Experience an International Industry Event in a Class of its own:
The Expert Forum for Bearings – Rolling and Plain Bearings!

>> The World of Bearings – key topics: Innovative concepts ++ White Etching Cracks (WEC) ++ Reliability and functional safety ++ Tribology and energy ++ Damage diagnosis and avoidance ++ other issues

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The Schaeffler Group is a global automotive and industrial supplier. Top quality, outstanding technology, and exceptionally innovative spirit form the basis for the continued success of the company. By delivering high-precision components and systems in engine, transmission, and chassis applications, as well as rolling and plain bearing solutions for a large number of industrial applications, the Schaeffler Group is already shaping “Mobility for tomorrow” to a significant degree.

The technology company generated sales of approximately EUR 13.3 billion in 2016. With around 89,400 employees, Schaeffler is one of the world’s largest family companies and, with approximately 170 locations in over 50 countries, has a worldwide network of manufacturing locations, research and development facilities, and sales companies.

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SKF is a global supplier of bearings, seals, mechatronics, lubrication systems and services which include technical support, maintenance and reliability services, engineering consulting and training. SKF is represented in more than 130 countries and has 17,000 distributor locations worldwide. In 2017 annual sales were SEK 77 938 million, the number of employees was about 46 000.

In Germany, SKF has about 6,700 employees; out of these ca. 4,100 are working in Schweinfurt, where SKF GmbH is located and which is the largest production site in SKF Group. Sales in 2017 were ca. 2 billion Euros.

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Ladies and gentlemen,

Bearings are the heart of the machine. Rolling bearings are an essential element in technology, the enabling technology wherever there is movement. This is as true for industrial applications as it is for the automotive industry. The focus of the second BEARING WORLD conference is still on all aspects of rolling bearings, but this year we will also include an interesting look at plain bearings. Reliability and efficiency are the core topics. With more than 40 high level presentations on ongoing and completed research projects along with reports from field operation, the conference provides a comprehensive overview of the current state of technology, research, and development, and also looks at future trends.

The globalisation of the industry demands more and more international networking of research and development work. With FVA BEARING WORLD, the German Research Association for Drive Technology is initiating an international dialogue, an exchange of knowledge and experience in which researchers and developers from universities and bearing manufacturers come together with users and experts from the industry.

It is important for the industry and the research community to network internationally and receive valuable ideas from around the world. BEARING WORLD is a globally unique forum for the leading international experts in the fields of rolling and plain bearings. Become part of a leading global community.

The BEARING WORLD conference takes place every two years. With BEARING WORLD JOURNAL our aim is to continue this exchange among international experts by regularly publishing high-quality peer reviewed scientific reports related to rolling and plain bearings. With the Journal, we want to provide the international research community a publication platform for cutting-edge research and promote technological progress in the field of bearings.

We hope you have a rewarding experience at the conference with lots of engaging discussions!

Foreword

Dr. Arbogast Grunau
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IMKT Leibniz University Hannover, Germany
Speaker of the Program Committee

Prof. Bernd Sauer
MEGT University of Kaiserslautern, Germany
Member of the Program Committee and Scientific Board
Local host of BEARING WORLD 2018
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Program overview
Tuesday, 6 March, 2018

AUDITORIUM I

09:30 Opening
09:50 Keynotes
10:40 Coffee break
11:00 Energy efficiency
12:40 Lunch
13:40 Failure modes
15:20 Coffee break
15:50 Failure modes
18:00 End of presentations
19:30 Evening Event

Program overview
Wednesday, 7 March, 2018

AUDITORIUM I

08:30 Bearing calculation and dimensioning
10:35 Coffee break
11:05 Bearing calculation and dimensioning
12:20 Bearing calculation and dimensioning
13:10 Lunch
14:10 Lab testing vs. field performance/validation
16:15 Closing

AUDITORIUM II

08:30 Lubrication
10:35 Coffee break
11:05 Drive technology applications and challenges for bearings
12:20 Life and durability
13:10 Lunch
14:10 Life and durability
16:15 Closing

“BEARING WORLD 2018 will bring together experts from research and industry in the fields of design, calculation, and the practical use of bearings. We anticipate around 40 high level presentations detailing the latest completed and ongoing research projects as well as reports from field operation. Come to Kaiserslautern, Germany, and meet the international experts!”

Prof. Bernd Sauer, University of Kaiserslautern, Germany
Member of the BEARING WORLD program committee and scientific board
Program
Tuesday, 6 March, 2018 – AUDITORIUM I

Opening
Session chair: Prof. Gerhard Poll, Leibniz University Hannover, Institute of Machine Design and Tribology (IMKT), Germany

09:30 Opening
Prof. Gerhard Poll
Leibniz University Hannover,
Institute of Machine Design and Tribology (IMKT), Germany

Prof. Bernd Sauer
University of Kaiserslautern,
Institute of Machine Elements, Gears and Transmissions (MEGT), Germany

Christian Kunze
Forschungsvereinigung Antriebstechnik e.V. (FVA), Germany

Keynotes
Session chair: Prof. Gerhard Poll, Leibniz University Hannover, Institute of Machine Design and Tribology (IMKT), Germany

09:50 From “condition monitoring” to “reliable rotation” – how technology enables industrial revolutions, and how people turn technology into business value
Dr.-Ing. Victoria van Camp
SKF Group, Sweden

10:15 Shaping the mobility for tomorrow through innovation in bearing technology for a smarter, cleaner and safer world
Prof. Dr. Tim Hosenfeldt
Schaeffler AG, Germany

10:40 Coffee break

“Bearings are the heart of every machine or device with moving parts. With presentations from international experts, Bearing World offers up-to-date knowledge related to rotating equipment and its care and maintenance. Performance and reliability are the central topics of Bearing World.”
Bernd Stephan, AB SKF, Gothenburg, Sweden
CTO SKF Group
Program
Tuesday, 6 March, 2018 – AUDITORIUM I

**Energy efficiency**
Session chair: Prof. Rob Dwyer Joyce, The University of Sheffield, Department of Mechanical Engineering, United Kingdom

11:00  **Investigation of the frictional torque and temperature behavior of tapered roller bearings**
Marco Schwarz, ZF Friedrichshafen AG, Germany
Co-author: Jürgen Liebrecht, Technische Universität Kaiserslautern, Institute of Machine Elements, Gears and Transmissions (MEGT), Germany

11:25  **Friction losses optimized rolling bearing for substitution of highly loaded tapered rolling bearings**
Prof. Bernd Sauer
University of Kaiserslautern, Institute of Machine Elements, Gears and Transmissions (MEGT), Germany

11:50  **Development and efficiency testing of new generation „High Efficiency“ tapered roller bearings to meet efficiency of angular contact ball bearings on pinion shafts**
Thorsten Klähn
Co-authors: Jean Merckling, Dragos Oprescu, Timken Europe, France
Mike Gromosiak, Caleb Chovan, Timothy Crabill, The Timken Company, France

12:15  **Temperature behavior of rolling bearings exposed to centripetal acceleration**
David Hochrein
Co-authors: Dr. Stephan Tremmel, Prof. Sandro Wartzack
Friedrich-Alexander-Universität Erlangen-Nürnberg, Engineering Design, Germany
Oliver Graf-Goller, Schaeffler Technologies AG & Co. KG, Germany

12:40  Lunch

**Failure modes**
Session chair: Prof. Farshid Sadeghi, Purdue University, School of Mechanical Engineering, West Lafayette, (IN), USA

13:40  **Influence of mechanical and electrical loading on the formation of White Etching Cracks**
Dr. Ralf Martin Dinter, Flender GmbH, Germany
Co-author: Francisco Gutierrez Guzman, RWTH Aachen University, Institute for Machine Elements and Machine Design (IME), Germany

14:05  **WEC failure at the inner ring of roller bearings under dynamic conditions**
Prof. Hubert Schwarze, Clausthal University of Technology, Institute of Tribology and Energy Conversion Machinery, Germany
Co-author: Dr.-Ing. Jörg Loos, Schaeffler Technologies AG & Co. KG, Germany

14:30  **The relation of White Etching Cracks with (very) high cycle fatigue**
Dr. Reinder Hindrik Vegter
Co-author: Dr. Junbiao Lai
SKF Research & Technology Development, Netherlands
Program

Tuesday, 6 March, 2018 – AUDITORIUM I

Failure modes
Session chair: Prof. Farshid Sadeghi, Purdue University, School of Mechanical Engineering, West Lafayette, (IN), USA

14:55  Evolution of White Etching Cracks during bearing tests
Dr. Steve Ooi
University of Cambridge, United Kingdom

15:20  Coffee break

Failure modes
Session chair: Prof. Michel Fillon, University of Poitiers, Institut Pprime, CNRS, France

15:50  Lubricant influences on the formation of White Etching Cracks (WEC)
Dr. Christoph Mayer
Klüber Lubrication München SE & Co. KG, Germany

16:15  Camshaft ball bearing WEC premature failure on simplified component test:
suitable bearing design and improved test with representative boundary conditions
Marc Paquien
NTN-SNR Roulements, France

16:40  Differences between brinelling marks, false brinelling and standstill marks
Dr. Markus Grebe
Competence Center for Tribology at the Mannheim University of Applied Sciences, Germany

17:05  Solutions to reduce wear in wind turbine blade bearings
Fabian Schwack
Leibniz Universität Hannover, Insitute of Machine Design and Tribology (IMKT), Germany
Co-author: Malthias Stammler, Fraunhofer Institute for Wind Energy
and Energy System Technology (IWES), Germany

17:30  Relationship of smearing criteria and transient lubrication analysis
Prof. Wen Wang
Co-author: Liang Guo
Shanghai University, China

18:00  End of presentations
19:30  Evening event

“Bearing World is the international expert forum for bearings. Here, researchers and developers from universities and bearing manufacturers come together in dialogue with users and experts from the industry. The goal is to align the drive system industry more closely to the requirements of the future. There can be no progress without modern drive technologies!”

Dr. Arbogast Grunau, Corporate R&D Competence and Services, Schaeffler AG, Germany
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Program
Wednesday, 7 March, 2018 – AUDITORIUM I

Bearing calculation and dimensioning
Session chair: Andreas Weber, Vestas Nacelles Deutschland GmbH, Germany

08:30    Miscellaneous Engineering Approaches to contact elasticity calculations
Dr. Luc Houpert
The Timken Company, France

08:55    Non-linearly coupled modelling of spindle bearing systems
Jens Falker
Co-authors: Prof. Christian Brecher; Marcel Fey
RWTH Aachen, Laboratory for Machine Tools and Production Engineering (WZL), Germany

09:20    The effect solid particle lubricant contamination on the dynamic behavior of compliant journal bearings
Prof. Benyebka Bou-Saïd
Co-authors: Hamid Boucherit, Mustapha Lahmar
Université de Lyon, CNRS INSA-Lyon, France

09:45    Development and investigation of a simulation-driven preloading process for bearing installation
Philipp Abele
Co-authors: Ermait Lamaj, Dr. Jörg Hermes
SEW-Eurodrive GmbH & Co. KG, Germany

10:10    Influence of geometric form deviations on operating parameters in hydrodynamic bearings
Marko Ebermann
Co-author: Prof. Erhard Leidich
Chemnitz University of Technology, Department of Mechanical Engineering, Institute of Design Engineering and Drive Technology, Germany

10:35    Coffee break

Bearing calculation and dimensioning
Session chair: Prof. Eustathios Stathis Ioannides, Imperial College London, Centre for Plastic Electronics, Great Britain

11:05    Is surface texturing really efficient in hydrodynamic sliding bearings?
Prof. Michel Fillon
University of Poitiers, Institut Pprime, CNRS, France

11:30    Optimization and assessment of bearing running noise
Dr. Hannes Grillenberger
Co-author: Joachim Schleifenbaum
Schaeffler Technologies AG & Co. KG, Germany

11:55    Radially preloaded cylindrical roller bearings – experimental studies regarding axial roller kinematic
Roman Böttcher
Co-author: Prof. Gerhard Poll
Leibniz Universität Hannover, Institute of Machine Design and Tribology (IMKT), Germany
Program
Wednesday, 7 March, 2018 – AUDITORIUM II

Lubrication
Session chair: Prof. Pat-Lam Patrick Wong, City University of Hong Kong, Department of Mechanical and Biomedical Engineering, China

08:30 Base oil and grease effects on friction and film thickness in transition to mixed lubrication
Tomas Zapletal
Co-authors: Dr. Petr Šperka, Ivan Krupka
Brno University of Technology, Czech Republic

08:55 Lubricant formulations in rolling bearing simulation based upon friction mapping results
Torben Fruth, FUCHS Schmierstoffe GmbH, Germany
Co-author: Dr.-Ing. Timo Kiekbusch, University of Kaiserslautern, Institute of Machine Elements, Gears and Transmissions (MEGT), Germany

09:20 Observation of grease film evolution in rolling point contacts
Dr. Xinming Li
Qingdao University of Technology, China

09:45 Analyses of rheological behaviors based on a novel rheological model for the shear thinning lubricants
Ping Yang
Qingdao University of Technology, School of Mechanical Engineering, China

10:10 Characterization of electrical lubricant properties for modeling of electrical drive systems with rolling bearings
Dr.-Ing. Timo Kiekbusch
Co-author: Prof. Bernd Sauer
University of Kaiserslautern, Institute of Machine Elements, Gears and Transmissions (MEGT), Germany

10:35 Coffee break

Drive technology applications and challenges for bearings
Session chair: Dr. Oliver Koch, Schaeffler Technologies AG & Co. KG, Germany

11:05 The path of the common-mode currents: measures against damage of bearings caused by electrical discharge currents at large drives derived from latest field research results
Sven Tröger
Co-author: Prof. Matthias Kröger
Technische Universität Bergakademie Freiberg, Institute for Machine Elements, Engineering Design and Manufacturing, Germany

11:30 An experimental study of the effects of dynamic shaft movements on friction in cylindrical roller bearings
Andreas Meinel
Co-author: Dr. Stephan Tremmel
Friedrich-Alexander-Universität Erlangen-Nürnberg, Engineering Design, Germany

11:55 Interdisciplinary product development of optimized spherical roller bearings for wind main shaft applications
Andreas Bierlein
Schaeffler Technologies GmbH & Co. KG, Germany
Program

Wednesday, 7 March, 2018 – AUDITORIUM I

**Bearing calculation and dimensioning**

Session chair: Prof. Eustathios Stathis Ioannides, Imperial College London, Centre for Plastic Electronics, Great Britain

12:20 **Experimental and numerical investigations of the durability of bearing cages**
Dr. Robert Szlosarek  
Technische Universität Bergakademie Freiberg, Institute for machine elements, design and manufacturing, Germany  
Co-author: Franz Pätzold, Kugel- und Rollenlagerwerk, Leipzig GmbH, Germany

12:45 **Dynamic analysis of railway gearbox: from rotating system simulation to dynamics of a rolling bearing**
Dr. Witold Marek Smolenksi  
Co-author: Dr. Andrei Degtiarev  
Schaeffler Technologies AG & Co. KG, Germany

13:10 Lunch

**Lab testing vs. field performance/validation**

Session chair: Luc Houpert, The Timken Company, France

14:10 **Experimental bearing cage vibration and corroboration with bearing cage dynamic modeling**
Prof. Farshid Sadeghi  
Co-author: Lijun Cao  
Purdue University, School of Mechanical Engineering, West Lafayette, (IN), USA

14:35 **Investigation of rolling bearing condition monitoring techniques: a study based on long term run-to-failure vibration data**
Reza Golafshan  
Co-author: Prof. Georg Jacobs  
RWTH Aachen University, Institute for Machine Elements and Machine Design (IME), Germany

15:00 **Testing of main bearings of wind turbine generator**
Dr. Houssein Janbein  
Co-author: Lutz Heuser  
Vestas Wind Systems, Germany

15:25 **Hydrogen evolution in rolling contact**
Dr.-Ing. Dominik Kürten  
Co-author: Dr. Andreas Kailer  
Fraunhofer Institute for Mechanics of Materials (IWM), Germany

15:50 **Non-invasive load measurement of hertzian contact within a cylindrical roller bearing**
Gary Nicholas  
Co-author: Rob Dwyer-Joyce  
The University of Sheffield, United Kingdom

16:15 Closing
Program
Wednesday, 7 March, 2018 – AUDITORIUM II

Life and durability
Session chair: Rüdiger Sontheimer, SKF GmbH, Germany

12:20 Reliable calculation of slewing bearings for the industrial practice
Dr.-Ing. Martin Neidnicht
Co-authors: Dr. Thomas Handreck; Dr. Bernd Lüneburg
thyssenkrupp Rothe Erde GmbH, Germany;
Dr. Thomas Griggel, Thomas Gellermann, Allianz Risk Consulting GmbH, Germany

12:45 An analytical method to account for spinning friction in axial ball bearings using the standard DIN ISO 281
Paul Sauvage
Co-authors: Christopher Sous; Prof. Georg Jacobs
RWTH Aachen, University, Institute for Machine Elements and Machine Design (IME), Germany
Martin Correns, Schaeffler Technologies AG & Co. KG, Germany

13:10 Lunch

Life and durability
Session chair: Prof. Bernd Sauer, University of Kaiserslautern, Institute of Machine Elements, Gears and Transmissions (MEGT), Germany

14:10 Bearing fatigue life of a multi-material shaft with an integrated raceway
Timm Coors
Co-author: Prof. Gerhard Poll
Leibniz Universität Hannover, Institute of Machine Design and Tribology (IMKT), Germany

14:35 The effect of retained austenite and carbide distribution on the wear resistance of the bearing raceway
Zeren Ozgeneci, ORS Bearings, Polatlı- Ankara, Turkey
Co-author: Bilgehan Ogel, Middle East Technical University, Metalurgical and Material Engineering Department, Turkey

15:00 Integrity assurance of silicon nitride balls for hybrid bearings
Dr. Junbiao Lai
Co-authors: Charlotte Vieillard; Yuri Kadin
SKF Research & Technology Development, Netherlands

15:25 A new through-hardenable high hardenability bearing steel designed by means of simultaneous optimisation of multiple responses using the desirability function approach
Dr. Urszula Sachadel
Co-authors: Mohamed Sherif; Boris Minov; Wijbe Buisin
SKF, Netherlands

15:50 Evaluation of multiple-flaw failure of bearing steel 52100 in the VHCF regime and mathematical description of the single-flaw fatigue behavior
Dr. Klaus Burkart
Co-authors: Prof. Hans-Werner Zoch; Prof. Brigitte Clausen
Leibniz Institute for Materials Engineering IWT, Germany

16:15 Closing
Organisation

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