Ing. Peter Tenberge, Full Professor, Chair of Industrial and Automotive Drivetrains, Mechanical Engineering, Ruhr-University Bochum, Germany

13:45

A new concept for the assessment of structural integrity considering local plastification of cast parts in gearboxes

- Effect of material quality on static and fatigue strength
- Effect of local plastification on fatigue strength

Dipl.-Ing. Jean-André Meis, Development engineer, Siemens AG, Bocholt, M. Eng. Alexander Kamps, CAD engineer, Siemens AG, Voerde, Dipl.-Ing. (FH) Arno Klein-Hitpass, Head of R&D, Siemens AG, Aachen, Germany

14:15

From a safety factor driven concept to reliability rating of a multi-mega-watt wind (MMW) energy gearbox

- Reliability engineering: determination of reliability limiting failure mechanisms and oversized gearbox components
- Gearbox system reliability calculation: prediction of the gearbox system lifetime considering dominating failure mechanisms

Dr.-Ing. Falko Thoma, Team Manager, Verification and Validation, Dr.-Ing. Dirk Strasser, Design Department Manager, M.Sc. Philipp Schmaltz, Calculation Engineer, BOSCH Rexroth AG, Witten, Germany

14:45

Case study and test observations on helical gearing with plain bearings in a 2 MW wind turbine gear unit

- Comparison of gear geometry solutions with respect power density, noise and vibrations, efficiency
- Test results from intensive bench testing

Dipl.-Ing. Dirk-Olaf Leimann, Gear Technology, Manager Gear Technology & Advanced Engineering, ZF Wind Power Antwerpen NV, Lommel, Belgium

15:15 Coffee break and visit to the exhibition and poster presentations

Lecture Room B

MOBILE APPLICATIONS

Prof. (TUM emeritus of excellence) Dr.-Ing. Bernd-Robert Höhn, Technische Universität München, Germany / **Prof. Dr. Changle Xiang**, Beijing Institute of Technology and National Key Lab of Vehicle Transmission, China

Local efficiency grade of bevel and hypoid gears - Determination of gear efficiency by means of loaded TCA

- Efficiency of Bevel and Hypoid Gears
- Local Tooth Contact Analysis für Efficiency

Dr. Christian Wirth, Geschäftsführer, ZG GmbH, Garching

Bearings for gearing - roller gearing technology

- Presenting our R&D progress in roller gearing - a novel mechanism for gearing and transmissions where purely rolling balls (rollers) are employed to intermediate between the input and output wheels
- Discussing selected examples of application projects done so far ranging from miniature wrist watch to gigantic wind turbine gears, proposing further ideas for more potential applications

Dr. Pál Bogár, Director, sincroll drive technologies kft., Budapest, Hungary

Multiple drive for vertical roller mills – example for integrated drive systems

- Holistic view on a frequency inverter operated 16 MW electro-mechanical drive system
- Improvement of life cycle costs by gear unit design features and integrated load and condition monitoring

Dr.-Ing. Jörg Deckers, Senior Key Expert Engineering, Dietmar Uebbing, Senior Key Expert Engineering, Customer Service, Siemens AG, Voerde, Germany

Micro-pitting failure analysis and lesson learned in helicopter planetary gears

- Failure analysis and expertise investigation executed on helicopter planetary reduction stage gears affected by micro-pitting
- Identification of the most relevant design parameters of the case study, detailing lesson learned and corrective actions

Eng. Sergio Sartori, Gear Design Specialist, Research Unit Responsible, Eng. Giuseppe Gasparini, Head, Transmission Systems Design & Development, AgustaWestland S.P.A., Cascina Costa di Samarate (Varese), Italy, Prof. Dr.-Ing Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Lecture Room C

MICRO GEOMETRY

Dr.-Ing. Reiner Vonderschmidt, Georgii Kobold GmbH & Co. KG, Germany / **Prof. Dr. Eng. Jože Duhovnik**, University of Ljubljana, Slovenia

Consideration of technology dependent deviations in designing gear micro geometry

- Effective simulation of manufacturing deviations
- Use of topographies in detailed tooth contact analysis

Dr.-Ing. Jörg Börner, Expert for Gearing Fundamentals and Software, Gear Development, ZF Friedrichshafen AG, Germany

Increased tooth bending strength and pitting load capacity of fine module gears

- Calculation of load capacity for fine module gears
- Higher power density in small gear applications

Dipl.-Ing. Andreas Dobler, Research Associate, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Dr.-Ing. Maria Hergesell, Head of Technology, WITTENSTEIN bastian GmbH, Fellbach, Germany

Quality dependent lifetime prognosis of micro gears

- Modelling of the relationship of measured shape deviations and the lifetime of micro gears
- Prognosis of the gear lifetime based on the model

M.Sc. Dipl.-Wi.-Ing. Benjamin Häfner, Research Assistant, Quality Assurance, Prof. Dr.-Ing. Gisela Lanza, Head, wbk Institute of Production Science, Karlsruhe Institute of Technology (KIT), Germany

Impact of gear finishing operation on micro geometry

- Capabilities of micro geometry modifications in certain manufacturing processes
- Simulation of failure influences on tooth micro geometry

Dipl.-Ing. Simon Kimme, Research Associate, Adaptronics and Acoustics, Dipl.-Ing. Ruben Bauer, Research Associate, Cutting Technology, Prof. Dr.-Ing. Welf-Guntram Drossel, Director, Fraunhofer Institute for Machine Tools and Forming Technology IWU, Dresden, Germany

Second section 16:00–18:00

Lecture Room A

PLANETARY GEARS

Dr.-Ing. Ralf Georg Wittor, Eickhoff Antriebstechnik GmbH, Germany / **Dipl.-Ing. Dirk-Olaf Leimann**, ZF Wind Power Antwerpen NV, Belgium

16:00 Low-loss gears for high efficiency precision planetary gearboxes: influence of the gear design on the meshing and the churning power losses

- Substantial efficiency increment by topological modification of the teeth shape
- Experimental validation of the analytical/numerical approach (CFD) in order to map the thermal and efficiency behavior of the gearbox under several operating conditions

Dr.-Ing. Franco Concli, R&D Senior Engineer, Bonfiglioli Mechatronic Research S.P.A., Rovereto, Italy

16:30 On optimum tooth profile modifications to minimize dynamic mesh forces in planetary gears

- Presentation of numerous numerical simulations illustrating the significant role of tooth profile modifications on dynamic tooth loads
- Profile modification performances are illustrated at various speeds and loads

Mechanical Engineer Matthieu Chapron, PhD student, Laboratory Engineer, Ing. Samuel Becquerelle, Head of the R&T department, Hispano-Suiza SA, Colombes, Dr. Ing. Philippe Velez, Full Professor, LaMCoS, INSA – Institute National des Sciences Appliquées de Lyon, Villeurbanne Cédex, France

17:00 Finite element method based analysis of planetary gear systems considering backlash and manufacturing errors

- Implementation of finite element method in the analysis of planetary gear systems
- Influence of the backlash and manufacturing errors on the performance of planetary gear systems

Prof. Dr. Eng. Athanassios Mihailidis, Head of the Laboratory of Machine Elements and Machine Design, Dipl. Eng. Emmanouil Bouras, Research Associate, Dipl. Eng. Emmanouil Athanasopoulos, PhD candidate, Mechanical Engineering, Aristotle University of Thessaloniki, Greece

17:30 Calculation approach for load capacity calculation of the tooth root of thin walled planetary wheels for planetary drives with high peripheral speeds

- Load capacity calculation of toothing for thin walled realized planetary gear rims
- Calculation of the flexible and deformable circular ring with alternating load and high centrifugal force

Dr.-Ing. Frank Baumann, Engineer for development and design, Gear Design, Business Unit power, oil and gas, Voith Turbo GmbH & Co. KG, Crailsheim, Dipl.-Ing. Johannes Woller, scientific assistant, Institute for solid state mechanics, Chair of Dynamics and Mechanism, Faculty of Mechanical Science and Engineering, Technical University of Dresden, Germany



Source: R&K Gastronomie GmbH

Lecture Room B

HYPOID GEARS

Prof. Dr.-Ing. Erhard Leidich, Technical University of Chemnitz, Germany / **Eng. Amir Aboutaleb**, American Gear Manufacturers Association, USA

Optimization of hypoid gear design for high efficiency drives

- The high accuracy prediction method of hypoid gear meshing efficiency
- Optimization of hypoid gear design for high efficiency drives

Dipl.-Ing. Kazuhiro Takaki, Gear engineer, Dipl.-Ing. Masaki Sugimoto, Expert Leader, Dipl.-Ing. Atsushi Hayata, Manager, Powertrain Technology and Prototype Development Department, Nissan Motor CO., Ltd., Kanagawa, Japan

Efficiency and load capacity of conjugate-curve gears

- Meshing theory of conjugate-curve gears
- Experimental investigation of conjugate-curve gears

Prof. Bingkui Chen, Director, B.Eng. Yane Gao, The State Key Laboratory of Mechanical Transmissions, Chongqing University, Chongqing, China

New method for calculation of the load carrying capacity of bevel and hypoid gears regarding tooth flank fracture

- Load method for calculation of the load carrying capacity of bevel and hypoid gears regarding tooth flank fracture
- Influence of gear geometry, heat treatment and operating conditions

Dipl.-Ing. Ivan Boiadjiev, Research Assistant, Institute of Machine Elements, Dr.-Ing. Johann-Paul Stemmlinger, Head of Department EHL, Efficiency Worm and Bevel Gears, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Development of a dynamic simulation of hypoid gears considering flank topography

- Analyzing the running behavior of bevel gears
- Developing a method to optimize the running behavior

Dipl.-Ing. Peter Knecht, Work group leader, Research Group Gear Testing, Prof. Dr.-Ing. Christian Brecher, Full Professor, Head of Chair of Machine Tools, Dipl. Wirt.-Ing. Christoph Löpenhaus, Chief Engineer Gear Department, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University, Germany

Lecture Room C

ASYMMETRIC GEARS

Prof. Dr.-Ing. Bernd Sauer, University of Kaiserslautern, Germany / **Prof. Dr. Eng. Haruo Houjoh**, Tokyo Institute of Technology, Japan

Analysis and optimization of asymmetric epicyclic gears

- Asymmetric tooth gears allows the improvement of amplify power transmission density, increasing load capacity, and reduce size and weight
- Presentation a sample of application of asymmetric epicyclic gears

Dr./Ph.D. Alexander Kapelevich, President, AKGears, LLC, Shoreview, Minnesota, USA

Theoretical and experimental dynamic gears researches with advanced asymmetrical profile on having in gears of runout and profile deviation

- Essence of direct dynamic synthesis of gear teeth with asymmetrical tooth profile and its difference from other known methods of designing
- Results of measurement of vibrations of gearbox with asymmetrical teeth

Prof. Dr. Sc. Vladislav Dorofeev, Head of scientific researches, Dipl.-Ing. Viktor Golovanov, Chief, Department of Air Gears, Central Institute of Aviation Motors (CIAM), Dr.-Ing. Dmitry Dorofeev, Assistant Professor, MATI – Russian State Technological University, Moscow, Russia

Asymmetric gears: design, test and certification from a practical point of view

- Measurements and calculation of tooth root stresses
- Calculation of load carrying capacity for asymmetric gears

Dr.-Ing. Mara Ewering, Engineer R&D, Ph.D. Peter Michalke, test engineer, Dipl.-Ing. Michael Flinks, former student assistant, M.Sc., Siemens AG, Bocholt, Germany

Geometry, strain and deformation of asymmetric spur gearings

- Comprehensive handling of an additional degree of freedom in spur gear calculation
- Enhanced load capacity by geometrically reduced stress level

Dr.-Ing. Andreas Langheinrich, Development Drive Technology – Gearings in Plastic, Horst Scholz GmbH & Co. KG, Kronach/Gundelsdorf, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Evening Reception at the „Hacker-Pschorr Bräuhaus“ Munich

At the end of the first conference day we cordially invite you to our evening reception at the Hacker-Pschorr, a traditional Bavarian brewery with deep roots in Munich. Enhance your personal network and use the relaxed and informal atmosphere for deeper-going discussions with other participants and speakers. The name Hacker-Pschorr stands for a Munich brew tradition crafted over centuries, and acclaimed far beyond the borders of Bavaria throughout the entire world.



Dinner Speech

Johannes Hintersberger, Member of the Bavarian State Parliament, State Secretary in the Bavarian State Ministry of Finance, Regional Development and Regional Identity, Augsburg, Germany

Prof. Dr.-Ing. Bernd Sauer, Full Professor, Vice Dean and Head of MEGT – Institute of Machine Elements, Gears, and Transmissions, Department of Mechanical and Process Engineering, University of Kaiserslautern

Prof. Dr.-Ing. Berthold Schlecht, Full Professor, Institute of Machine Elements, Faculty of Mechanical Engineering, Technical University of Dresden

Dipl.-Ing. Michael Schöffmann, Head of Transmission Development, Audi AG, Ingolstadt

Prof. Dr. Alfred J. H. Schoo, Professor, Mechanical Engineering, Westfälische Hochschule Gelsenkirchen Bocholt Recklinghausen, University of Applied Sciences, Bocholt

Prof. Dr.-Ing. Peter Tenberge, Full Professor, Chair of Industrial and Automotive Drivetrains, Mechanical Engineering, Ruhr-University Bochum, Germany

Dr.-Ing. Joachim Thomas, Managing Director, ZG Hypoid GmbH, Eching

Dr.-Ing. Reiner Vonderschmidt, Managing Director, Georgii Kobold GmbH & Co. KG, Horb

Dr.-Ing. Ralf Georg Wittor, Managing Director, Eickhoff Antriebstechnik GmbH, Bochum

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Eng. Amir Aboutaleb, Vice President, Technical Division, American Gear Manufacturers Association, Alexandria, USA

Ir. J.J. Bos, Manager engineering and Director of Damen Schelde Gears, Vlissingen, The Netherlands

Prof. Dr. Eng. Jože Duhovnik, Full Professor, Head of LECAD Group Laboratory, Chair for Design and Transport systems, Faculty for Mechanical Engineering, University of Ljubljana, Slovenia

Prof. Dr. Geng Liu, Full Professor, Deputy Dean, School of Mechanical Engineering, Northwestern Polytechnical University, Director, Shaanxi Engineering Laboratory for Transmissions and Controls, Xi'an, China

Prof. Dr. Sc. Veniamin Goldfarb, Director, Institute of Mechanics, Izhevsk State Technical University, Russia

Prof. Ing. Carlo Gorla, Associate Professor, Department of Mechanical Engineering, Politecnico di Milano, Italy

Prof. Dr. Eng. Haruo Houjoh, Professor, Precision and Intelligence Laboratory, Precision Machine Devices Division, Tokyo Institute of Technology, Yokohama, Japan

Prof. Dr. Ahmet Kahraman, Howard D. Winbigler Professor and Director, Gear and Power Transmission Research Laboratory, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, USA

Dipl.-Ing. Dirk-Olaf Leimann, Gear Technology, Manager Gear Technology & Advanced Engineering, ZF Wind Power Antwerpen NV, Lommel, Belgium

Prof. Dr.-Ing. Athanassios Mihailidis, Full Professor, Head of the Laboratory of Machine Elements and Machine Design, Mechanical Engineering, Aristotle University of Thessaloniki, Greece

Prof. Dr.-Ing. Vojislav Miltenovic, Full Professor, Machines Development and Construction Centre, Faculty of Mechanical Engineering, University of Niš, Republic of Serbia

Prof. Dr. Eng. Ichiro Moriwaki, Professor of Mechanical and System Engineering, Director of KIT Liaison Center, Kyoto Institute of Technology, Kyoto, Japan

Dr. Michel Oetue, Senior Gear Consultant, Mechatronics, Power Transmissions and Sensors (MEC), CETIM (Technical Center for Mechanical Engineering Industries), Senlis, France

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

TUESDAY, OCTOBER 6TH, 2015, 2ND CONFERENCE DAY

First Section 08:30–10:00

Lecture Room A

PLANETARY GEARS

Prof. Dr.-Ing. Peter Tenberge, Ruhr-University Bochum, Germany / **Prof. Dr. Eng. Adam Döbröczöni**, University of Miskolc, Hungary

08:30 Analytical framework of planetary gearbox monitoring based on the machine current signature analysis

- Electro-mechanical coupling dynamics of the permanent magnetic synchronous motor (PMSM) based drive system
- Prediction of the load torque oscillation frequency and the time-varying mesh stiffness frequency

Dr. Kai Chen, Prof. Jibin Hu, department dean, Prof. Zengxiong Peng, prelector, School of Mechanical Engineering, Beijing Institute of Technology, China

Lecture Room B

GEAR DESIGN

Prof. Dr.-Ing. Michael Weigand, Vienna University of Technology, Austria / **Dr.-Ing. Jörg Hermes**, SEW-EURODRIVE GmbH & Co. KG, Germany

Statistical methods in gear design

- Geometrical generation and technical evaluation of gear design candidates
- Data presentation in order to assist the decision for final gear design

Dipl.-Ing. Stephan Hellenbroich, Engineer gear development, Gear Design, Process & Tools, Getrag Ford Transmissions GmbH, Köln, Germany

Lecture Room C

SPUR GEARS

Dr.-Ing. Burkhard Pinnekamp, Renk AG, Germany

Static and dynamic analysis of double-slope profile relief on high-contact-ratio spur gears

- Gear dynamics and noise: analysis of the influence of particular tooth shape modifications on dynamic tooth loading
- Optimization of tooth shape modification with regard to transmission error and dynamic factor

Prof. Dr.-Ing. Philippe Velez, Full Professor, Dr.-Ing. Jérôme Bruyère, Associate Professor, LaMCoS, INSA – Institute National des Sciences Appliquées de Lyon, Villeurbanne Cédex, France

Prof. Dr. Datong Qin, Full Professor, Vice Dean of Graduate School, Deputy Director of Academic Committee of State Key Lab on Mechanical Transmission, Director of Power Transmission Institute, Faculty of Engineering, Chongqing University, China

Prof. Ray Snidle, Professor of Mechanical and Engineering, School of Engineering, Cardiff University, United Kingdom

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

Prof. Dr.-Ing. Michael Weigand, Full Professor, Machine Design and Rehabilitation Engineering, Institute for Engineering Design and Logistics Engineering, Vienna University of Technology, Austria

Prof. Dr. Changle Xiang, Professor, Dean, School of Mechanical Engineering, Beijing Institute of Technology, Director, National Key Lab of Vehicle Transmission, China

BOARD OF GEAR EXCELLENCE

Prof. Dr.-Ing. Kiril Arnaudov, Emeritus Professor, Institute of Mechanics, Bulgarian Academy of Sciences, Sofia, Bulgaria

Prof. Dr. Eng. Adam Döbröczöni, Professor, Institute of Machine and Product Design, University of Miskolc, Hungary

Prof. Dr.-Ing. Manfred Hirt, Past President, Research Association for Drive Technology (FVA), Frankfurt/Main; former board of Renk AG, Augsburg, Germany

Prof. Dr. D. Houser, Emeritus Professor, Department of Mechanical-Engineering, Ohio State University, Columbus, USA

Prof. Dr.-Ing. Aizoh Kubo, General Manager, Research Institute for Applied Sciences, Kyoto, Japan

Prof. Dr.-Ing. habil. Heinz Linke, Emeritus Professor, Technical University of Dresden, Germany

Dr.-Ing. Toni Weiss, Gear Consultant, ret. from Renk AG Augsburg, now GanaCon – Gear analysis and Consulting, Inning, Germany

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POSTER PRESENTATIONS

P-1 Sustainable laser based surface-cleaning and preparation for welding and bonding in gear production
B.Sc. Tobias Weichert, Technology Consulting, Lean Lasersysteme GmbH, Herzogenrath, Germany

P-2 A brief overview on the evolution of the scientific theory of gearing: A preliminary discussion
Prof. Dr. Eng. Sci, Ph.D., Stephen P. Radzevich, Principal R&D Gear Transmission Engineer, Apex Tool Group, LLC, Lexington, USA

P-3 Electromechanical dynamic analysis for the motor-gear-drum system of the unmanned long-wall shearer
Changzhao Liu, State Key Laboratory of Mechanical Transmission, Chongqing University, China

09:00 Investigation of motion of planet gear considering its instantaneous rotation center under three axes driving planetary gear set
• Theory of three-axis driving planetary gear set based on driving test
• Power transmission mechanism of planet gear in the planetary gear set
Masao Nakagawa (BA), Graduate student, Doshisha university Graduate school of science and engineering, Kyoto, Japan

09:30 A computerized approach for load analysis of planetary gear drives with epitrochoid-pin tooth-pairs
• An efficient computerized approach for load analysis of multiple tooth contact
• Contact characteristics of cycloidal planetary drives
Dr.-Ing. Shyi-Jeng Tsai, Assistant Professor, Wei-Jhen Huang, Jin-Hao Huang, Graduate Students, Department of Mechanical Engineering, National Central University, Jhong-Li, Taiwan

10:00 Coffee break and visit to the exhibition and poster presentations

High-conformal gearing: a new look at the concept of Novikov gearing

- An increase of power density by means of (a) synthesizing the optimal contact geometry between the interacting tooth flanks of the gear and the pinion, and (b) the kinematics and the geometry of the gear pair
 - Gearbox size reduction causes by means of synthesizing a gear pair with the favorable design parameters
- Prof. Dr. Eng. Sci, Ph.D., Stephen P. Radzevich**, Principal R&D Gear Transmission Engineer, Apex Tool Group, LLC, Lexington, USA

About the necessity of flexible gears

- Simulation of flexible gears in (multi-body simulation) MBS
 - Accurate and efficient merge of FEM and MBS
- Dr.-Ing. Carsten Schulz**, Product Manager, SIMPACK GmbH, M.Sc. Steve Mulski, SIMPACK Wind, SIMPACK AG, Gilching, Germany

Second Section 10:45–12:45

Lecture Room A

NOISE

Dr.-Ing. Hartmut Faust, LuK GmbH & Co. KG, Germany / **Prof. Dr.-Ing. Vojislav Miltenovic**, University of Niš, Republic of Serbia

10:45 Effect of shot peening exposure time on the elemental accuracy deviation, noise and vibrational behavior of shaved spur and helical gears according to ALMEN saturation curve
• Influence of shot peening exposure time on noise behaviour and elemental accuracy
• Performance optimised exposure time of shot peening for helical gear in terms of gear’s noise and accuracy
Technical Expert Hossein Mohassel, Manufacturer of Gearbox and Steering System, Gearbox Research Center, P.h.D., Hasan Vafadar, Managing Director, Charkheshgar Co. (under the license of ZF Germany), Ph.D. Farid Vakili-Tahami, Department of Mechanical Engineering, University of Tabriz, Tabriz, Iran

11:15 Gear tooth profile for achieving both high load capacity and low noise performance
• Durability improvement for the transmission gears
• Downsize and reduce the weight
Ryohei Saito, Assistant Manager, Hardware System Development Department, JATCO Ltd., Kanagawa, Dr.-Ing. Yoshitomo Suzuki, Senior Expert, Production Division, JATCO Ltd., Shizuoka, Japan

11:45 Topographical tooth modifications in real running and for reduction of the noise excitation without load-capacity loss
• Using profile angle variation along tooth wide is an option for noise reduction
• Noise reduction without load-capacity loss is possible by using the same contact pressure level
Dr.-Ing. Johannes W. Vriesen, Senior Key Expert Gear Components, Winergy – Engineering Technology, Siemens AG, Voerde, Germany

12:15 Rapid simulation of bearing loads and stresses in thin-walled planetary gear rings
• Total rating life of deformed bearings
• Rapid simulation using transfer matrices
M.Sc. Lukas Quinkert, Scientific Assistant, Prof. Dr.-Ing. Peter Tenberge, Full Professor, Chair of Industrial and Automotive Drivetrains, Mechanical Engineering, Ruhr-University Bochum, Germany

12:45 Lunch break and visit to the exhibition and poster presentations

Lecture Room B

LOAD CAPACITY

Dr.-Ing. Ralf Hess, Siemens AG, Germany / **Prof. Ing. Carlo Gorla**, Politecnico di Milano, Italy

Standardized wear and temperature prediction for worm gears under non-steady operating conditions

- Improve standardized wear prediction method for worm gears
- Wear and temperature behavior of worm gears under non steady operating conditions

Dr.-Ing. Björn Sievers, Gear-Development Engineer, Dr.-Ing. Jörg Hermes, Head of Development, Standard Gear Units, SEW-EURODRIVE GmbH & Co. KG, Bruchsal, Dr.-Ing. Marius Berger, Project Manager R&D, Ed. Fitscher GmbH & Co. KG, Oberhausen, Germany

A dynamic load distribution model for parallel-axis gear pairs

- Spur and helical gear dynamic load distribution
- Dynamic contact and root stress

Dr. David Talbot, Research Scientist, Prof. Dr. Ahmet Kahraman, Howard D. Winbigger Professor and Director, Gear and Power Transmission Research Laboratory, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, USA

Revolving kinematics of profile modified gears: impact on load carrying capacity and transmission error

- Changing sliding directions
- Exact determination of load cycles

Dr.-Ing. Khashayar Nazifi, Head of R&D, ZAT R&D, ZOLLERN GmbH & Co KG, Herberlingen, Germany

Calculation of fatigue strength of transmission shafts with multiple notches according to the nominal stress concept by integrating FE-analysis results

- Integrating FEA results in the nominal stress based strength calculation
- New method for the determination of stress concentration factors at multiaxial stress states

Dipl.-Ing. Jörg Wendler, Research Associate, Prof. Dr.-Ing. Berthold Schlecht, Full Professor, Institute of Machine Elements, Faculty of Mechanical Engineering, Technical University of Dresden, Germany

Third Section 14:15–15:45

Lecture Room A

NOISE

Prof. Dr.-Ing Karsten Stahl, Technische Universität München, Germany / **Prof. Dr. Ing. Philippe Velex**, INSA – Institute National des Sciences Appliquées de Lyon, France

14:15 Magnetic gearboxes: comparing running noise and efficiency to gear transmissions
• Magnetic gearboxes transmit power without physical contact
• The contact-free power transmission leads to a significantly lower running noise and significantly higher efficiencies
Dipl.-Psych. B.Sc. (Elektro.-Ing.) Andreas Vonderschmidt, Managing Director, Dr.-Ing. Reiner Vonderschmidt, President, magnetica GmbH & Co. KG, Horb, Germany

Lecture Room B

LOAD CAPACITY

Prof. (TUM emeritus of excellence) Dr.-Ing. Bernd-Robert Höhn, Technische Universität München, Germany / **Ir. J.J. Bos**, Damen Schelde Gears, The Netherlands

A load distribution model of major-diameter-fit splines

- Major and minor diameter fit spline load distribution
- Spline contact pressure

Dr. David Talbot, Research Scientist, Prof. Dr. Ahmet Kahraman, Howard D. Winbigger Professor and Director, Dr. Jiazheng Hong, Graduate Research Assistant, Gear and Power Transmission Research Laboratory, Department of Mechanical and Aerospace Engineering, The Ohio State University, Columbus, USA

Lecture Room C

MEASUREMENT

Dr.-Ing. Joachim Thomas, ZG Hypoid GmbH, Germany / **Prof. Dr. Geng Liu**, Northwestern Polytechnical University and Shaanxi Engineering Laboratory for Transmissions and Controls, China

Reliable measurements of the diametrical dimension over balls

- Introduction of a novel measurement standard as well as a new measurement process for any measurements in double-flank contact
- A typical application in the field of gear inspection is the diametrical dimension over balls

Dipl.-Ing. (FH) Achim Wedmann, Technical assessor for the German Accreditation Body (DAkKS) of gear and thread measurement, calibration of gear and thread standards, Dr.-Ing. Karin Kniel, Head of department “Coordinate Metrology”, Dr. rer. nat. Martin Stein, Head of working group “Gear and Thread”, Physikalisch – Technische Bundesanstalt, Braunschweig, Germany

Technology for detecting nicked gears for a mass production final tester

- Detecting gear nicks simultaneously with the measurement of gear noise in the final tester process for transmissions
- Gear nick detection for multiple gears on the same shaft in a transmission

Dipl.-Ing. Kouji Matsuo, Parts Process Engineering Department, Machining Process Engineering Section No.2, Dr.-Ing. Yoshitomo Suzuki, Production Division, JATCO Ltd., Shizuoka, Japan

Recent advances in optical gear measurements – A new approach for fast measurements of large gears

- Geometric gear measurements using an optical 1-d sensor
- Geometry and roughness measurements of large gears

Dr.-Ing. Felix Balzer, Software Development Engineer, Dr. rer. nat. Markus Schäfer, Development Engineer, Hexagon Metrology GmbH, Wetzlar, Dipl.-Ing. Jan F. Westerkamp, Research scientist, Project manager EVEQT, Institute for Metrology, Automation and Quality Science, University of Bremen, Germany

Fast and versatile measurement of residual stress and hardness of gear and shaft materials – material defect, mal-hardening and change of residual stress by usage

- Measurement of residual stress
- Quality check of steel for gears

Prof. Dr.-Ing. Aizoh Kubo, General Manager, Research Institute for Applied Sciences, Kyoto, Prof. Dr.-Ing. Toshihiko Sasaki, Department of Mechanical Engineering, Ordinarius of Kanazawa University, Japan

Influence of profile modification on dynamic load of spur gear based on lateral-torsional-rocking coupled nonlinear dynamic model

- Nonlinear dynamic model when considering coupling effects among different freedoms
- Profile modification and optimization by introducing dynamic response

Prof. Hui Liu, Professor, Prof. Dr. Changle Xiang, Professor, Dean, School of Mechanical Engineering, Beijing Institute of Technology, Director, National Key Lab of Vehicle Transmission, Beijing, China, Dr. Cheng Wang, Engineer, China North Vehicle Research Institute, Beijing, China

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| 14:45 | <p>Simulating oil flow for Gearbox Lubrication using smoothed particle hydrodynamics</p> <ul style="list-style-type: none"> Computational fluid dynamics by mesh-free method Oil churning <p>Dr. Paul Groenenboom, Senior physicist, Redex innovation Centre, ESI-Group Netherlands, Delft, The Netherlands, Ing. Mohamed Zied Mettichi, Application & support engineer, Dr. Yacine Gargouri, General Manager, ESI Services Tunisie, Tunis, Tunisie</p> |
| 15:15 | <p>A novel cost-effective permanent magnet gear with soft magnetic composite modulator and Halbach magnetized rotors</p> <ul style="list-style-type: none"> Torque density optimization of permanent magnet gear Influence of modulator dimensions on cogging torque <p>PhD Stig Högberg, PhD Student, Nenad Mijatovic, Post Doc, Department of Electrical Engineering, Technical University of Denmark, Lyngby, Dr. Flemming Buus Bendixen, Magnet Specialist, Sintex a/s, Hobro, Denmark</p> |
| 15:45 | Coffee break and visit to the exhibition and poster presentations |

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| <p>Load adjusted design of the bevel gear stage of azimuthing thrusters</p> <ul style="list-style-type: none"> Complex stress analysis of gearings Tooth interior fatigue in gearings <p>Dipl.-Ing. Christian Bauer, Scientific Associate, Prof. Dr.-Ing. Berthold Schlecht, Full Professor, Dr.-Ing. Thomas Rosenlöcher, scientific associate, Institute of Machine Elements, Faculty of Mechanical Engineering, Technical University of Dresden, Germany</p> | <p>Efficient calculation of load distribution and design of tooth flank modifications in planetary gear systems</p> <ul style="list-style-type: none"> Static load and deformation analysis in a fully coupled mechanical model of a gear box structure with LAPLAsN Design of tooth flank modification considering manufacturing errors and eccentricities <p>Dipl.-Ing. Benedikt Neubauer, 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 Centre (FZG), Technische Universität München (TUM), Garching, Germany</p> |
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| <p>Non-linear dynamic analysis of geared systems with FEM simulation</p> <ul style="list-style-type: none"> Which low-cost digital encoders were used to reach industrial applicability How measurements of high quality were obtained (submicron resolution and repeatability) <p>Ir. Laurent Britte, Product Line Manager, Siemens PLM - Simulation and Test Solutions, Siemens Industry Software NV, Leuven, Belgium</p> | <p>Design, simulation and modal dynamics of gears and transmissions</p> <ul style="list-style-type: none"> Innovative models for gear trains with improved parameters and technical indicators Influence of natural frequencies, natural modes and vibration amplitude upon different types of gears <p>Prof. PhD Antoaneta Dobрева, Lecturer, Department of Machine science, Machine elements and Engineering Graphics, Assoc. Prof. PhD Vasko Dobrev, Vice Dean, PhD Svetlin Stoyanov, Chief assistant, Faculty of Transport, University of Ruse, Bulgaria</p> |
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| <p>P-4</p> <p>Influence of casing stiffness in gearbox design</p> <p>Dipl.-Ing. Jürg Langhart, Sales, KISSsoft AG, Bubikon, Switzerland</p> | <p>P-5</p> <p>Traction calculation in toroidal traction drives including elastic slip</p> <p>Prof. Dr.-Ing. Gerhard Poll, Director, Institute for Machine Design and Tribology, Leibniz University Hannover, Germany</p> |
| <p>P-6</p> <p>Research and bench test for the dynamic power control strategy of the two-mode Electro-mechanical Variable Transmission (EVT) system</p> <p>Dr. Eng. Weida Wang, Associate Professor, School of Mechanical Engineering, Beijing Institute of Technology, China</p> | <p>P-7</p> <p>Influence of load distribution in ball bearings with defects on the dynamic behavior of gear transmissions systems</p> <p>Dr.Sci. Ivana Atanasovska, Associate Research Professor, Innovation center, Faculty of mechanical engineering, University of Belgrade, Serbia</p> |
| <p>P-8</p> <p>Numerical analysis of the production and operation loading conditions of polymer S-type gears</p> <p>Borut Černe (mag. ing. stroj), Researcher, LECAD Group Laboratory, Chair for Design and Transport systems, Faculty for Mechanical Engineering, University of Ljubljana, Slovenia</p> | <p>P-9</p> <p>Gear transmission error measurement: application to an all-electric vehicle gearbox</p> <p>Dr. Eng. Antonio Palermo, Research Engineer, Digital Factory Division - Simulation and Test Solutions, SIEMENS Industry Software NV, Leuven, Belgium</p> |
| <p>P-10</p> <p>Experimental study of shot peening influence on the surface, accuracy and vibrational behavior of shaved spur gears</p> <p>Technical Expert Hossein Mohassel, Manufacturer of Gearbox and Steering System, Gear Research Center, Charkheshgar Co. (under the license of ZF Germany), Tabriz, Iran</p> | <p>P-11</p> <p>Electrically insulating coatings for rolling bearings as an application example for the functionalization of bearings by thermal spray technology</p> <p>Dr. Sven Hartmann, Technical Director, obz innovation gmbh, Bad Krozingen, Germany</p> |
| <p>P-12</p> <p>Experimental investigation of internal meshing worm drive (via the planar internal gear meshing with the crown worm)</p> <p>Dr. Yonghong Chen, Lecturer, State Key Laboratory of Mechanical Transmissions, Chongqing, China</p> | |

Fourth Section 16:30–18:30

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| Lecture Room A | Lecture Room B | Lecture Room C |
| LUBRICATION | TOOTH GEOMETRY | SIMULATION |
| <p>Prof. Dr.-Ing. Gerhard Poll, Leibniz University Hannover, Germany / Prof. Ray Snidle, Cardiff University, United Kingdom</p> | <p>Prof. Dr.-Ing. Berthold Schlecht, Technical University of Dresden, Germany / Prof. Dr. Datong Qin, Chongqing University, China</p> | <p>Dr.-Ing. Uwe Keller, Daimler AG, Germany / Prof. Ahmet Kahraman, The Ohio State University, USA</p> |
| 16:30 | 16:30 | 16:30 |
| <p>Monitoring of lubricants in gears to detect mixture and to avoid critical consequences</p> <ul style="list-style-type: none"> Analysis to monitor lubricants Changes and consequences according to mixture in lubricants <p>Dipl.-Ing. (FH) Stefan Mitterer, Head of Technical Service, OELCHECK GmbH, Brannenburg, Germany</p> | <p>Tooth root geometry optimization using FE-based tooth contact analysis</p> <ul style="list-style-type: none"> Reduction of tooth root bending stress for cylindrical gear sets using 2-dimensional parametrization approaches Model generation and evaluation by FE-based tooth contact <p>M.Sc. Jonas Pollaschek, Scientific Employee in Gear Calculation and Manufacturing Simulation, Prof. Dr.-Ing. Christian Brecher, Full Professor, Chair of Machine Tools, Dipl.-Wirt.-Ing. Christoph Löpenhaus, Chief Engineer of the Gear Department, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University, Germany</p> | <p>FE-based design method for pressure optimized profile corrections</p> <ul style="list-style-type: none"> FE-based method for the evaluation of the influence of the profile modifications on tooth flank pressure New approach for the evaluation of tip relief design <p>M.Sc. Philip Konowalczyk, Analysis and Testing of Tooth Flank Load Capacity, Research Group Gear Testing, Prof. Dr.-Ing. Christian Brecher, Full Professor, Chair of Machine Tools, Dipl.-Wirt.-Ing. Christoph Löpenhaus, Chief Engineer Gear Department, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University, Germany</p> |
| 17:00 | 17:00 | 17:00 |
| <p>Influence of run-in procedures on the formation of anti-wear films in planetary gears</p> <ul style="list-style-type: none"> Improved wear resistance of planetary gears Operating conditions for targeted anti-wear-layer formation <p>Dipl.-Ing. Francisco Gutiérrez Guzmán, Research Scientist, Dipl.-Ing. Andreas Stratmann, team leader, Prof. Dr.-Ing. Georg Jacobs, Full Professor, IME - Institute for Machine Elements and Machine Design, Faculty for Mechanical Engineering, RWTH Aachen University, Germany</p> | <p>Implementation of a new coupling model for fast and accurate simulation of gear pairs using stiffness characteristic arrays</p> <ul style="list-style-type: none"> Multibody simulation of gear pairs Load-dependent stiffness distribution <p>M.Sc. Faysal Andary, Research Engineer, Dipl.-Ing. Matthias Wegerhoff, Chief Engineer, IME - Institute for Machine Elements and Machine Design, Dipl.-Ing. Daniel Piel, Research Engineer, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University, Germany</p> | <p>Transmission error based simulations of the dynamic response of geared systems</p> <ul style="list-style-type: none"> Formulation of mesh excitations by transmission error and mesh stiffness functions Influence of spacing errors on spur and helical gear dynamics <p>Nina Sainte-Marie, Vibro-acoustic engineer, Dynamics, Vibrations and Internal Noise department, Airbus Helicopters SAS, Marignane, Prof. Dr. Ing. Philippe Velex, Full Professor, LaMCoS, INSA – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cédex, France</p> |
| 17:30 | 17:30 | 17:30 |
| <p>Influences on failure modes and load carrying capacity of grease lubricated gears</p> <ul style="list-style-type: none"> Influences of grease components and NLGI (National Lubricating Grease Institute) grade on gear failure mode Lubrication supply mechanisms of gears with grease lubrication <p>Dipl.-Ing. Hansjörg Schultheiss, 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</p> | <p>Proposal of a face gear which generates virtual high mesh frequency by addition of grooves on the tooth flank</p> <ul style="list-style-type: none"> Proposal of a new method of tooth flank modification which increase a mesh frequency by several grooves on the tooth flank of a face gear as an illusion of high mesh frequency Investigation of the effect by these grooves using vibration simulator and sample face gears <p>Tetsuo Inoue, Department Manager, Department of Reel Development/Fishing Operations Division Shimano Inc., Osaka, Prof. Dr. Eng. Syuhei Kurokawa, Faculty of Engineering, Kyushu University Fukuoka, Japan</p> | <p>A method to optimize the running behavior of planetary gear stages based on a dynamic approach and the FE-based tooth contact analysis</p> <ul style="list-style-type: none"> Analyzing the running behavior of planetary gear stages Developing a method to optimize the running behavior <p>Dipl.-Ing. Daniel Piel, Calculation and Analysis of Planetary Gears, Research Group Gear Design and Manufacturing Simulation, Prof. Dr.-Ing. Christian Brecher, Chair of Machine Tools, Dipl. Wirt.-Ing. Christoph Löpenhaus, Chief Engineer Gear Department, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University, Germany</p> |
| 18:00 | 18:00 | 18:00 |
| <p>Analysis of lubricating characteristics of gear pair with non-newtonian fluids under high shear rate condition</p> <ul style="list-style-type: none"> A new rheology model in high shear rate presented by experiments in this paper Analysis of lubricating characteristics for gear pair based on different rheological models <p>Ph.D. Xin Zhao, Student, Professor Yuan Shi-Hua, Associate Professor, Chao Wei, Transmission School of Mechanical Engineering, Beijing Institute of Technology, China</p> | <p>The electronic control anti-backlash transmission based on variable tooth thickness gear</p> <ul style="list-style-type: none"> Design of the electronic control anti-backlash for the gear transmission Experiment of the anti-backlash technology <p>Li Yu, PhD Candidate, Guangjian Wang, Associate Professor/PhD, Liangliang He, Master Candidate, The State Key Laboratory of Mechanical Transmission, Chongqing University, China</p> | <p>A complete parameter study approach to designing differential bevel gears</p> <ul style="list-style-type: none"> Performance optimization of differential bevel gears Calculation method combining fast multi-parametric variants calculation together with stress prediction for bevel gear forging specific geometries <p>Dr.-Ing. Andreas C. Hohle, Programme Engineering Manager, GKN Driveline International GmbH, Lohmar, Germany, Dipl.-Ing. Jürg Langhart, Technical Sales, KISSsoft AG, Bubikon, Switzerland</p> |



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First Section 08:30–10:30

| | Lecture Room A | Lecture Room B | Lecture Room C |
|--------------|---|--|--|
| | LUBRICATION | HEAT | SURFACE |
| | Prof. Dr.-Ing. Peter Tenberge , Ruhr-University Bochum, Germany / Prof. Ray Snidle , Cardiff University, United Kingdom | Prof. Dr. Alfred J. H. Schoo , Westfälische Hochschule Gelsenkirchen Bocholt Recklinghausen, Germany / Prof. Ing. Carlo Gorla , Politecnico di Milano, Italy | Dr. Ulrich Knödel , GETRAG Getriebe- und Zahnradfabrik Hermann Hagenmeyer GmbH & Cie KG, Germany / Prof. Dr.-Ing. Athanassios Mihailidis , Aristotle University of Thessaloniki, Greece |
| 08:30 | A study on the characteristics of dynamic load for involute gear in heavy duty transmission considering oil film lubrication effect <ul style="list-style-type: none"> Dynamic load distribution in various heavy load conditions and various parameters Effect of dynamic load on the lubrication characteristics Ph.D. Shiyang Hou , Student, Professor Jibin Hu, Vice Dean of School of Mechanical Engineering, Wei Wu, Associate Professor, Beijing Institute of Technology, Beijing, China | New analysis on the heat balance of industrial gearboxes – optimized calculation-method of a gearbox manufacturer <ul style="list-style-type: none"> New examination results on the accuracy of existing calculation methods for calculating the heat balance of industrial gearboxes Improved calculation of the heat balance of industrial gearboxes Dipl.-Ing. Jan Bendzulla , Calculation Engineer, Dr.-Ing. Bernhard Bouché, Technical Director, Dr.-Ing. Reiko Thiele, Head of Calculation Department, Getriebebau NORD GmbH & Co. KG, Bargteheide, Germany | Elimination of shot-peening in gas carburized components through innovative steel design <ul style="list-style-type: none"> Changing the residual stress state on the surface from tensile to compressive to improve bending fatigue strength Applying an alloying strategy that enable a surface free of intergranular oxidation and non-martensitic structure to improve bending fatigue strength M.Sci Patrik Ölund , Head of Group R&D, Ovako AB, Hofors, M.Sci Hans Hansson, Technical Director, Swepart Transmission AB, Liatorp, M.Sci Mats Wennmo, Senior Technical Manager, Gear Milling Solutions, Sandvik Coromant, Sandviken, Sweden |
| 09:00 | New approval process for dynamic tightness tests of gear units – Practical qualifications based on increased customer requirements & optimized lubricant properties <ul style="list-style-type: none"> New test conditions for practical evaluating of dynamic gearbox tightness Test results of the new SEW test in comparison with tests by state of technology Dr.-Ing. Jörg Hermes , Head of Development, Standard Gear Units, Dipl.-Ing. (BA) Alexander Huettinger, Engineering Engineer, SEW-Eurodrive GmbH & Co. KG, Bruchsal, Erich Prem, Product development Industry, Freudenberg Sealing Technologies GmbH & Co. KG, Weinheim, Germany | Prediction of heat generation in meshing of HRC gears <ul style="list-style-type: none"> Prediction of heat generation in gear mesh using FEM Influence of the coefficient of friction in meshing zone of HRC gears Dr.-Ing. Aleksandar Miltenovic , Research assistant, Ing. Milan Banic, teaching & research assistant, Prof. Dr.-Ing. Vojislav Miltenovic, Faculty of Mechanical Engineering, University of Nis, Serbia | Studies for the load capacity of nitrocarburized gears <ul style="list-style-type: none"> Flank and tooth root load capacity of nitrocarburized gears Damage progress of the white layer M.Sc. Peter Elkenkamp , Testing Engineer, Dr.-Ing. Norbert Kurz, Manager, Gear Laboratory, ZF Friedrichshafen AG, Germany |
| 09:30 | Analysing tribological stresses of gear tooth contacts: The distribution of the specific dissipated friction power along the line of contact <ul style="list-style-type: none"> Combined gear tooth meshing and micro contact simulation Highly localized character of tribological stresses Dipl.-Ing. Daniel Stickel , Research Assistant, Material Science and Engineering, University of Duisburg and Essen, Duisburg, Prof. Dr.-Ing. Peter Tenberge, Full Professor, M.Sc. Christoph Lohmann, Research Assistant, Chair of Industrial and Automotive Drivetrains, Mechanical Engineering, Ruhr-University Bochum, Germany | Thermal behaviour of a high-speed gear unit <ul style="list-style-type: none"> Analyse of the amount of power losses and of physical phenomena with a thermal model of a high-speed gear unit Dissipation sources like hydrodynamic bearings, jet lubrication, windage effects, friction and fluid trapping between teeth are taken into account Prof. Dr. Eng. Christophe Chagnenet , Head of Research, ECAM, Lyon, Prof. Dr. Eng Fabrice Ville, Research Supervisor, Prof. Dr. Ing. Philippe Velez, Full Professor, LaMCoS, INSA – Institut National des Sciences Appliquées de Lyon, Villeurbanne Cédex, France | Tribological characterization of WC/C coated gears <ul style="list-style-type: none"> Interpretation of WC/C coated gears wear behavior Lubrication of WC/C coated gears Dr. Boris Kržan , Researcher, Prof. Mitjan Kalin, Head of department, Laboratory for Tribology and Interface Nanotechnology, Faculty of Mechanical Engineering, University of Ljubljana, Ljubljana, Slovenia |
| 10:00 | Simulating the wear behaviour of worm gears with local contact patterns <ul style="list-style-type: none"> Experimental investigations on the running-in process of worm gears with local contact pattern Local simulation of the wear behavior of worm gears Dipl.-Ing. Werner Sigmund , Team leader worm gears, Gear Research Centre, Dr.-Ing. Johann-Paul Stemplinger, Department leader, Prof. Dr.-Ing Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany | New prospects for oil flow simulation in rotating spur-gear systems <ul style="list-style-type: none"> Computational fluid dynamics (CFD) simulation of an inter-meshing gear-system Multiphase simulation of gear lubrication Dr. rer. nat. Christine Klier , CFD engineer, Dipl.-Ing. Kathleen Stock, Branch Manager Munich, CFD Schuck Ingenieurgesellschaft mbH, Munich, Dipl.-Ing. Ludwig Berger, Branch Manager Heidenheim, CFD Schuck Ingenieurgesellschaft mbH, Heidenheim, Germany | Stress Distribution over gear teeth after grinding, running-in and efficiency testing <ul style="list-style-type: none"> Surface stresses generated by grinding were fairly uniform on one side of the gear tooth, while the other side there were stress gradients from tip to dedendum and in axial direction The compressive stresses were increased by running-in but less so by the following efficiency testing M.Sc. Dinesh Mallipeddi , PhD student, Dr. Mats Norell, Senior Lecturer, Prof. Lars Nyborg, Head, Materials and Manufacturing Technology, Chalmers University of Technology, Göteborg, Sweden |
| 10:30 | Coffee break and visit to the exhibition and poster presentations | | |

Second Section 11:15–13:15

| | Lecture Room A | Lecture Room B | Lecture Room C |
|--------------|--|---|--|
| | FATIGUE | EFFICIENCY | SURFACE |
| | Prof. (TUM emeritus of excellence) Dr.-Ing. Bernd-Robert Höhn , Technische Universität München, Germany / Prof. Dr.-Ing. Aizoh Kubo , Research Institute for Applied Sciences, Japan | Prof. Dr.-Ing Karsten Stahl , Technische Universität München, Germany / Prof. Dr. Ing. Philippe Velez , INSA – Institut National des Sciences Appliquées de Lyon, France | Dr.-Ing. Bernhard Bouché , Getriebebau NORD GmbH & Co. KG, Germany / Dr. Michel Octrue , CETIM (Technical Center for Mechanical Engineering Industries), France |
| 11:15 | Tooth flank fracture – Research, standardization and practical experience <ul style="list-style-type: none"> Research activities for tooth flank fracture and the international standardization Validation of the approach in ISO DTR 19042 with practical examples Dr.-Ing. Michael Heider , Calculation engineer, Dr.-Ing. Burkhard Pinnekamp, Head of Division Central Gear Technology, Renk AG, Augsburg | Automated efficiency measurements of vehicle gearboxes on durability test benches <ul style="list-style-type: none"> Combination of durability tests and efficiency measurements on one test bench Better statistical coverage of efficiency measurement results by a higher number of measurement points Dipl.-Ing. Robert Voigt , Team Leader, Dipl.-Ing. Tim Willers, Department Manager Powertrain Testing, GIF-Gesellschaft für Industrieforschung mbH, Alsdorf, Germany | HiPerComp: high performance materials for gears <ul style="list-style-type: none"> Gear load carrying capacity of improved materials Different types of mechanisms to increase strength and damage tolerance were considered Dipl.-Ing. Carolin Wickborn , 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 |
| 11:45 | Influence of macro and micro geometry on tooth flank fracture <ul style="list-style-type: none"> General concept of new ISO standard for calculation of flank fracture safety Influence of gear geometry on the calculation results Dr. rer. nat. Stefan Beermann , CEO, KISSsoft AG, Bubikon, Switzerland | Enhanced gear efficiency calculation including contact analysis results and drive cycle consideration <ul style="list-style-type: none"> Integrated determination of power losses in gear drive trains on system level Modification and optimization of parameters for most accurate calculation of thermal rating Dipl.-Ing. Jürg Langhart , Technical Sales, Mechanical Engineer INSA Lyon Thomas Panéro, Development/Support, KISSsoft AG, Bubikon, Switzerland | New case hardening processes for highly stressed gears <ul style="list-style-type: none"> Thermo-chemical heat treatment of gear wheels Stabilized retained carbon-nitrogen-austenite Dr.-Ing. Matthias Steinbacher , Deputy head of department heat treatment, Prof. Dr.-Ing. habil. F. Hoffmann, head of department heat treatment, Prof. Dr.-Ing. Hans-Werner Zoch, Director, Foundation Institute for Material Science Bremen, Germany |
| 12:15 | Simulation of initiation and increasing of fatigue failure on tooth flanks <ul style="list-style-type: none"> Analysis and simulation of gear fatigue failure (like micropitting, pitting) on tooth flanks Simulation of a Wöhler Curve M.Sc. Christoph Lohmann , Member of research staff, M.Sc. Tim Voßschmidt, Graduate assistant, Prof. Dr.-Ing. Peter Tenberge, Full Professor, Chair of Industrial and Automotive Drivetrains, Department of Mechanical Engineering, Ruhr-University Bochum, Germany | High torque, torsional stiff and precise – the Galaxy-Kinematics <ul style="list-style-type: none"> Introduction of a new gearbox kinematic – surface tooth contact instead of a line tooth contact Optimization of load distribution by adaptive teeth MEng. Tobias Burger , Head of Engineering Galaxie Drive Systems, Dr.-Ing. Thomas Wimmer, Head of Mechatronic Lab, Dipl.-Ing. Heiko Schreiber, Development Engineer, WITTENSTEIN AG, Igersheim, Germany | A gear contact model to analyze the dynamics of transmissions with lightweight, flexible gears <ul style="list-style-type: none"> Efficient gear contact modelling accounting for true gear geometry and material High-fidelity gear loads prediction for lightweight gears Dr.-Ing Gert Heirman , Sr. research engineer, Dr.-Ing Alessandro Toso, Sr. project leader RTD, Siemens Industry Software NV, Leuven, Ing. Niccolò Cappellini, Research engineer, Department of Mechanical Engineering, University of Leuven (KU Leuven), Leuven, Belgium |

12:45 A comparative study of the tooth flank fracture in cylindrical gears

- Risk assessment of the tooth flank fracture on the cylindrical gears
- Parametric study: influence of geometrical parameters and heat-treatment characteristics

Dr. Dhafer Ghribi, Engineer, Dr. Michel Ocrue, Senior Gear Consultant, CETIM: Technical Center for Mechanical Engineering Industries, Senlis, Dr. Philippe Sainsot, Professor, LaMCoS, INSA Lyon-Universität de Lyon, France

Worm gear drives with high efficiency

- Calculation and improvement of the efficiency of worm gear drives
- Optimization of the tribological behaviour of worm gear drives

Dipl.-Ing. Manuel Oehler, research associate, Jun. Prof. Dr.-Ing. Balázs Magyar, Prof. Dr.-Ing. Bernd Sauer, Full Professor, Vice Dean and Head of MEGT – Institute of Machine Elements, Gears, and Transmissions, Department of Mechanical and Process Engineering, University of Kaiserslautern, Germany

Investigations on tooth root bending strength of case hardened and shot-peened gears

- Bending strength of aerospace gears
- Influence of ultrasonic shot peening

Dr. Edoardo Conrado, PhD, Assistant Professor, Department of Mechanical Engineering, Politecnico di Milano, Milano, Eng. Sergio Sartori, Gears Design Specialist, Transmission System Design & Development, AgustaWestland S.P.A., Cascina Costa di Samarate (Varese), Italy

13:15 Closing remarks

Closing remarks

Closing remarks

13:30 Awarding of the best paper for junior engineers by the vice president Prof. Dr.-Ing Karsten Stahl in the main hall

VENUE

The International Conference on Gears will take place in Munich, Technische Universität München (TUM), Garching, Germany, from Monday 5th to Wednesday 7th October, 2015



Gear Research Centre
(Forschungsstelle für Zahnräder und Getriebebau)

Institute of Machine Elements
Technische Universität München (TUM)
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- underground U6 direction Garching-Forschungszentrum to final destination (Garching-Forschungszentrum)

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- regional bus 690 direction Garching-Forschungszentrum to Garching-Forschungszentrum – 9th stop

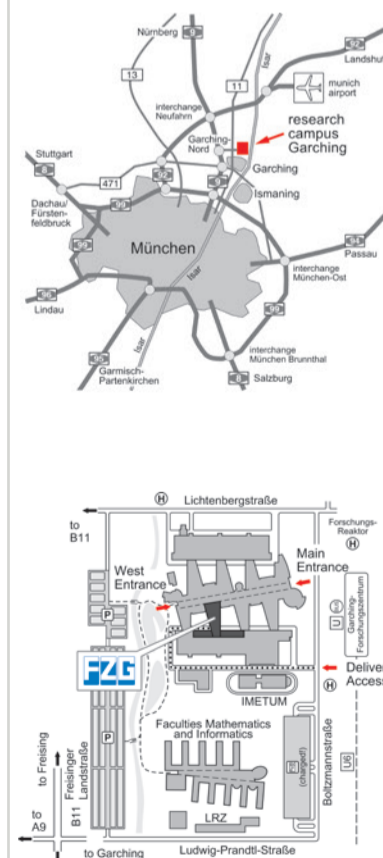
time of travel approx. 50 min. + 5 min. walk

6 sections on multi-journey ticket (stripe ticket).

The web-site www.mvv-muenchen.de offers a direct query for connections. menu items "journey planner"/"timetable information" – recommend on journeys from Munich airport

by car

- highway A9, exit Garching-Nord – proceeding direction Forschungszentrum
- free park available between B11 (major road) and faculty buildings – P+R car park near underground station is charged



INTERNATIONAL CONFERENCE ON GEAR PRODUCTION 2015

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EXTRACT FROM THE PROGRAMME

Gear Data Exchange (GDE) – Basic for the Industry 4.0

Dr.-Ing. Herman Yakaria, Corporate Research and Development, Gear Development/ Gear Manufacturing, Simulation, ZF Friedrichshafen AG, Germany

Manufacturing Method of Large-Sized Cylindrical Worm Gear Set with Neiman Profile Using Multi-Axis Control and Multi-Tasking Machine Tool

Dr. Eng. Kazumasa Kawasaki, Associate Professor, Institute for Research Collaboration and Promotion, Niigata University, Niigata, Japan

Influence of the tool geometry on properties of surface densified PM gears

M.Sc. Tim Frech, Research Assistant, Chair of Manufacturing Technology, Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen, Germany

New macro-and micro-geometries of generated ground gears

Dipl.-Phys. Robert Würfel, Technical Mathematics, Development and Design Gear Cutting Machines, Liebherr-Verzahntechnik GmbH, Kempten, Germany

Study on the continuous generating grinding method of gear shaper cutters with cone worm wheel

Dr. Guolong Li, Professor/Mechanical, Department of Mechanical Engineering, The State Key Laboratory of Mechanical Transmission, Chongqing University, China

Manufacturing of High Quality Miniature Gears by Wire Electric-Discharge Machining

Dr./Ph.D.-Mechanical Eng. Kapil Gupta, Postdoctoral Research Fellow, Department of Mechanical and Industrial Engineering Science, University of Johannesburg, South Africa

5-Axis milling and properties of spherical conjugated bevel gears

Dipl.-Ing. Jean-André Meis, Development Engineer, Process Industries & Drives, Mechanical Drives, Research & Development 1, Siemens AG, Bocholt, Germany

Integrated Closed Loop in 5-Axis CnC Gear Manufacturing

Ing.-Ph.D. Claude Gosselin, President, Involute Simulation Softwares Inc., Quebec, Canada

Measurement of microgears in a production environment – an interaction of μN and μm

M.A. (Oxon), M.B.A. Christopher Morcom, President/CEO, Tool MT, Gießen, Germany

Waviness analysis in the serial production of cylindrical gears

Dipl.-Ing. Frank Descher, Metrology Specialist, Central Manufacturing Engineering, GETRAG Getriebe- und Zahnradfabrik Hermann Hagenmeyer GmbH & Cie KG, Untergruppenbach, Germany

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Dipl.-Ing. Michael Bauser, Managing Partner, Werner Bauser GmbH, Wehingen, Germany

EXTRACT FROM THE PROGRAMME

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Ph.D. Jiaxing Zhan, School of Aerospace, Mechanical & Manufacturing Engineering, RMIT University, Melbourne, Australia

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Thermoplastic Materials for Gears: Status, Future Trends and Solutions

Dr. Domenico La Camera, Staff Scientist, Material Science, Innovative Plastics, Sabic BV, Bergen op Zoom, The Netherlands

Vibration and Damping – Characteristics of Steel Polymer-Compound-Gears evaluated on a Back-to-Back Test Rig

Dipl.-Ing. (FH) Christoph Nitsch, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

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Dr.-Ing. Reimo Nickel, Application Development Manager - Automotive, DSM Engineering Plastics Research & Technology B.V., Geleen, The Netherlands

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Dr.-Ing. Jan-Martin Kaiser, Research and Development Engineer, Design of Plastic Components, Robert Bosch GmbH, Renningen, Germany

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