Tenth International Symposium on Bearing Steel Technologies: Advances in Steel Technologies for Rolling Bearings

Sponsored by ASTM Committee A01 on Steel, Stainless and Related Alloys

May 6-8, 2014
Sheraton Toronto
Toronto, Ontario, Canada

Symposium Chairman: John M. Beswick,
SKF Group Technology Development,
Nieuwegein, The Netherlands

MONDAY MAY 5, 2014
5:00 - 7:00 PM RECEPTION

TUESDAY MAY 6, 2014

8:00 AM
Opening Remarks, Award Presentations and Symposium Introduction
John M. Beswick, SKF Group Technology, Nieuwegein, The Netherlands
Pat McDonough, Gerdau Special Steel North America, Fort Smith, AR, USA

Session 1: Advances in Bearing Steel Steelmaking and Processing

Session Chair: Pat McDonough
Gerdau Special Steel North America
Fort Smith, AR, USA

8:30 AM
The Effect of Steelmaking Process on the Oxide Inclusion Population
Peter Glaws, (presented by Scott Hyde) The Timken Company, Canton OH, USA

9:00 AM
Thermodynamic Calculations Versus Instrumental Analysis of Slag-Steel Equilibria in an ASEA-SKF Ladle Furnace
K. Riyah and U. Sjöblom, Ovako Hofors Hofors, Sweden; and P. Ölund, AB SKF, Gothenburg, Sweden,
9:30 AM
Steelmaking Technologies and Quality Assurance Methodologies for 600 ktons Production of State-of-the Art 1C-1.5Cr Bearing Steel
Q. Gang, L. Guozhong, X. Xiaohong, C. Ru, Jiangyin Xing Cheng, PR China; and H.-A. Munther, Consultant, LaoHan AB, Hofors, Sweden

10:00 AM BREAK

10:30 AM
The Effect of Area Reduction on Preventing Rolling Contact Fatigue in Large Bearings
P. Walker and P. E.J. Rivera-Díaz-del-Castillo, SKF University Technology Centre and University of Cambridge, Cambridge, United Kingdom; A. Kerrigan, SKF Engineering & Research Centre, Kelvinbaan, Nieuwegein, The Netherlands; N. Cardinal, Tata Steel Specialty, Stocksbridge, Sheffield, United Kingdom; and M. Green, Tata Steel, Swinden Technology Centre, Moorgate, Rotherham, United Kingdom

11:00 AM
10 Different Bearing Steels – Processing of Lean Steel up to Top Premium Quality
F. Wilke, Deutsche Edelstahlwerke, Witten, Germany

11:30 AM
Castability Improvement in Bearing Steels by Treatment of a Database of the Process Parameters
E Hénault and F. R. Meyer, (presented by Gilles Auclair) Ascometal CREAS and J. Gremillet, Ascometal, Hangondange Steel Plant, Hagondange, France

12:00 PM Lunch

Session 2: Steel Cleanliness Knowledge and Relationships with Rolling Bearing Functional Properties

Session Chair: Phil Predmesky
SKF North American Technical Centre
Plymouth MI, USA

1:00 PM
Influence of Sulfur Inclusion Content on Rolling Bearing Contact Fatigue Life
M. Dinkel and W. Trojahn, Schaeffler Technologies, Schweinfurt, Germany

1:30 PM
D-type Non-Metallic Inclusions, Microscope Inclusion Rating Standards and Fatigue Initiation Propensity
T. Lund, AB SKF, Gothenburg, Sweden; and S. Stude, AB SKF, Gothenburg, Sweden
2:00 PM
Non Metallic Inclusion Density in Bearing Steel Characterized by Ultrasonic Testing
F. Midroit and F. Merchi, (presented by Mathilde Meheux) Ascometal Research Centre – CREAS, Hagondange, France

2:30 PM
Characterization of Non-metallic Inclusions in Bearing Steels by Means of Focused Ion Beam
A. Naveira Suarez, SKF - Group Manufacturing Development Centre, Horsgatan, Gothenburg, Sweden

3:00 PM    BREAK

3:30 PM
Crack Initiation and Propagation Behavior around the Defect in Steel under Rolling Contact Fatigue
T. Fujimatsu, T. Nakamizo, M. Nakasaki and N. Tsunekage, Sanyo Special Steel Co., Ltd., Himeji, Hyogo, Japan
4:00 PM
Improvement of Rolling Contact Fatigue Resistance in Bearing Steels by Adjusting Composition of Oxide Compositions
T. Minamida, Kobe Steel Ltd, Shinagawa-ku, Tokyo, Japan

Session 3: New Bearing Steels for Improved Functional Properties

Session Chair:   Jim Carosiello
                 The Timken Company
                 Canton OH, USA

4:30 PM
Improved Chemical Composition of Low Alloyed High Carbon Martensitic Bearing Steels for Higher Fatigue Strength
B. Clause and H.-W. Zoch, Stiftung Institut für Werkstofftechnik, Bremen, Germany; W. Trojahn, Schaeffler Technologies AG & Co.KG, Schweinfurt, Germany

5:00 PM
A Relationship between Surface Nitrogen Concentrations and RCF Lives
D. Sato, NTN Corporation, Kuwana, Mie, Japan

5:30 - 7:30 PM    Gerdau Special Steel North America RECEPTION
WEDNESDAY, MAY 7, 2014

Session 3: continued:
New Bearing Steels for Improved Functional Properties

8:00 AM
*Slip-rolling Resistance of Alternative Steels under High Contact Pressures in Engine Oils*
M. Woydt and C. Scholz BAM Federal Institute for Materials Research and Testing, Berlin, Germany

8:30 AM
*Review of Stainless Bearing Steel – Cost Effective Grades Achieving Best-in-Class Properties*
O. Laurent, Aubert & Duval, Charlotte, North Carolina, USA; J. Bellus, Aubert & Duval, Les Ancizes, France; and F. Devilder, Aubert & Duval, Paris, France

9:00 AM
*Introduction of Nitried M50 and M50NiL Bearings into Jet Engine Mainshaft Applications*
M. Johnson, K. Miedema, M. Rhoads, J. Scheetz and J. Williams, GE Aviation, Cincinnati, Ohio, USA

9:30 AM
*Enhanced Performance of Rolling Bearings by Improving Durability against Surface Feature Degradation of Rolling Elements*
H. Komata, Y. Iwanaga, T. Ueda, K. Ueda and N. Mitamura, NSK Ltd. Fujisawa-Shi, Kanagawa, Japan

10:00 AM
*Novel High-Carbon High-Vanadium PM Steel for Demanding Bearing Applications*
M. Y. Sherif and J. M. Beswick, SKF Engineering & Research Centre, Nieuwegein, The Netherlands

10:30 AM  BREAK

11:00 AM
*Advantages and Shortcomings of Retained Austenite in Bearing Steels*
C. Sidoroff, P. Dierickx and D. Girodin, NTN-SNR Roulements, Annecy, France

11:30 AM
*High Integrity Powder Metallurgy for Demanding Bearing Applications*
J. Olofsson, F. Sandberg, D. Rébois and S. Sundin, Erasteel Kloster AB, Söderfors, Sweden; and E. Tarney, Erasteel Inc., Boonton, New Jersey, USA

12:00 AM  LUNCH
Session 4: Softening and Hardening Heat Treatment Physical Metallurgy

Session Chair: Jeff Fuller
Amsted Rail
Petersburg, VA, USA

1:00 PM
Accelerated Carbide Spheroidisation of 100CrMnSi6-4 Bearing Steel by Controlled Rolling
D. Hauserova, J. Dlouhy and Z. Novy COMTES FHT a.s., Prumyslova, Dobrany, Czech Republic

1:30 PM
Microstructure and Mechanical Properties of Hardened 100CrMnSi6-4 Bearing Steel after Accelerated Carbide Spheroidisation and Long Duration Annealing
J. Dlouhy, D. Hauserova and Z. Novy COMTES FHT a.s., Prumyslova Dobrany, Czech Republic

2:00 PM
Kinetics of Bainite Formation in 100Cr6 and Similar High Carbon Steel Grades
T. Sourmail and V. Smanio, (presented by Gilles Auclair) Ascometal Research Centre - CREAS, Hagondange Cedex, France

2:30 PM
Study of Austempering Effect on the Rolling Contact Fatigue Characteristics of Bearing Steels KS SCr420H(AISI 5120) and KS STB2(AISI 52100)

3:00 PM   BREAK

3.30 PM
Low Temperature Plasma Nitriding of Pyrowear 675
H. K Trivedi, UES Inc, Dayton, OH, USA; and R. Monahan, Ionic Technologies Inc, Greenville, SC, USA

4.00 PM
Heat Treatment Process for Martensitic Stainless Steel Pyrowear 675 for Improved Corrosion Resistance
H. K. Trivedi and R. S. Bhattacharya, UES Inc, Dayton, OH, USA; F. Otto, Midwest Thermal Vac (MTV), Kenosha, WI, USA; T. Piazza, Blackstone-Ney Ultrasonics (Cleaning Technologies Group), Jamestown, NY, USA; and B. McCoy, SKF USA Inc., Falconer NY, USA
Session 5: Rolling Bearing Metallurgy for Wind Energy Applications

Session Chair: Mark Ikezawa
Republic Engineered Products
Canton OH, USA

4:30 PM
Serial Sectioning Investigations of White Etching Crack (WEC) Formation Under Rolling Contact Fatigue
M. -H. Evans, L. Wang and R. J.K. Wood, (presented by Aidan Kerrigan) National Centre for Advanced Tribology at Southampton (nCATS), University of Southampton, Southampton, Hampshire, UK

5:00 PM
The Dilemma with Premature White Etching Crack Bearing Failures
K. Stadler, SKF GmbH, Schweinfurt, Germany; E. Vegter and J. Lai, SKF B.V, Nieuwegein, The Netherlands

5:30 PM
Material Qualification of Main Bearing for Large Wind Energy Turbines
B. Lünberg, M. Burchen and U. Maschelski, ThyssenKrupp Rothe Erde GmbH, Lippstadt, Germany

6:00 - 8:00 PM RECESSION

THURSDAY, MAY 8, 2014

Session 6: Developments in Fatigue and Rolling Contact Fatigue Testing

Session Chair: Aidan Kerrigan
SKF Engineering & Research Centre
Nieuwegein, The Netherlands

8:00 AM
Mechanical Twinning in Aircraft Engine Bearing Steel
J. Nygaard, SKF Univ. Technology Centre, University of Cambridge, Cambridge, United Kingdom

8:30 AM
Flat Washer Test Practices – Statistical Analysis
M. Meheux and E. Henault, ASCOMETAL CREAS, Hagondange, France
9:00 AM  
**Understanding Microstructural Transitions Occurring Under Rolling Contact Fatigue**
J.-H. Kang and P. E. J. Rivera-Diaz-del-Castillo, University of Cambridge, Cambridge, United Kingdom; M. Moody, Oxford University, Oxford, UK; and B. Hosseinkhani, SKF Engineering & Research Centre, Nieuwegein, The Netherlands

9:30 AM  
**Advances in Fatigue Strength Rating Using Rotating Bending Fatigue Testing of Specimens from Hardened Bearing Components**
L. Viskari and I. Strandell, AB SKF, Gothenburg, Sweden.

10:00 AM  
**BREAK**

10:30 AM  
**Subsurface Material Response of Hypo Eutectoid Bearing Steels**

11:00 AM  
**Measurement of Residual Stresses in Ball Bearings by Synchrotron Radiation**
R. H. Vegter and H. A. Verschoor, SKF Engineering & Research Centre, MT Nieuwegein The Netherlands; and T. Buslaps, ESRF, Grenoble, France

11:30 AM  
**Closing Remarks**
John Beswick, Symposium Chairman

11:45 AM  
**SYMPOSIUM ADJOURNS**