

International Conference on Gears 2017

Highlights



Panel discussion on "The Future of Gears – a high-tech product?"



Exchange of knowledge on parallel tracks with 38 sessions and over 140 speakers



Two social evening events for excellent networking with colleagues

Date and Venue

September 13-15, 2017 Technische Universität München (TUM) Garching/Munich, Germany





Associated Organisations





Drive Technology Research



The Korean Society of Mechanical Engineers, Korea



ARTEMA, France



Institution of Mechanical Engineers, United Kingdom



Koninklijk Instituut van Ingenieurs,



British Gear Association



Japan Society of



The Society of Instrument and Control Engineers, Japan



Chinese Mechanical Engineering Society



Romanian Association of Mechanical Transmissions



Gear Research Institute, USA



Canadian Society for Mechanical Engineering



Scientific Society of Mechanical Engineers, Hungary



The Institution of Engineers,

The Czech Association of

Scientific and Technical Societies



WiGeP, Germany

With accompanying conferences free of charge



Gear Production 2017 www.vdi.de/gearproduction



High Performance Plastic Gears 2017 www.vdi.de/plasticgears



An event organized by **VDI** Wissensforum www.vdi-gears.eu Phone +49 211 6214-201 +49 211 6214-154

Location/Venue International Conference on Gears 2017

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





How To Find Us

Scan the QR code and find all travel information at a glance!



Program 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. Heinz-Uwe Arnscheidt, Head of Transmission Calculation and Gear-teeth Development, Volkswagen AG, Wolfsburg

Dr.-Ing. Jörg Börner, Gear Expert, Central Research & Development, ZF Friedrichshafen AG

Prof. Dr.-Ing. Christian Brecher, Full Professor, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering, Faculty for Mechanical Engineering, RWTH Aachen University

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

Dipl.-Ing. Norbert Haefke, Managing Director, Research Association for Drive Technology (FVA), Frankfurt/Main

Dr.-Ing. Ralf Hess, Senior Key Expert, Process Industries and Drives, Mechanical Drives, Siemens AG, Bocholt

Dr.-Ing. Jörg Hermes, Head of Development, 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. Carsten Gitt, Senior Manager, Advanced Engineering + Calculation Transmission/Drivetrain, Daimler AG, Stuttgart

Dr. Ulrich Knödel, Senior Manager Core Design & Verification Engineering, GETRAG Magna Powertrain, GETRAG Getriebe- und Zahnradfabrik Hermann Hagenmeyer GmbH & Cie KG, Untergruppenbach

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 Central Technology, Renk AG, Augsburg

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

Dipl.-Ing. Zsolt Roth, Mechanical Design Engineer, Voith Turbo GmbH & Co. KG,

Heidenheim

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

Prof. Dr.-Ing. Berthold Schlecht, Full Professor, Institute of Machine Elements and Machine Design, Faculty of Mechanical Science and 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, Ruhr-University Bochum

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

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

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

Program Overview — International Conference on Gears and accompanying conferences

1st Conference Day, Wednesday, September 13th, 2017

With accompanying conferences free of charge

| | Lecture Room A | Lecture Room B | Lecture Room C | Lecture Room D | Lecture E | | |
|------------------|---|----------------|----------------|-----------------|---------------|--|--|
| 08:30 - 18:00 | International Conference on Gears | | | Gear Production | Plastic Gears | | |
| 18:15 | Organized bus transfer to the evening reception | | | | | | |
| 19:00 | Evening reception at "Hofbräuhaus München" | | | | | | |
| | | | | | | | |

2nd Conference Day, Thursday, September 14th, 2017

With accompanying conferences free of charge

| | Lecture Room A | Lecture Room B | Lecture Room C | Lecture Room D | Lecture E | |
|------------------|----------------|-------------------------------------|----------------|----------------|---------------|--|
| 08:30 - 18:30 | | International Conference on Gears | | | Plastic Gears | |
| 18:30 | | Evening reception at the University | | | | |

3rd Conference Day, Friday, September 15th, 2017

| 5 Comercial Day, Friday, September 15 , 2017 | | | | | | | |
|--|-----------------------------------|----------------|----------------|----------------|--|--|--|
| | Lecture Room A | Lecture Room B | Lecture Room C | Lecture Room D | | | |
| 08:30 - | International Conference on Gears | | | | | | |
| 15:00 | | | | | | | |

Presidency



Conference President

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



Vice Presidents

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



Conference Board

Dr.-Ing. Arbogast M. Grunau, President of the Managing Board, Research Association for Drive Technology (FVA), Frankfurt a.M., Germany; Senior Vice President, Corporate R&D Competence and Services, Schaeffler AG, Herzogenaurach, Germany



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

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

International Conference on Gears 2017

1st Conference Day, Wednesday, September 13th, 2017

08:30 Registration

Plenary Lectures

09:30 Welcome and opening by the conference presidents of the "International Conference on Gears 2017"

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

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

Dr.-Ing. Bernhard Bouché, Getriebebau NORD GmbH & Co. KG, Bargteheide, Germany

Panel Discussion: The Future of Gears – a high-tech product?

09:45-11:45



Moderation: Prof. Dr.-Ing. Karsten Stahl, FZG, Technische Universität München (TUM), Garching, Germany
"Why is conventional thinking and manufacturing paradigms preventing"
"Successful p

solutions that minimize NVH and maximize efficiency and power density?"

Andrew Dempsey, Vice President – Powder Metal Division, Stackpole

the widespread adoption of cost-effective powder-metal energy transfer

machines are going to be discussed by corresponding senior experts.



"With modern gearing technologies, different materials and manufacturing processes can be combined for tailored gear design to meet the demands regarding cost,

power density, NVH-behavior and efficiency. The potentials and challenges of conventional gears, powder metal gears, plastic gears and gears cut on universal 5-axis-CNC-

"Successful plastic gear gearbox applications provide significant reductions in noise, weight and cost while maintaining product performance. The optimization of the plastic gear tooth form is a critical factor in order to reach maximum performance."

George Diaz, General Manager, Gleason Plastic Gears, Rochester, New York, USA



"CnC machines offers flexibility and cost effectiveness in gear manufacturing. Like for dedicated machines, Closed Loop is essential, but should not be based on the "point cloud" method which normally requires an external Tooth Flank Generator."

Claude Gosselin Ph.D. P. Eng., President Involute Simulation Softwares Inc., Quebec, Canada



"Tradition vs. Progress – how can we match the potential of material, lube oil, calculation and machining with increasing emphasis on reliability, efficiency, light weight, and cost?"

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

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

International, Ancaster, Canada

Lecture Room A

Gear endurance – tribology and material

Moderation: Prof. Ray Snidle, Cardiff University, United Kingdom / Dr.-Ing. Carsten Gitt, Daimler, Germany

13:15 Simulation of gear wear using a dynamic load distribution model

- Prediction of the effect of parallel axis gear dynamic load distribution on gear wear
- Prediction of the effect wear of dynamic behavior of parallel-axis gear load distribution

Prof. David Talbot Ph.D., Research Assistant Professor, Mechanical and Aerospace Engineering, Prof. 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

Planetary gear systems – design and analysis

Lecture Room B

Moderation: Dr.-Ing. Burkhard Pinnekamp, Renk, Germany / Prof. Dr. Datong Qin, Chongqing University, China

Holistic simulation of gearboxes in wind power

- Analysis of complete systems with gearboxes
 Interactions between mechanical, thermal and electrical
- Interactions between mechanical, thermal and electrica systems

Dipl.-Ing. Sebastian Grützner, Chief of Library Development, Mechanical Engineering, Alex Magdanz B.Sc., Application and Development Engineer, Energy Industry Team Leader, ESI ITI GmbH, Dresden, Germany Lecture Room C

Applications – electrified power train

Moderation: Prof. Dr.-Ing. Dr. h.c. Albert Albers, IPEK, KIT, Germany / Ir. J.J. Bos, Damen Schelde Gears, The Netherlands

Design, analysis and experimental work on a novel seamless auto transmission for electric vehicles

- An innovative two-speed seamless auto transmission
- Experiment and verification of the transmission's feasibility

Jie Yu, Ph.D. candidate, Research Assistant, Prof. Ligang Yao, Dean, Chengcheng Ren, Master Candidate, Institute of Mechanical Engineering and Automation, Fuzhou University, Fuzhou City, Fujian Province, China

13:45 Self-lubricating gears with oil-impregnated sintered materials

- Coefficient of friction and bulk temperature measurement on an efficiency gear-test rig
- Interpretation of results and operating principle of selflubricating gears

Martin Ebner M.Sc., Research Associate, Thomas Lohner M.Sc.. Head of Department of Mechanical Engineering, Prof. i.R. Dr.-Ing. Bernd-Robert Höhn, TUM emeritus of excellence, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Simulation of the lubricant's influence on the wear 14:15 and fatigue mechanisms on tooth flanks

- Conditioning of the tooth surface due to lubricant
- New experimental test method to investigate wear and fatigue in highly loaded tooth contacts

Leonard Gondecki M.Sc., Research Assistant, Max Weibring M.Sc., Research Assistant, Prof. Dr.-Ing. Peter Tenberge, Full Professor, Chair of Industrial and Automotive Drivetrains, Ruhr-University Bochum, Germany

14:45 Change of steel quality for gears as function of

- Deterioration of gear steel quality as function of globalization leads to many outbreaks of gear failure
- Many measured points of hardness with high-speed automatic apparatus can help find bad steel quality

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

Design of cycloid planetary gear drives with tooth number difference of two - a comparative study of contact characteristics and load analysis

- Systematic influence analysis of design parameters regarding tooth contact characteristics
- Basic equations, loaded-tooth contact analysis approach and design guideline

Dr.-Ing. Shyi-Jeng Tsai, Assistant Professor, Ling-Chao Chang B.Sc., Master student, Chin-Hao Huang B.Sc., Ph.D. student, Machine Design Lab, Department of Mechanical Engineering, National Central University, Taoyuan City, Taiwan

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

- Advanced FE mesh generation for gears
- Load distribution in planetary gear systems

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

Loaded-tooth contact analysis under load on double helical geared planetary gearboxes

Lecture Room B

NVH behavior

Moderation: Prof. Dr. Eng. Jože Duhovnik, University

of Ljubljana, Slovenia / Prof. i.R. Dr.-Ing. Bernd-Robert

Höhn, Technische Universität München (TUM), Germany

Topographical tooth modifications in planetary gears

for reduction of noise excitation without load-capacity

- Noise reduction in helical gears and planetary gears

Dr.-Ing. Johannes W. Vriesen, Winergy - Engineering

- Noise reduction without load capacity loss

- Investigation of load distribution and noise level
- Comparison of design variants: spur-, helical- and double-helical gears

Dr.-Ing. Tobias Schulze, Managing Director/CEO, DriveConcepts GmbH, Dresden, Germany

Electrical stress and parasitic currents in machine elements of drive trains with voltage source inverters

- Drive train behavior as a capacitive voltage divider
- Estimation of EDM-currents over gears and bearings M.Eng. Alexander Furtmann, Research Associate, Prof. Dr.-Ing. Gerhard Poll, Director, Institute for Machine Design

and Tribology, Leibniz University Hannover

Validation approach of PM (Powder Metallurgy) gears for eDrive applications

- From powder to part of system
- Component and system testing of PM gears for eDrive

Dipl.-Ing. Björn Leupold, Manager Advanced Gear Programs, Advanced Engineering, Vitali Janzen, Manager Advanced NVH Development, GKN Sinter Metals Engineering GmbH, Radevormwald, Dominic Eichholz, Programme Engineering Manager eDrive, GKN Driveline Technoloy Centre, GKN Driveline International GmbH, Lohmar, Germany

Research into dynamic power split characteristics and electric-power-coordinated control for a hybrid transmission system

- Coupling response of the power-split hybrid transmission
- Double closed-loop electric-power-coordinated control

Dr. Weida Wang, Associate Professor, Dr. Lijin Han, Lecturer, Dr. Qingdong Yan, Professor, School of Mechanical Engineering, Beijing, China

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

Lecture Room A

Gear endurance – micropitting and Planetary gear systems tooth flank properties

Moderation: Dr.-Ing. Ralf Hess, Siemens, Germany / Prof. Dr.-Ing. Vojislav Miltenovic, University of Niš, Republic of Serbia

Practical use of micropitting test results according 16:00 to FVA 54/7 for calculation of micropitting load capacity acc. to ISO/TR 15144-1

- Practical guideline for setting the right test parameters for micropitting tests
- Calculation of micropitting load capacity using results from FVA 54/7

Nadine Sagraloff M.Sc., Research Associate, Dipl.-Ing. Michael Hein, Team Leader, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Shot-peening of gear tooth flanks: search for an

- Improvement of the micropitting load capacity by an

Dr. Dhafer Ghribi, Dr. Catherine Peyrac, both R&D

Engineers, Dr. Michel Octrue, Senior Gear Consultant,

Mechatronics, Power Transmissions and Sensors (MEC),

Isotropic superfinishing of high-hardness steels

- Isotropic superfinishing enhances gear performance

Martin McCormick M.Chem., Sales Manager, REM

Surface Engineering, St. Neots, United Kingdom

- ISF® Process identifies & repairs distressed metal zones

CETIM (Technical Center for Mechanical Engineering

optimal shot peening

Industries), Senlis Cedex, France

optimal surface topography countering micropitting

- Influence of surface topography on micropitting damages

16:30

Technology, Key Expert, Mechanical Drives, Process Industries and Drives, Siemens AG, Voerde, Germany

Investigating the dynamic behavior of planetary gear

- Modal dynamic models for planetary gear trains

trains through the systematic approach

- Applying innovative methods based upon systematic approach and ABAOUS

Prof. Antoaneta Dobreva Ph.D., Head of department Machine Science, Machine Elements and Engineering Graphics, Svetlin Stoyanov, Ph.D., Assoc. Prof. Vasko Dobrev, Dean of Transport Faculty, University of Ruse, Bulgaria

The iterative spectral method for computing the planetary-gear dynamic response

- Analysis of local and global dynamic transmission errors
- Comparison with the Runge-Kutta time integration

Jessica Neufond, Engineer, Joel Pierre-Liaudet, Ph.D., Associate Professor of Mechanics, Emmanuel Rigaud, Ph.D., Associate Professor of Mechanics, Tribology and Systems Dynamics Laboratory, LTDS - Ecole Centrale de Lyon, France

Lecture Room C

Applications

Moderation: Prof. Dr.-Ing. Michael Weigand, Vienna University of Technology, Austria / Dr.-Ing. Ralf Georg Wittor, Eickhoff Antriebstechnik, Germany

Thrust cone bearings provide increased efficiency for helical gears at moderate speed levels: indications of possible energy-saving potential in an expanded field of application

- Higher gearbox efficiency for partial load operation
- Quantification of wear resistance for mixed friction

Dipl.-Ing. Marcel Heß, Scientific Employee, Prof. Dr.-Ing. Armin Lohrengel, Head of Department, Fritz-Süchting-Institute for Mechanical Engineering, Clausthal University of Technology, Clausthal-Zellerfeld, Germany

Evaluation of a developed micro-gear endurance test system and a basic study of the load-carrying characteristics of sour micro-gears

- A method for the appropriate endurance testing of microgears
- Results of micro-gear acceleration endurance testing Dr. Mikio Takahashi, Technical Official, Takayoshi Itagaki, Department of Mechanical Engineering, National Institute of Technology, Kisarazu College, Kisarazu, Chiba, Noritsugu Maeda, Development Division, Ogasawara Precision Laboratory co. ltd, Ashigarakami, Kanagawa, Japan

Influential criteria in the optimization of a gearbox, with application to an automatic transmission

- Generation of geometric variants of a gearbox with fixed ratios - LTCA (Loaded Tooth Contact Analysis) and FEM calculation
- for noise and efficiency evaluation

Dipl.-Ing. Thomas Panéro, Development Engineer, KISSsoft AG, Bubikon, Switzerland, Prof. Dr.-Ing. Peter Tenberge, Full Professor, Daniel Kupka M.Sc., Research Associate, Chair of Industrial and Automotive Drivetrains, Ruhr-University Bochum, Germany

Kinematic classification of a gearbox comprising separate thrusted teeth and its advantages regarding existing approaches

- Classification of the Galaxie® kinematics by comparing the representation of the kinematic chain with existing kinematic approaches
- Description of the advantages of the linear guiding of the tooth element

Dr.-Ing. Tobias Röthlingshöfer, Team Leader, Dipl.-Ing. Heiko Schreiber, Development Engineer, Galaxie Start Up, WITTENSTEIN SE, Igersheim, Germany

Investigation on the flank surface durability of 17:30 gears with increased pressure angle

- Tooth flank load carrying capacity of gears
- Variation of pressure angles

Christian Weber M.Sc., Research Associate, Dr.-Ing. Thomas Tobie, Head of Department, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

The influence of mesh misalignment on planetary gear set with time-varying mesh stiffness

- Establishing of a dynamic model of planetary gear set, in which the time-varying mesh stiffness (TVMS) coupled with the mesh misalignment model are taken into consideration
- Length fluctuation of the contact line and the load distribution due to mesh misalignment are obtained by dividing the tooth into several slices along tooth width

You are

Sitao Ping, Master Student, Professor, Yimin Shao, State Key Laboratory of Mechanical Transmission, Chongqing University, Chongqing, China

18:15 Organized bus transfer to the evening reception

19:00

invited! Evening reception at the "Hofbräuhaus München" At the end of the first conference day we cordially invite you to our evening reception at the "Hofbräuhaus München", 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.



Dinner Speech: Dipl.-Ing. Oliver Zipse, Member of the Board of Management, Production, BMW AG, Munich, Germany



International Members

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. Bingkui Chen, Director, The State Key Lab of Mechanical Transmissions, Chongqing University, China

Prof. Dr. Eng. Jože Duhovnik, Full Professor, Dean and 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. 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 Engineering, Kyoto Institute of Technology, Kyoto, Japan

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

M.Sc. Robin Olson, Sustaining Engineering Manager, Gear Group, Rexnord Corporation, Milwaukee, Wisconsin, USA

Prof. Dr.-Ing. José 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, Vice Dean of Graduate School, Deputy Director of Academic Committee of State Key Lab of 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

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

Board of Gear Excellence

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Haruo Houjoh, Prof. Emeritus, Tokyo Institute of Technology, Japan

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

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

Prof. Dr.-Ing. habil. Heinz Linke, Emeritus Professor, Institute of Machine Elements and Machine Design, Faculty of Mechanical Science and Engineering,

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

Technical University of Dresden, Germany

Poster Exhibition

P-1 Efficiency evaluation of a multispeed transmission Associate Prof./Dr. Fuchun Yang,

Associate Professor, School of Mechanical Engineering, Shandong University, Jinan, China

P-2 An improved lifetime prediction technique for plastic gears through finite element analysis and continuum damage mechanics Amir K. Shojaei Ph.D., Mechanical Engineering Consultant, DuPont Performance Materials, Delaware, USA

P-3 Pentac® Mono-RT high-performance face milling cutter heads Dipl.-Ing. (FH) Eyüp Böyükbas, Senior Application and Process Engineer Bevel Gears, Bevel Gear Application, Gleason-Pfauter Maschinenfabrik GmbH, Ludwigsburg, Germany

P-4 Experimental measurement of gear impacts in transmission Ing., Ph.D. Ondrej Berka,

Academic Assistant, Department of Designing and Machine Components, Czech Technical University of Prague, Czech Republic

P-5 Heat-fluid coupled analysis of the temperature field of gearboxes **Bachelor Hauifeng Yang,** Student, The State Key Lab of Mechanical Transmission, Chongqing University, China

P-6 High-precision test rig for the transmission performances of precision planetary reducers **Peng Changyan,** The State Key Lab of Mechanical Transmission, Chongqing

University, China P-7 Friction loss and surface durability of WN gears (comparison with involute gears)

Professor/Ph.D. Ryozo Nemoto, Professor, Monozukuri Engineering Department, Tokyo Metropolitan College of Industrial Technology, Tokyo, Japan

P-8 Load-carrying capacity of crossed helical gears with high contact ratio **Professor/Ph.D. Ema Tamura,** Professor, Monozukuri Engineering Department, Tokyo Metropolitan College of Industrial Technology,

P-9 Is the mean stress effect for shafts dependent on the geometry, material or load type?

Dipl.-Ing. Kai Neikes, Research Assistant, Chair of Machine Elements, Institute of Machine Elements and Machine Construction, Faculty of Mechanical Science and Engineering, Technical University Dresden, Germany

P-10 Analysis of the grinding-notch effect according to ISO 6336 and FEM Inho Bae Ph.D., Head of Support, KISSsoft AG, Bubikon, Switzerland

P-11 A compensation method of tooth surface error in continuous generating grinding based in the virtual-axis Kai Xu B.Sc., The State Key Lab of Mechanical Transmission, Chongqing University, China

P-12 Influence of casing deformation in transmissions

Dipl.-Ing. Jürg Langhart, Sales Engineer, KISSsoft AG, Bubikon, Switzerland

P-13 Comparative analysis of a few new procedures for spur-gears toothprofile optimization with different methods and aspects

Dr. sci. Ivana Atanasovska, Associate Research Professor, Department of Mechanics, Mathematical Institute, Serbian Academy of Sciences, Belgrade, Serbia

P-14 Modelling of a gear-rotor system considering tooth-contact temperature and its dynamic characteristics Prof./Dr. Xiangfeng Gou. Head of Department, School of Mechanical Engineering, Lanzhou Jiaotong University, Gansu,

P-15 Traction drive analysis identified with rheological friction property of traction fluid

Master Toshihiro Saito, Chief Engineer, Honda R&D Co., Ltd. Automobile R&D Center, Tochigi, Japan

P-16 A reduced order internal combustion engine model for transmission development

Kazuhide Togai Ph.D., Professor, Department of Mechanical Engineering for Transportation, Osaka Sangyo University, Daitou, Japan

P-17 Prediction of heat generation in transmission bearings by application of FEM

Dr.-Ing. Aleksandar Miltenovic, Assistant Professor, Department of mechanical design, development and engineering, Faculty of Mechanical Engineering, University of Nis, Serbia

2nd Conference Day, Thursday, September 14th, 2017

Lecture Room A

Gear endurance – damage initiation and propagation

Moderation: Robin Olson M.Sc., Rexnord Corporation, Milwaukee, USA / Dr.-Ing. Reiner Vonderschmidt, Georgii Kobold, Germany

Fracture analysis of pitting damages of case 08:30 hardening steels in gear applications

- Separation of pitting area in fatigue and ruptured zone

- Explanation of pitting damage by local stress components Fabian Goergen M.Sc., Research Assistant, Dieter Mevissen M.Sc., Workgroup Leader, Gear Department, Prof. Dr.-Ing. Christian Brecher, Full Professor, Chair of Machine Tools, Laboratory for Machine Tools and Production Engineering, Faculty for Mechanical Engineering, RWTH Aachen University, Germany

Simulation and measurement of flank geometry 09:00 deviations of bevel gears caused by pittings and micro pittings

- Optical measuring method for micro-topology deviations

- Simulation of progressing tooth-flank damage **Dipl.-Ing. Felix Müller,** Research Assistant, Prof. Dr.-Ing. Berthold Schlecht, Full Professor, Dr.-Ing. Stefan Schumann, Chair of Machine Elements, Institute of Machine Elements and Machine Design, Faculty of Mechanical Science and Engineering, Technical University of Dresden, Germany

Simulation of fatigue failure on tooth flanks in

- Analysis of the fatigue mechanisms of gear tooth flanks - Crack initiation and growth and the occurence of pittings

consideration of pitting initiation and growth

Max Weibring M.Sc., Research Assistant, Leonard

Drivetrains, Ruhr-University Bochum, Germany

Gondecki M.Sc., Research Assistant, Prof. Dr.-Ing. Peter

Tenberge, Full Professor, Chair of Industrial and Automotive

09:30

Effects of external splines on deformations of ring gears of planetary gear sets

- Experimental methodologies to quantify the deflections and
- Computational model to study the effects of outside splines

Haris Ligata Ph.D., Graduate Research Associate, Gear and Power Transmission Research Laboratory, Department of Mechanical and Aerospace Engineering, The Ohio State

Lecture Room B

Moderation: Dr.-Ing. Hartmut Faust, LuK, Germany / Prof. Dr. Geng Liu, Northwestern Polytechnical University & Shaanxi Engineering Laboratory for Transmissions and Controls, China

Planetary gear systems -

efficiency and strength

Smashing the efficiency barrier - a practical comparison of a planetary and orbitless gear-head

- Overview of the novel Orbitless drive technology

- Load and efficiency test of a prototype Orbitless gear-head **Dr./Ph.D. Leo Stocco,** President, Research & Development, Orbitless Drives Inc., Vancouver, British Columbia, Canada, Robert Gloeckner, Research and Development Engineer, Advanced Engineering, Micromo, Clearwater, USA

Development of a novel test stand for three-axis driving planetary gear-train control and analysis of a novel PGT for noise reduction

- Balance of inertia in PGT for stable driving and novel control
- Noise reduction with novel component

Master Masao Nakagawa, Research Fellow, Doctoral Student, Graduate School of Mechanical Engineering, Doshisha University, Kyoto, Japan

- hoop stresses of ring gears of planetary gear sets with splines
- on ring gear deflections

Prof. Ahmet Kahraman, Winbigler Professor and Director, University, Columbus, USA

Lecture Room C

Worm and crossed helical gears simulation

Moderation: Prof. Dr.-Ing. Bernd Sauer, University of Kaiserslautern, Germany / Prof. Dr. Eng. Ichiro Moriwaki, Kyoto Institute of Technology, Japan

Comprehensive simulation methods for crossed helical gear sets with the main focus on the calculation of contact patterns

- Calculation possibilities of crossed helical gears
- Contact pattern of crossed helical gears

Philipp Norgauer M.Sc., Research Associate, Worm Gears Department, Dr.-Ing. Daniel Kadach, Head of Department 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

A new standardizable calculation method to predict the efficiency of worm gear drives

- Physically based simulation method for the efficiency of worm gear drives
- Derivation of easy-to-handle formulas for German standard DIN 3996

Jun. Prof. Dr.-Ing. Balázs Magyar, Junior Professor, Dipl.-Ing. Manuel Oehler, Research Associate, Prof. Dr.-Ing. Bernd Sauer, Full Professor, Vice Dean and Head of MEGT

- Institute of Machine Elements, Gears and Transmissions, University of Kaiserslautern, Germany

Computation of the tooth root strength of worm wheels with a calculation program based on local

- Algorithm to compute the stresses of worm wheels
- Using the stresses in the tooth root to determine strength Dr.-Ing. Jan Reißmann, Research Assistant, Prof. Dr.-Ing. Erhard Leidich, Director, Institute of Design Engineering and Drive Technology, Department of Mechanical Engineering, University of Chemnitz, Germany

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

Gear endurance - stress and material properties

Moderation: Ir. J.J. Bos, Damen Schelde Gears, The Netherlands / Dr.-Ing. Toni Weiss, GanaCon, Germany

10:45 Flank fracture assessment under consideration of material quality

- Modelling of flank fracture with a monte carlo approach
- Influence of geometry, heat treatment and material quality on the interior fatigue of gear

Dipl.-Ing. Jean-André Meis, Head of CAE, Mechanical Drives, Process Industries and Drives, Siemens AG, Bocholt, Germany

Bevel gears

Moderation: Dipl.-Ing. Michael Schöffmann, Audi, Germany / Prof. Dr.-Ing. Athanassios Mihailidis, Aristotle University of Thessaloniki, Greece

Global synthesis of speed increasing spiral bevel and hypoid gears

Peng Wang Ph.D., Research Assistant, School of Mechanical and Materials Engineering, North China University of Technology, Beijing, China

Worm gears - design and quality

Moderation: Dr.-Ing. Jörg Hermes, SEW-EURODRIVE, Germany / Prof. Dr.-Ing. Erhard Leidich, Technical University of Chemnitz, Germany

New tolerance concepts for the realization of steelonly worm gears

- Development of a design and bearing concept as well as an adjustment concept for the substitution of bronze with steel in worm gears
- Use of tolerance management methods, such as Key Characteristics (KC), KC flowdown, tolerance chains and their optimization

Leonie Schirmer M.Sc., Research Assistant, Assembly Processes and Automation, Prof. Dr.-Ing. Rainer Müller, CEO, ZeMA - Zentrum für Mechatronik und Automatisierungstechnik GmbH, Saarbrücken, Germany

"Alternative" microstructures and their influence 11:15 on mechanical properties of case-hardened gears

- Load-carrying capacity of gears - Variation of microstructure
- Dipl.-Ing. Christian Güntner, 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

Influence analysis of system parameters on nutation drive characteristics for double-circle arc spiral bevel gears

- It is of great significance to study the influence of error on the transmission characteristics for the correct design, manufacture and use
- The dynamic meshing force plays an important role in the characteristics of shock, vibration and noise Yongwu Cai, Ph.D. candidate, Ligang Yao, Professor,

Zhivu Xie, Master Candidate, School of Mechanical Engineering and Automation, Fuzhou University, Fuzhou City, Fujian Province, China

Technical guideline for the quality determination of bronze

- Definition of quality parameters to describe bronze for worm wheels - Assistance for sample preparation and testing procedures
- Dr.-Ing. Björn Sievers, Gear-Development Engineer, R&D Standard Gear Units, Dr.-Ing. Jörg Hermes, Head of Development, Gear Units, SEW-EURODRIVE GmbH & Co KG, Bruchsal, Dr.-Ing. Marius Berger, Project leader R&D, Ed. Fitscher GmbH & Co. KG, Oberhausen, Germany

11:45 Tooth profile design and stress analysis of double helical gear transmissions with geometric elements constructed tooth pairs

- Generation principle and mathematical model of tooth profiles Stress analysis and performance comparison
- Dr. Dong Liang, Researcher, Prof. Bingkui Chen, Director,
- Chaoyang Li, Research Assistant, The State Key Laboratory of Mechanical Transmissions, Chongqing University, China

Optimizing tooth proportions to improve topland balance in aerospace bevel gears

- ence of working depth, gear addendum and gear pinion dedendum angles on topland unbalance
- Reverse calculation method for obtaining optimum tooth proportions for reduced topland unbalance

Erdem Erkilic M.Sc., Gear Design Engineer, Zihni Burcay Saribay Ph.D., Transmission Design Manager, Transmission Design Department, Turkish Aerospace Industries, Ankara,

Design of transmission accuracy of the involute cylindrical gear-worm gear system under large temperature difference

- Modelling of the transmission accuracy of worm gear transmission error chain
- Influence of main factors on the transmission error of the gear-worm system

Dr. Wang Yue, Development Engineer, Structure Design Department, Dr. Bo Peng, R&D Center, China Academy of Launch Vehicle Technology, Beijing, Prof. Dr. Geng Liu, Full Professor, Deputy Dean, School of Mechanical Engineering, Northwestern Polytechnical University, Xi'an, China

12:15 Influence of surface-layer properties on tooth-root bending-strength of cylindrical gears

- Weakest-link approach for tooth root bending strength calculation
- Surface layer properties influencing tooth root load carrying capacity

Jonas Pollaschek M.Sc., Research Assistant, Prof. Dr.-Ing. Christian Brecher, Chair of Machine Tools, Full Professor, Dr.-Ing. Dipl.-Wirt.-Ing. Christoph Löpenhaus, Chief Engineer, Laboratory for Machine Tools and Production Engineering, Faculty for Mechanical Engineering, RWTH Aachen University, Aachen, Germany

Tooth contact analysis of a new type of face gear drive

- Mathematical models of the torus-face gear pair
- Tooth contact analysis / Check of curvature interference Associate professor, Lei Liu Ph.D., Nanjing University of Aeronautics and Astronautics, Nanjing, China

The development of worm gears

- A comprehensive compilation of state-of-the-art information on worm drives with regard to geometry, contact analysis, materials, manufacturing processes, efficiencies, failure, and condition monitoring
- Future prospects in relevant research and development information on worm drives

Joe Liou Ph.D., Senior Scientist, USCRC, Stefan Rakuff Ph.D., Principal Scientist, ABB, Inc., Bloomfield, USA

Lunch break and visit to the exhibition and poster presentations

NVH behavior – noise

Moderation: Prof. Ahmet Kahraman, The Ohio State University, USA / Dr. Ulrich Knödel, GETRAG Getriebe- und Zahnradfabrik Hermann Hagenmeyer, Germany

14:15 Computing and minimizing whining noise

- Application to a bogie gearbox
- Whining noise prediction
- Numerical computation versus experimental results comparison

Dr.-Ing. Alexandre Carbonelli, Research Engineer. Numerical Simulations, Vibratec, Ecully, France

Study of vibration and noise in spur-gears with 14:45 tooth profile modification and the experimental validation of the modification method

- Influence of modification parameters on vibration and noise of gears
- Comparison of experimental and simulation values Chen Zhang Ph.D., Researcher, Vehicle Research Center, Beijing Institute of Technology, Beijing, China

15:15 Optimization of the NVH behavior of gears by using alternative gear materials

- Investigation of damping effects in regard to structureborne noise
- Simulation of alternative gear materials

Philipp Scholzen M.Sc., Research Assistant, Gear department, Prof. Dr.-Ing. Christian Brecher, Chair of Machine Tools, Full Professor, Dr.-Ing. Dipl.-Wirt.-Ing. Christoph Löpenhaus, Chief Engineer, Laboratory for Machine Tools and Production Engineering, Faculty for Mechanical Engineering, RWTH Aachen University, Germany

Beveloid gears

Moderation: Prof. Dr. Sc. Veniamin Goldfarb, Izhevsk State Technical University, Russia / Dipl.-Ing. Zsolt Roth, Voith Turbo, Germany

Potential of free-flank modifications for beveloid gears

- Optimization method for beveloid gears
- Improve the operational behavior with free-flank modifications

Jens Brimmers M.Sc., Research Assistant, Prof. Dr.-Ing. Christian Brecher, Chair of Machine Tools, Full Professor, Dr.-Ing. Dipl.-Wirt.-Ing. Christoph Löpenhaus, Chief Engineer, Laboratory for Machine Tools and Production Engineering, Faculty for Mechanical Engineering, RWTH Aachen University, Germany

Method for the pre-dimensioning of beveloid gears

- Geometric design of feasible main gearing data
- Pre-optimized design of skewed axes arrangements

Dipl.-Ing. Timon Schöler, Scientific Assistant, Prof. Dr.-Ing. Hansgeorg Binz, Head of Institute, Dipl.-Ing. Matthias Bachmann, Chief Engineer/Team Leader Drive Technology, Institute for Engineering Design and Industrial Design, University of Stuttgart, Germany

Potential for using beveloid gears in planetary gear trains for increased power density and reduced backlash

- Backlash elimination in high-ratio planetary gear trains Hans Hansson Lic.Mech.Eng., Technical Manager, Technical department, SwePart Transmission AB, Liatorp, Henrik Alm, Ph.D. student, Linköping Technical University,
- Equal load sharing between planetary gears in gear trains

Linköping, Sweden

Magnetic gears

Moderation: Eng. Amir Aboutaleb, AGMA, Alexandria, USA / Prof. Dr.-Ing. Georg Jacobs, RWTH Aachen University, Germany

A novel magnetic angular transmission

- Design and functionality of an angular magnetic transmission
- Efficiency analysis of magnetic angular gearboxes Dr.-Ing. Stefan Vonderschmidt, Head of Development, Research and Development, Dipl.-Psych. Andreas Vonderschmidt B.Sc., CEO, Dr.-Ing. Reiner Vonderschmidt, Shareholder, GEORGII KOBOLD GmbH & Co. KG, Horb am Neckar, Germany

Geometric modeling and analysis of the magnetic nutation gear drive

- Structure and principle of the magnetic nutation gear drive
- Simulation analysis and experiment

Ding-jian Huang, Ph.D. candidate, Prof. Ligang Yao Ph.D., Dean, Wenjian Li, Master candidate, Mechanics Institute, School of Mechanical Engineering and Automation, Fuzhou University, Fuzhou City, China

- A gear design that utilizes magnetic and reluctance principles to transfer torque without contact or oil
- Simple, cost-efficient and yet robust design that allows for high torque density and gearing ratios

Specialist, Innovation, Sintex A/S, Hobro, Denmark

Reluctance magnetic gear

Alexandru Sorea M.Sc., Development and Sales Engineer, Flemming Buus Bendixen M.Sc., Senior Magnet

15:45

17:30

18:00



Coffee break and visit to the exhibition and poster presentations

NVH behavior – dynamic behavior

Moderation: Prof. Dr.-Ing. Peter Tenberge, Ruhr-University Bochum, Germany / Prof. Dr. D. Houser, Emeritus Professor, Ohio State University, USA

Static and dynamic analyses of thin-rimmed gears 16:30 with holes

- Original hybrid lumped parameter / FE model to simulate thin-rimmed flexible gears
- Influence of hollow blanks on gear dynamics Eng. Berengere Guilbert, Ph.D. student, Prof. Dr. Ing. Philippe Velex, Full Professor, LaMCoS, INSA -Institut National des Sciences, Appliquées de Lyon, Lyon, Villeurbanne Cédex, Ing. Philippe Cutuli, SAFRAN Helicopter Engines, Bordes, France

Prediction of vibroacoustic response of an electric 17:00 window-lift gear motor

- Coupling mesh stiffness/electromagnetic torque fluctuations
- Effect of mechanical imbalance and gear wheel eccentricity

factors for high-speed applications

calculating gear dynamic factors

teeth on its dynamic behavior

dynamic factors

United Kinadom

Emmanuel Rigaud Ph.D., Associate Professor, Tribology and Systems Dynamics Laboratory, Ecole Centrale de Lyon, Lyon, France

A simulation approach to calculating gear dynamic-

· Multi-body dynamic model of a high-speed gearbox for

Simulation, Research & Development, Barry James, CTO

and Head of R&D, Romax Technology Ltd, Nottingham,

Theoretical and experimental investigations on the

influence of anisotropic material properties of gear

- Anisotropy by cold-rolling and additive manufacturing

Dipl.-Ing. Carsten Ulrich, Research Assistant, Prof.

Dr.-Ing. Berthold Schlecht, Chair of Machine Elements,

Institute of Machine Elements and Machine Construction,

Faculty of Mechanical Science and Engineering, Technical

University of Dresden, Dipl.-Ing. Jan Bräunig, Research Associate, Fraunhofer Institute for Machine Tools and Forming Technology IWU, Dresden, Germany

- Measurement of the stiffness and damping of gear teeth

- Influence of torque and system dynamics on gear

Dr. Sharad Jain, Lead Researcher - Dynamic &

Hypoid gears

Moderation: Dr.-Ing. Joachim Thomas, ZG Hypoid, Germany / Haruo Houjoh, Prof. Emeritus, Tokyo Institute of Technology, Japan

Prediction of plastic deformation on hypoid gears

- Analysis of the plastic deformation mechanism under high load
- Estimation of the amount of plastic deformation in designing high-performance gears

Takayuki Aoyama B.Eng., Team Leader, Research and Development, Lightweight System Design Laboratory Materials & Processing Department I, Toyota Central R&D Labs. Inc., Nagakute, Hiroki Inokura M.Eng., Assistant Manager, Yoshikatsu Shibata M.Eng., Project Manager, Drivetrain Development, Toyota Motor Corporation, Toyota, Aichi Prefecture, Japan

Elastic deformation of a hypoid gearbox measurements on a static test rig to validate the calculated elastic deformation behavior

- Deformation measurements of a hypoid gearbox
- Validation of an FEM approach to consider the elastic deformation behavior of the housing

Dipl.-Ing. Markus Daffner, Research Associate, Dr.-Ing. Michael Otto, 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

Evaluation of gear noise with application force

- Evaluation of gears` NVH for different measurement types
- Gear noise evaluation method

Dipl.-Ing. Thanak Utakapan, Research Associate, Dipl.-Ing. Bernhard Kohn, Research Associate, Dipl.-Ing. Max Fromberger, Research Associate, Institute of Machine Elements, Gear Research Centre (FZG), Technische Universität München, Garching, Germany

Determination and improvement of hypoid gear efficiency by means of loaded TCA

- Efficiency calculation of hypoid gears under consideration of micro-geometry, loads and axis deviations
- Adjustment of micro-geometry to improve efficiency Dr.-Ing. Joachim Thomas, Managing Director, ZG Hypoid GmbH, Dr.-Ing. Christian Wirth, CEO, ZG GmbH, Eching,

You are invited!

Gear Endurance – Geometry

Moderation: Dipl.-Ing. Dirk-Olaf Leimann, ZF Wind Power Antwerpen NV, Belgium / Prof. Dr. Alfred 1. H. Schoo, Westfälische Hochschule Gelsenkirchen Bocholt Recklinghausen, Germany

High-load-carrying tooth-root fillet based on a Bézier curve

- 10 20 % higher tooth-root load carrying capacity using a Bézier curve
- Easy parametrization and applicability also to an asymmetrical tooth form

Dipl.-Ing. Zsolt Roth, Mechanical Design Engineer, Voith Turbo GmbH & Co. KG, Heidenheim, Johannes Opferkuch B.Sc., Student, Technische Universität München, Germany

The effect on tooth root breakage strength of tooth-root shapes resulting from different hobbing conditions

- Influence of hobbing condition on tooth root breakage strength
- Relationship between hobbing condition and tooth root undulation

Ryohei Saito, Development Manager, Dipl.-Ing. Kouji Matsuo, Gear Production Engineer, Hardware System Development Department, JATCO Ltd, Atsugi City, Dr.-Ing. Yoshitomo Suzuki, Senior Expert, Engineering Management Department, JATCO Ltd Fuji City, Japan

Root-fillet optimization of thin-rim planet gears with asymmetric teeth

- Thin-rim asymmetrically-toothed gears
- Tooth bending stress minimization by root fillet optimization

Dr/Ph.D. Alex Kapelevich, President, Dr. Yuriy Shekhtman Ph.D., Senior Researcher, AKGears, LLC, Shoreview, USA

Geometry, pitting and tooth root capacity of

- feasible designs
- Calculation of tooth-root capacity and an approach for simplification

Dr.-Ing. David Krueger. Design Engineer. Structures and Transmissions, Rolls-Royce Deutschland Ltd & Co KG,

asymmetric gears - Overview of basic design parameters and limits for

Blankenfelde-Mahlow, Germany

Evening Reception at the University 18:30

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



Dinner Speech: Matthew E. Croson, President, American Gear Manufacturers Association (AGMA). Alexandria. USA



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Lecture Room A

Load-sharing - load distribution

Moderation: Prof. Dr.-Ing. Manfred Hirt, former Renk, Germany / Prof. Dr.-Ing. Gerhard Poll, Leibniz University Hannover, Germany

08:30 A multiple-split load-sharing model of star gearing system for 2-stage external gearing

- Calculation of the load sharing coefficient based on transmission error
- Obtaining the floating orbit and floating displacement of the sun gear

Dr. Mo Shuai Ph.D., Team Leader, Master Ma Shuai, Student, Jin Guoquang Ph.D., Professor, School of Mechanical Engineering, Tianjin Polytechnic University, China

Non-involute tooth profiles

Lecture Room B

Moderation: Prof. Bingkui Chen, The State Key Lab of Mechanical Transmissions, Chongqing University, China / Dr.-Ing. Arbogast M. Grunau, Research Association for Drive Technology (FVA) & Schaeffler, Germany

A strain wave gearing with a new profile of

- Analysis of the movement locus of flexible gear
- Increase load capacity by dispersing the stress Bachelor Shoichi Ishikawa, Technical Adviser, Bachelor Yuya Murayama, Engineer, Harmonic Drive Laboratory, Harmonic Drive Systems Inc., Tokyo, Dr. Eng. Satoshi Kishi, Research Engineer, Production Technology Dept. Adviser, Harmonic Drive Systems Inc., Nagano, Japan

Condition monitoring and diagnostic

Lecture Room C

Moderation: Prof. Dr.-Ing. Berthold Schlecht, Technical University of Dresden, Germany / Dr.-Ing. Heinz-Uwe Arnscheidt, Volkswagen, Germany

Gear diagnostic system using zonal laser beam for practical use

- Damage detection on the gear surface
- Tendencies in the accuracy of size and position Prof. Dr. Eng. Eiichiro Tanaka, Professor, Faculty of Science and Engineering, Graduate School of Information, Production and Systems, Han-Ching Lin, Student, Waseda University, Kitakyushu, Fukuoka,

Efficiency

Lecture Room D

Moderation: Prof. Ing. Carlo Gorla, Politecnico di Milano, Italy / Prof. Dr.-Ing. Peter Tenberge, Ruhr-University Bochum, Germany

Numerical modeling of the churning power losses of gears: an innovative 3D computational tool suitable for planetary gearbox simulation

- Efficiency calculation of planetary gearboxes
- CFD simulations of churning and lubricant fluxes Franco Concli Ph.D.-Ing., Assistant Professor, Faculty of Science and Technology, Free University of Bolzano, Prof. Ing. Carlo Gorla, Associate Professor, Department of Mechanical Engineering, Politecnico di Milano, Italy

09:00 Load distribution in planetary gears considering effects of manufacturing tolerances with a statistical approach

- Manufacturing deviations and effect of probability - Monte-Carlo simulation

Dr.-Ing. Jennifer Papies, Development Engineer, Calculation department, Mechanical Drives, Process Industries and Drives, Siemens AG, Bocholt, Germany

Non-standard spur-gear tooth profiles for improved epicyclic gear system performance in low speed applications

- Multi-parametric analysis of spur gear design factors
- Load-carrying capacity of non-standard planetary

Erasmo Chiappetta, Ph.D. student, Prof. Denise Morrey, Professor, Mechanical Engineering and Mathematical Sciences, Oxford Brookes University, Oxford, United Kingdom

The application of relative mesh load intensity distribution for in-service condition monitoring

- Gearbox instrumentation and reliability
- Gear alignment and failure prevention Tomas Rosinski M.Eng., Senior Mechanical Engineer, Jarek Rosinski, CEO, Steve Lowry, Electronics Engineer, JR Dynamics Ltd, Cramlington, United Kingdom

Improved calculation method for loaddependent gear losses

- Experimental determination of the mean coefficient of friction
- Frictional behavior of helical gears with flank modifications

Dipl.-Ing. Thomas Jurkschat, Team Leader, Dr.-Ing. Thomas Lohner, Head of Department, Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, Germany

Load-sharing model for spur gears with tip 09:30

- Influence of tip relief on load-sharing ratio
- Effective contact ratio on loaded tooth Prof. Dr. Eng. José I. Pedrero, Professor, Dr. Eng. Miguel Pleguezuelos, Associate Professor, Dr. Eng. Miryam B. Sánchez, Assistant Professor Department of Mechanics, Faculty of Engineering, Universidad

Nacional de Educación a Distancia (UNED), Madrid,

Point-line meshing gear drive

- Characteristics of a point-line meshing gear drive
- Manufacture, testing and application of a point-line meshing gear drive

Huang Hai Ph.D., Associate Professor, School of Logistic Engineering, Prof. Haixiang Li, Team Leader, Wuhan University of Technology, China

Estimation of loaded static transmission error using vibration measurement under operating conditions in a two-stage helical gear reducer

- Evaluation of mesh excitation for each gear in a
- Estimation of relative tooth-surface shape of gear pair

Dr. Toshiya Nagumo, Engineer, Sumitomo Heavy Industries, Ltd., Yokosuka-shi, Kanagawa, Japan

General modelling method of power losses in transmission with parameter identification

- Selection of power loss models of transmission components
- Identification of the uncertain and influential parameters of models

Ye Shen M.Sc., Research Associate, Prof. Dr.-Ing. Stephan Rinderknecht, Head of Institute, Institute for Mechatronic Systems in Mechanical Engineering, Technische Universität Darmstadt, Germany, Dr.-Ing. Maik Hoppert, Engineering Specialist – Tribology & Low Carbon, Romax Technology Ltd, Nottingham, United Kingdom

Mesh stiffness of cylindrical gear including

Spain

10:30

- tooth surface friction based on FEA method - Mesh stiffness of cylindrical gears considering friction and oil
- A method using FEA and contact analysis Mimi Nan, Ph.D. student, Prof. Dr. Geng Liu, Full Professor, Deputy Dean, Lan Liu Ph.D., Associate Professor, School of Mechanical Engineering, Northwestern Polytechnical University, Xi'an, China

Curvature interference characteristic of conical surface enveloping a spiroid

- Global properties of curvature interference limit line - Measures to avoid curvature interference
- Yaping Zhao Ph.D., Professor, Mechanical Engineering Department, Northeastern University, Shenyang, China

Printing of a crack-detection sensor and meander line antenna for spur gears by laser sintering of conductive ink

- Smart gear by printed technology - Development of a 4-axis laser printer
- **Dr. Daisuke Iba,** Associate Professor, Shintaro Futagawa, Master student, Prof. Dr. Eng. Ichiro Moriwaki, Professor, Department of Mechanical Engineering, Kyoto Institute of Technology, Kyoto, Japan

Thermal analysis and optimization of gearboxes by simulation

- Simulation of oil distribution on the gearbox
- Simulation of air flow along the gearbox surface Dr.-Ing. Björn Bauer, Head of Product Development, Dr. Ralf Hambrecht, Head of Product Line Management, Andreas Kube, Head of System Engineering, Siemens AG, Voerde, Germany

Reliability

Moderation: Prof. i.R. Dr.-Ing. Bernd-Robert Höhn,

Technische Universität München (TUM), Germany /

Prof. Dr.-Ing. José I. Pedrero, UNED, Spain

Coffee break and visit to the exhibition and poster presentations

Transmission error

Moderation: Prof. Dr.-Ing. Karsten Stahl, Technische Universität München (TUM), Germany / Prof. h.c. Dr.-Ing. Aizoh Kubo, Research Institute for Applied Sciences, Japan

Robust optimization of gear macro- and micro-geometries in order to minimize static transmission error and gear stiffness fluctuations

- NVH optimization method acting of both macro and microgeometries
- Semi-analytical tooth bending model coupled with an efficient contact model

Pierre Garambois, Post-doctoral Researcher, loel Pierre-Liaudet Ph.D., Associate professor of mechanics, Emmanuel Rigaud, Ph.D., Associate Professor of Mechanics, Tribology and Systems Dynamics Laboratory, Ecole Centrale de Lyon, France

Materials

Moderation: Dr. Michel Octrue, CETIM, France / Dr.-Ing. Jörg Börner, ZF Friedrichshafen, Germany

Prediction of powertrain component performance based on novel steel quantification techniques and procedures

- Prediction of fatigue performance based on steel quantification
- Increasing permissible power density with clean

Patrik Ölund M.Sc., Head of Group R&D, Joakim Fagerlund M.Sc., Senior R&D Engineer, Lily Kamjou M.Sc., Senior Specialist Powertrain, Industry Solution, Ovako AB, Hofors, Sweden

Quality / measurement

Moderation: Dr.-Ing. Bernhard Bouché, Getriebebau NORD, Germany / Prof. Dr. Ing. Philippe Velex, INSA Lyon, France

Grinding burn inspection - tools for supervising and objectifying the testing

- Grinder burns testing reliability reference blocks - LASER treatment
- Surface temper etching eddy current-testing -Barkhausen-noise method

Dr. rer. nat. Dr. sc. techn. Martin W. Seidel, CEO, Dr. rer. nat. Antje Zösch, Head of R/D, B.Eng. Konstantin Härtel, Project Engineer, imq Ingenieurbetrieb für Materialprüfung, Qualitätssicherung und Schweißtechnik GmbH, Crimmitschau, Germany

Documentation of gearbox reliability – an upcoming demand

- Reliability provides a comparative statement for individual gearbox components
- Identification of the weakest elements in a drive

Dr.-Ing. Ulrich Kissling, Managing Director, Dr.-Ing. Michael Stangl, Senior Software Engineer, KISSsoft AG, Bubikon, Switzerland

The influence of the overlap ratio on 11:45 transmission error in parallel axis gears

- Comparison of transmission error between spurgears and helical gears
- Influence of the overlap ratio on the transmission error of helical gears considering misalignment and micro-modifications

Master Layue Zhao, Mechanical Engineer, National Key Lab of Vehicle Transmission, China North Vehicle Research Institute, Beijing, China, Dr. Robert Frazer. Senior Engineer, Expert, Dr. Brian Shaw, Director, Design Unit, Newcastle University, Newcastle Upon Tyne, United Kingdom

Development and investigation of austempered ductile iron (ADI) for thick-walled gear

- Optimized casting and heat treatment of planetary carriers
- Correlation of mechanical and microstructural properties

Dr.-Ing. Jochen Lohmiller, Development Engineer, Dr.-Ing. Jürgen Hoffmeister, Head of Technology department Materials Technology, Dr.-Ing. Jörg Hermes, Head of Development Gear Units, SEW-EURODRIVE GmbH & Co. KG, Bruchsal, Germany

Automatic geometrical separation of involute flank areas

- Geometrical decomposition of involute flanks
- Automated approximation of geometric parameters Dipl.-Ing. Axel von Freyberg, Research Assistant, Prof. Dr.-Ing. Andreas Fischer, Professor, Bremen Institute for Metrology, Automation and Quality Science (BIMAQ), University of Bremen, Germany

The remaining useful life of gears with inherent uncertainties

- Prediction of the remaining useful life reliability
- Development of an efficient modeling of gear-tooth crack propagation

Prof. Ph.D. Stephen Ekwaro-Osire, Professor, Haileyesus B. Endeshaw M.Sc., Research Assistant, Department of Mechanical Engineering, Texas Tech University, Lubbock, Fisseha M. Alemayehu Ph.D., Assistant Professor, West Texas A&M University, Canyon, USA

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Lecture Room A Lecture Room B Lecture Room C Lecture Room D

The influence of meshing stiffness with tooth 12:15 friction on vibration displacement in helical gear system

- Performance optimization of vibration and noise
- Influence of optimized meshing stiffness technology Associate Professor/Doctorate Wenliang Li, Engineer, Transmission department, Research Institute of China Shipbuilding Industry Corporation (CSIC), Harbin, China

Austempered Ductile Iron (ADI) for gears: manufacturing, performances and tests

- Bending fatigue tests on gears made of ADI - Contact fatigue tests on gears made of ADI
- Edoardo Conrado Ph.D.-Ing., Assistant Professor, Dr. Eng. Francesco Rosa, Assistant Professor,

Department of Mechanical Engineering, Politecnico di Milano, Franco Concli Ph.D.-Ing., Assistant Professor, Faculty of Science and Technology, Free University of Bolzano, Italy

Paradigm change in cylindrical gear metrology using areal measurements and evaluations

- Production-oriented modification and deviation parameters referring to the entire gear instead of individual flanks
- Area-oriented instead of line oriented evaluations Prof. Dr.-Ing. Gert Goch, Professor, Mechanical Engineering and Engineering Science, Kang Ni, Ph.D. student, Yue Peng, Ph.D. student, University of North Carolina at Charlotte, USA

- We achieved using 5-X & Light sectioning probe

- We achieved 1.5um repeatability(2sigma) with

Kenta Kanto, Section Manager 3rd Development

Yokohama-city, Junichi Morishita, Engineer, DMG

Research Institute for Applied Sciences, Kyoto, Japan

Section, Development Department, Industrial

Metrology Business Unit, Nikon Corporation.

MORI, Nagoya, Prof. Dr.-Ing. h.c. Aizoh Kubo,

Test method for time-scaled fatigue tests of transmission systems

- Transmission system test methods
- Evaluation of shortened tests w/o reaching failure

Dipl.-Ing. Michael Hein, Team Leader Flank Load Carrying Capacity, Load capacity cylindrical gears, Fatigue life analysis, 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

Reliability safeguarding for an 8 MW wind-

- Prototype development covering verification and
- Serial process development ensuring stable quality at the highest level

Non-contact measurement of 3D tooth flankenergy gearbox in serial production form accuracy of bevel gears on a 5-axis machining center

validation processes

Dr.-Ing. Dirk Strasser, Head of Wind Gearbox Development Witten, Dipl.-Ing. Stefan Troll, Project Manager, Process Engineering, Dipl.-Ing. Ralf Sperlich, Design Engineer, Product Design, Multi Megawatt Windgearboxes, Business Unit Wind Turbine Drives, Division Industrial Technology, ZF Industrieantriebe Witten GmbH, Germany

12:45 Simultaneous experimental characterization of dynamic transmission error in regard to the noise and vibration behavior of a gear system under load

- Gear noise measurement methodology
- NVH performance of a gear system in relation to transmission error

Sebastien Dalle, Head of Acoustics Department, Noise and Vibrations Engineering, Christophe Patte, Power Transmission Engineer, CETIM, Senlis, France

Prediction of local load carrying capacity for gears - a materials science approach

- Heat treatment simulation considering heat specific chemical composition
- Prediction of hardness profile for tooth root and

Dr.-Ing. Maximilian Schwenk, Development Engineer, Dr.-Ing. Jürgen Hoffmeister, Head of Technology Department Materials Technology, Dr.-Ing. Jörg Hermes, Head of Development Gear Units, SEW-EURODRIVE GmbH & Co. KG, Bruchsal, Germany

Closing remarks

70 % time reducing

Closing remarks

Closing remarks

Awarding of the best presentation for junior engineers by the conference president in the main hall

Closing remarks

Lunchtime snack

13:15

13:30



End of the conference

September 13th to 14th, 2017

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International Conference on Gear Production 2017

Prof. Dr.-Ing. Karsten Stahl, Full Professor, Institute of Machine Elements, Director, Gear Research Centre (FZG), Technische Universität München (TUM), Garching, 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. Dr.-Ing. E.h. Dr. h.c. Dr. h.c. Fritz Klocke, Full Professor, Chair of Manufacturing Technology, Laboratory for Machine Tools and Production Engineering (WZL), Faculty for Mecha-

Key topics discussed:

- Process optimization by digital gear manufacturing
- Future potential of PM gear technology
- Improved running behavior by manufacturing of functional surfaces
- New approaches for productivity increases and enhanced flexibility in gear manufacturing
- Advances in cylindrical gear production
- Manufacturing relating to product properties

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Further details and the final program can be found here:

www.vdi.de/gearproduction



International Conference on High Performance Plastic Gears 2017

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

Prof. Dr.-Ing. Dietmar Drummer, University Professor, Institute of Polymer Technology, Friedrich-Alexander Universität, Erlangen, Germany

Key topics discussed:

- Novel precision plastic gear applications in various industries
- Characterization of thermo-elastohydrodynamically lubricated (TEHL) contacts of thermoplastic
- Design investigations and indications for acoustical optimized gear meshes using plastic gears
- High performance polymers for future tribological application

With Experts from:

 $\textbf{Bosch} \cdot \textbf{B\"{u}hler} \; \textbf{Motor} \cdot \textbf{DSM} \cdot \textbf{DuPont} \cdot \textbf{Gleason Higher Education Centre Novo Mesto} \cdot \textbf{IMS}$ Gear · KISSsoft · Klüber Lubrication · Sabic · Scholz · Victrex · ZF · IWM

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

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