

# **Society of Tribologists and Lubrication Engineers Annual Meeting and Exhibition 2010**

**Las Vegas, Nevada, USA  
16-20 May 2010**

**ISBN: 978-1-61738-727-2**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2010) by the Society of Tribologists and Lubrication Engineers  
All rights reserved.

Printed by Curran Associates, Inc. (2010)

For permission requests, please contact the Society of Tribologists and Lubrication Engineers  
at the address below.

Society of Tribologists and Lubrication Engineers  
840 Busse Highway  
Park Ridge, Illinois 60068-2302

Phone: (847) 825-5536  
Fax: (847) 825-1456

[information@stle.org](mailto:information@stle.org)

# TABLE OF CONTENTS

<b>Effect of Surface Roughness on Thermal Elastohydrodynamic Lubrication of Infinite Line Contacts Using Average Flow Model</b> .....	1
<i>Prawal Sinha, Hasim Khan</i>	
<b>The Influence of Speed and Load Spectra on the Friction of Rolling Bearings</b> .....	4
<i>T. Stahl, S. Tremmel, H. Meerkamm, S. Wartzack</i>	
<b>Advanced Treatment Options for Metal Removal Fluid Wastewaters</b> .....	7
<i>Alan Cross, John Burke</i>	
<b>Evaluation of Lubricants for Minimum Quantity Lubrication</b> .....	10
<i>Bruce L. Tai, Jean M. Dasch, Albert J. Shih</i>	
<b>Endotoxin Measurements in Different Metalworking Fluid Types</b> .....	13
<i>Alexandra Fluri</i>	
<b>Corrosion Issues &amp; Test Methods</b> .....	17
<i>Jerry P. Byers</i>	
<b>Prediction of Friction and Wear behavior of Al6061-SiCp (Ni-P coated) Composites</b> .....	19
<i>Chinnakurli Suryanarayana Ramesh, B. Hudedagaddi Channabasappa, Ramaiah Keshavamurthy</i>	
<b>A Study on In-flight Characteristics of Inconel 718 Particles During HVOF Thermal Spraying Process</b> .....	22
<i>Chinnakurli Suryanarayana Ramesh, Komandur Sudarshan Sridhar, Ramaiah Keshavamurthy, M. Nadaf Tippusultan</i>	
<b>A Study on Surface Finish of Laser-sintered IRON-SiC Composites</b> .....	25
<i>Chinnakurli Suryanarayana Ramesh, Cheekur Krishnamurthy Srinivasa, Varahasandra Ramalingegowda Raju, Ramaiah Keshavamurthy</i>	
<b>Modification of Surface Properties of Si Micro-molds by DLC Coatings Deposited with DC Magnetron Sputtering</b> .....	28
<i>E. Liu, B. Saha, S.B. Tor, D.E. Hardt, J.H. Chun</i>	
<b>Effect of Oil Aging Due to Bio-fuels on Wear of Piston Ring and Cylinder Liner System</b> .....	31
<i>Martin Jech, Claudia Lenauer, Nicole Doerr, Thomas Wopelka, Karoline Steinschuetz, Michael Urbanek, Franz Novotny-Farkas</i>	
<b>Multi-level Used Oil Management</b> .....	34
<i>Donald J. Smolenski</i>	
<b>Cradle to Grave Management of Metal Removal Fluids</b> .....	37
<i>Donald J. Smolenski</i>	
<b>Numerical Investigation of Thermal Behavior of a Hybrid High-Speed Bearing</b> .....	40
<i>Jun Wang, Feliciano Greco</i>	
<b>Formulating Vegetable-Based Industrial Lubricants: Performance and Rheological Considerations</b> .....	43
<i>James N. Vinci, Farrukh S. Qureshi</i>	
<b>Bearing Fatigue Life Tests of Advanced Base Oil for Space Applications Under Vacuum and Atmospheric Environments</b> .....	51
<i>Nobuyoshi Ohno, Kentaro Sonoda, Hiroyuki Tsuchida, Sobahan Mia, Shigeki Morita, Hiroshi Shiomi, Shingo Obara</i>	
<b>Electrochemical Friction Control Using Downhole Drilling Lubricants</b> .....	54
<i>M.N.F. Ismail, R.J.K. Wood, A. Humphreys, J.A. Wharton, T.J. Harvey</i>	
<b>Stopping Criterion in Iterative Solution Methods for Reynolds Equations</b> .....	57
<i>Nenzi Wang, Shih-Hung Chang, Hua-Chih Huang</i>	
<b>EHD Lubrication in Spiral Bevel Gears</b> .....	60
<i>Vilmos Simon</i>	
<b>A Review of Engineered Surfaces for Valvetrain Friction Reduction and Wear</b> .....	63
<i>Arup Gangopadhyay, Douglas G. McWatt, Robert J. Zdrodowski</i>	
<b>Effect of Micro-Dimpled Surface on Friction Reduction and Time-to-Beginning-Surface-Scratch in Disc-on-Disc (Cu-Zn Alloy and AISI304) Test</b> .....	67
<i>Y.S. Pyoun, I.S. Cho, C.S. Lee, I.G. Park, I.H. Cho</i>	
<b>Fretting Wear Behavior of Fiber Reinforced Composite Materials for Implant Applications</b> .....	70
<i>S. Achanta, D. Drees, Judith Juhasz, Sarena Best, Neil Rushton</i>	
<b>The Influence of Nanoparticles on the Lubricating Properties of Rapeseed Oil</b> .....	75
<i>T. Maliar, H. Cesiulis, S. Achanta, D. Drees</i>	
<b>High-Temperature Galling Characteristics of Ti-6AL-4V with and Without Surface Treatments</b> .....	80
<i>P.J. Blau, D.L. Erdman III, E. Ohriner, B.C. Jolly</i>	

<b>Novel Non-Varnishing PAG based Synthetic Turbine Fluid</b> .....	83
<i>Govind Khemchandani</i>	
<b>Tribology in Polishing of Thin Film Magnetic Recording Disks</b> .....	85
<i>Thomas E. Karis, Yosuke Kajihara</i>	
<b>Wear Characteristics of Plastic Joint Against Steel Ball Under Lubricated Condition</b> .....	88
<i>Se-Min Park, Gi-Hoon Kim, Dae-Sung Kim, Young-Ze Lee</i>	
<b>Understanding the Potential Significance of FT-IR for Condition Monitoring (Where Do We Go from Here?)</b> .....	91
<i>David Pinchuk, Emmanuel Akochi-Koble, Tao Yuan</i>	
<b>Physical Barrier and Chemical Bonding Effects on Lubricity of Semi-Synthetic Coolants</b> .....	94
<i>Yixing (Philip) Zhao</i>	
<b>Oil Debris and Viscosity Monitoring Using Ultrasonic and Capacitance Measurements</b> .....	98
<i>Matthew Appleby, Fred K. Choy</i>	
<b>Vibration Pattern Recognition on Damages in Gears and Rolling Element Bearings</b> .....	101
<i>Fred K. Choy, Chia-Hsuan Shen, Jie Wen, Pirapat Arunyanart</i>	
<b>Tribological and Rheological Behavior of a Heavy Naphthenic Oil and Polyisobutenes: A Comparative Study</b> .....	104
<i>Luis Bastardo-Zambrano, Mehdi Fathi-Najafi, Nynas Ab</i>	
<b>Influences of Autoxidation on the Tribological Properties of Vegetables Oils</b> .....	108
<i>M. Nakasako, I. Minami</i>	
<b>Internal Loading Distribution in Statically Loaded Ball Bearings, Subjected to a Combined Radial and Thrust Load, Including the Effects of Temperature and Fit</b> .....	111
<i>M.C. Ricci</i>	
<b>Effect of Internal Clearance on Life of Radially-Loaded Ball &amp; Roller Bearings</b> .....	113
<i>Fred B. Oswald, Erwin V. Zaretsky, Joseph V. Poplawski</i>	
<b>Energy Savings and Improved Precision with Adjustable Hydrodynamic Bearings</b> .....	119
<i>James Keith Martin</i>	
<b>Prediction of Power Losses in High Speed Rolling Element Bearings Using Thermal Networks Method</b> .....	124
<i>Francois Pouly, C. Changenet, F. Ville, P. Velez, Bruno Damiens</i>	
<b>Study of Tribological Properties of Cu-base Sintered Powder Materials Containing Molybdenum Disulfide and Molybdenum Diselenite Under Unlubricated Conditions</b> .....	127
<i>A.M. Kovalchenkoa, O.I. Fushchichb, S. Danyluka</i>	
<b>A Generalized Model for Porous Medium Flow in Squeezing Film Situations</b> .....	130
<i>Mohamed Nabhani, Mohamed El Khlifi, Benyebka Bou-Said</i>	
<b>Difficulties in Determining Application Quantities for Rail and Wheel Flange Lubrication</b> .....	133
<i>J.J. de Koker</i>	
<b>Monotonic Stress-Strain Response of Case Hardened Bearing Steels, Part II: Elastic-Plastic Finite Element Analysis</b> .....	136
<i>Nagaraj K. Arakere, Ghatu Subhash, Nathan Branch, Mike Klecka</i>	
<b>Tribological Characterization of Surface Engineered Tooling</b> .....	139
<i>Andrew Biksa, Stephen Veldhuis</i>	
<b>The Prediction of Wear Life for Parts of a Rotary Compressor with Carbon Dioxide As a Refrigerant</b> .....	142
<i>Hong-Gyu Jeon, Sung-Oug Cho, Young-Ze Lee</i>	
<b>Friction and Wear Maps of Solid Lubricating Coatings, Films, and Powders</b> .....	145
<i>K. Miyoshi, S. Watanabe, R.L Vander Wal, K.W. Street Jr.</i>	
<b>Investigation of the Performance of Highly Loaded Laser Structured Surfaces Part 1: Theory and Quasi Static Results</b> .....	147
<i>V. Bakolas, M. Pausch, A. Liebel, H. Meerkamm</i>	
<b>Investigation of the Performance of Highly Loaded Laser Structured Surfaces Part 2: Transient Results</b> .....	150
<i>M. Pausch, V. Bakolas, A. Liebel, H. Meerkamm</i>	
<b>Wear of Crankshaft Journal of Reciprocating Engine and Wear-Particle Releasing Behavior</b> .....	153
<i>Kenji Matsumoto, Naoki Ito</i>	
<b>Compositional Effects on the Surface Finish of the PS400 Solid Lubricant Coating</b> .....	155
<i>C. DellaCorte, M.K. Stanford, F. Thomas, B.J. Edmonds</i>	
<b>No Ash and Bionotox Engine Oil Based on Polyglycols</b> .....	162
<i>Mathias Woydt</i>	
<b>Analysis of Compliant Surface Foil Thrust Bearings and Face Seals Using Coupled Finite Difference and Finite Element Methods</b> .....	165
<i>Hooshang Heshmat, Zhaohui Ren</i>	

<b>Temperature Influence on the Equivalent Coefficients Estimation for Journal Bearings .....</b>	<b>168</b>
<i>Gregory B. Daniel, Diogo S. Alves, Katia L. Cavalca, Robson F. Cruz</i>	
<b>Advanced Oil-Free Hydrogen Centrifugal Compressor Development – Part I: Theoretical and Experimental Design Study of Foil Bearings and Seals .....</b>	<b>171</b>
<i>Zhaohui Ren, Hooshang Heshmat</i>	
<b>Hydrodynamic Lubrication Evaluation of Thrust Bearings .....</b>	<b>174</b>
<i>Leonardo C. Vieira, Katia L. Cavalca, Paula O.Nomura</i>	
<b>A Preliminary Study on Tribo-Photoemission from Sliding Surfaces .....</b>	<b>177</b>
<i>G. Molina, R. McDaniel, K. Hiratsuka, C. Kajdas</i>	
<b>Effects of Shaft Surface Topography on the Friction of Radial Lip Seals .....</b>	<b>180</b>
<i>Steffen Jung, Werner Haas</i>	
<b>Cost-Effective Condition Monitoring for Microbial Contamination in Metalworking Fluids and Metalworking Fluid Systems .....</b>	<b>184</b>
<i>Frederick J. Passman</i>	
<b>Parametric Study of Rolling Element Bearings .....</b>	<b>189</b>
<i>Mohsen Nakhaeinejad, Michael D. Bryant</i>	
<b>A Preliminary Study on Effects of Lubricant Contaminated with Biofuels .....</b>	<b>192</b>
<i>G. Molina, V. Soloiu, S.M. Shanta, C. Hilliard</i>	
<b>Numerical Analysis of a Surface Textured Mechanical Seal Operating in Mixed Lubrication .....</b>	<b>195</b>
<i>Noel Brunetiere, Bernard Tourmerie</i>	
<b>The Influence of Base Fluids on Antiwear Additive Film Formation Behaviour in Automotive Lubricant Degradation .....</b>	<b>198</b>
<i>Jian Wen Choo, Nurul Ashikin Zulkepli, Syamsidi Supandi</i>	
<b>The Pressure and Foot Print of a Viscoelastic Dry Point Contact Under Dynamic Conditions: Comparison Between the Contact Model Predictions and Experimental Observations .....</b>	<b>200</b>
<i>Michel Organisciak, Armando Felix Quinonez, Aldara Naveira-Suarez, Pascal Ehret</i>	
<b>Comparison of Different Leak Tightness Test Methods for Hydraulic Rod Seals .....</b>	<b>203</b>
<i>Lothar Hoerl, Ulrich Nissler, Werner Haas</i>	
<b>Wear Behavior of Cold Rolled Commercial Grade Pure Aluminium Carbon Fiber Metal Matrix Composite .....</b>	<b>208</b>
<i>Komandur Sudarshan Sridhar, Chinnakurli Suryanarayana Ramesh, B.K. Muralidhara, Viresh K. Basalalli</i>	
<b>On The Modeling Of Hybrid Aerostatic - Gas Journal Bearings .....</b>	<b>211</b>
<i>Stefano Morosi, Ilmar F. Santos</i>	
<b>Influence of Rod Surface Roughness on Hydraulic Seal Wear .....</b>	<b>214</b>
<i>Alexander Buck, Lothar Hoerl, Werner Haas</i>	
<b>Squeeze Film Characteristics between Sphere and Rough Porous Flat Plate with Micro-Polar Fluids .....</b>	<b>216</b>
<i>Abdallah A. Elsharkawy, Khaled J. Al-Fadhalah</i>	
<b>The Influence of Additives in Synthetic Oils on Radial Lip Seals .....</b>	<b>220</b>
<i>Mathias Klaiber, Frank Bauer, Werner Haas</i>	
<b>A Quantitative Metric for Nanocomposite Dispersion Analysis .....</b>	<b>224</b>
<i>Harmandeep S. Khare, David L. Burriss</i>	
<b>A Transient Based, Numerical Analysis of Flow and Pressure Fields Inside a Variable Depth Rayleigh Step Hydrodynamic Porous Thrust Bearing .....</b>	<b>227</b>
<i>Frank E. Horvat, Minel J. Braun</i>	
<b>Numerical Modeling of Textured Piston Ring/Liner Contact .....</b>	<b>230</b>
<i>Mohammed Jai, Jean Paul Cadalen, Gustavo Carlos Buscaglia</i>	
<b>Modified Vasco X-2 and AISI 9310 Spur Gear Fatigue Failure Revisited with Weibull-Johnson Monte Carlo Simulations .....</b>	<b>233</b>
<i>Noel Murray, B. Vlcek</i>	
<b>Experiment Design, Instrumentation and Preliminary Camshaft Tribology Studies of an Ethanol Fueled Otto Engine for Lawn Mower Application .....</b>	<b>242</b>
<i>V. Soloiu, C. Hilliard, G. Molina, B. Vlcek</i>	
<b>Influence of Charcoal-Diesel Slurries Characteristics on Injection System Wear and Diesel Engine Operation .....</b>	<b>245</b>
<i>V. Soloiu, Yoshinobu Yoshihara</i>	
<b>Analysis and Development of a Low Breakout Friction Dynamic Gasket for Large High Duty Seal Applications .....</b>	<b>248</b>
<i>Lionel Young, John Davis, Joshua Benedict</i>	
<b>Recent Advances in Energy Dispersive X-ray Fluorescence Spectroscopy .....</b>	<b>252</b>
<i>Richard Butler</i>	

<b>Impact of Hydromechanical Losses on Hydraulic Pump Efficiency as a Function of Pressure, Temperature and Fluid Viscometric Properties .....</b>	<b>293</b>
<i>D.H. Deneen, M.J. Alibert, S.N. Herzog, C.D. Neveu</i>	
<b>Experimental Study on Scuffing/Failure of 1080 Steel and Gray Cast Iron.....</b>	<b>296</b>
<i>R. Zhang , J.M. Han , O.O. Ajayi, G.C. Barber, Q. Zou, L. Guessous</i>	
<b>Comparison of Rolling-Element Fatigue Using Johnson-Weibull Monte Carlo Simulations .....</b>	<b>299</b>
<i>B. Vlcek, Noel Murray, Robert C. Hendricks, Erwin V. Zaretsky</i>	
<b>CFD Analysis for Predicting Windage Power Losses in Spur Gears .....</b>	<b>305</b>
<i>Y. Marchesse, C. Changenet, F. Ville, P. Velex</i>	
<b>In Situ Formation of Solid Lubricant Particles: A New Way to Obtain Self Lubricating Sintered Steels .....</b>	<b>308</b>
<i>Jose Daniel B. de Mello, Cristiano Binder, Roberto Binder, Aloisio N. Klein</i>	
<b>The Laser Surface Texturing Effect on the Wear of Diesel Engine Valve Tappet .....</b>	<b>311</b>
<i>Kyubong Han, Sunggi Kim, Kuenchul Song, Sangbeom Kim</i>	
<b>Radial Lip Seals – Overview an Function.....</b>	<b>314</b>
<i>Frank Bauer, Werner Haas</i>	
<b>Tribological Testing Methods for the Analysis of Seals.....</b>	<b>315</b>
<i>Frank Bauer, Werner Haas</i>	
<b>Thermal Elastohydrodynamic Lubrication of Infinite Line Contact Rough Surfaces Considering Shear Flow Factor .....</b>	<b>320</b>
<i>Hasim Khan, Prawal Sinha</i>	
<b>Tribological Characteristics of Low and Zero SAPS Antiwear Additives.....</b>	<b>323</b>
<i>Juliane Benedet, Jonathan H. Green, Gordon D. Lamb, Hugh A. Spikes</i>	
<b>A Multiscale Approach of Mixed Lubrication – Application to Mechanical Seals .....</b>	<b>326</b>
<i>Andre Parfait Nyemeck, Noel Brunetiere, Bernard Tournerie</i>	
<b>Fabrication of Nano/Micro-Scale Hierarchical Structures for Reducing Adhesion and Friction Forces on Silicon Surfaces.....</b>	<b>329</b>
<i>Duc-Cuong Pham, Kyoungwan Na, Shuxue Piao, Sungwook Yang, Jinseok Kim, Eui-Sung Yoon</i>	
<b>Numerical Modeling of a Hydraulic Elastomeric Rod Seal: From Fem Static Assembling Modeling to Hydrodynamic Seal Analysis .....</b>	<b>333</b>
<i>Aurelian Fatu, Mohamed Hajjam</i>	
<b>Condition Monitoring of Metalworking Fluid Systems .....</b>	<b>336</b>
<i>Danielle Nelson</i>	
<b>AFM and IR Studies of Molecular Assemblies on Silica Nanoasperities for Friction Modification .....</b>	<b>339</b>
<i>James D. Batteas, Bronwyn Harrod, Ryan Jones</i>	
<b>Effect of Micro-Dimpled Surface on Friction Reduction and Time-to-Beginning-Surface-Scratch in Disc-on-Disc (Cu-Zn Alloy and AISI304) Test .....</b>	<b>340</b>
<i>A. Amanov, Y.S. Pyoun, I.S. Cho, C.S. Lee, I.G. Park, I.H. Cho</i>	
<b>Development of Greases with Extended Grease and Bearing Life .....</b>	<b>343</b>
<i>Gareth Fish, William C. Ward Jr.</i>	
<b>Behavior of Infinitely Long Radial Journal Bearing Under <math>\bar{D}</math>-film Cavitation Model .....</b>	<b>346</b>
<i>M.C. Ricci, P.N. Souza</i>	
<b>In-Situ Measurements of Lubricant Composition at the Piston and Liner Interface.....</b>	<b>349</b>
<i>Simon A.G. Watson, Victor W. Wong</i>	
<b>Tribological Properties of Ultrathin Films in Adhesive and Non-Adhesive Contacts .....</b>	<b>353</b>
<i>Yutao Yang, Marina Ruths</i>	
<b>A New Method for the Determination of Volatile Organic Compounds in Metalworking Fluids, Vanishing Oils and Rust Inhibitors.....</b>	<b>356</b>
<i>John Burke, Michael Pearce, Bob Blithe, John Howell</i>	
<b>Effect of Particle Size on Erosive Wear Performance of Pump Casing Material in Solid Liquid Mixture .....</b>	<b>364</b>
<i>Sanjay Jain</i>	
<b>An Analytical Model for the Basic Design Calculations of Journal Bearings.....</b>	<b>370</b>
<i>R.K. Naffin, L. Chang</i>	
<b>Effects of Lubricating Oil on Hydrocarbon Emissions from a Spark Ignition Engine .....</b>	<b>373</b>
<i>Pablo C.C. Albuquerque, Ronaldo N.A. Avila, Paola H.B. Zarante, Jose R. Sodre</i>	
<b>Behaviour of Lubricant Additives in DLC/DLC and DLC/Steel Contacts .....</b>	<b>376</b>
<i>Balasubramaniam Vengudusamy, Jonathan H. Green, Gordon D. Lamb, Hugh A. Spikes</i>	
<b>Pressure Field Measurements of a Circumferential Groove Journal Bearing .....</b>	<b>379</b>
<i>A.F. Cristea, J. Bouyer, M. Fillon, M.D. Pascovici</i>	
<b>Hydraulic Pump Efficiency Testing .....</b>	<b>382</b>
<i>R.I. Davidson, S.J. Higuchi</i>	

<b>How Structure Affects Physical Properties in Phosphonium Derived Ionic Liquids</b> .....	384
<i>Richard Landtiser, Douglas Harris</i>	
<b>Thermal and Roughness Effects on the Performance of a Finite Slider Bearing Considering Heat Conduction Through the Pad</b> .....	387
<i>Getachew Adamu, Prawal Sinha</i>	
<b>Design of Three-Pad Hybrid Air Foil Bearing and Experimental Investigation on Static Performance</b> .....	390
<i>Daejong Kim, Donghyun Lee</i>	
<b>Numerical Study of Metalworking Fluid Flow in the Abrasive Contact Region</b> .....	393
<i>Stefan Mihic, Sorin Cioc, Ioan D. Marinescu, Michael C. Weismiller</i>	
<b>Development of a Testing Rig for Erosion with Nanofluids</b> .....	396
<i>G. Molina, M. Rahman, C. Walker</i>	
<b>Nano-Scale Displacement of a Rough Spherical Shell Loaded Against a Rigid Flat</b> .....	399
<i>Longqiu Li, Andrey Ovcharenko, Izhak Etsion, Frank Talke</i>	
<b>Experimental Investigation on the Influence of Surface Roughnesses and Bearing Materials on the Friction Coefficient During Start-Up</b> .....	402
<i>J. Bouyer, M. Fillon, Catalina Dobre</i>	
<b>A Transient Analysis of a Wave Journal Bearing Sleeve Motion</b> .....	405
<i>Nicoleta M. Ene, Florin Dimofte</i>	
<b>Wear Behaviour of PTFE Seals Under Different Pressure Conditions in a Gasoline Pumping and Measurement System</b> .....	408
<i>Liu Yajun, Liu Jun, Chen Yangzi, John Lumkes Jr.</i>	
<b>Viscosity and Bulk Modulus Measurements Under High Pressure Conditions</b> .....	413
<i>Sebastian Drumm, Alexander Wohlers, Arshia Fatemi, Hubertus Murrenhoff</i>	
<b>An Original Double Conical Hybrid Bearing: From Its Design to Its Experimental Use</b> .....	417
<i>P. Jolly, O. Bonneau, Jean Frene</i>	
<b>A Natural Way to Develop Top-Tier Hydraulic Fluids</b> .....	420
<i>Andy Vergauwen</i>	
<b>Effect of Surface Topography Modifications on Rolling Contact Fatigue of Mixed Lubricated Contacts</b> .....	423
<i>M. Vrbka, I. Krupka, M. Hartl, P. Svoboda</i>	
<b>Comparison of Zinc-containing and Zinc-Free Hydraulic Packages Using Severe Laboratory Performance Tests</b> .....	426
<i>Thomas Rühle, Steffen Sandhoefner, Thomas Rosrucker</i>	
<b>Frictional Behavior in Worn Lubricated Sliding Line Contact</b> .....	427
<i>I. Cracaoanu, D.J. Schipper</i>	
<b>New Oil Soluble Polyalkylene Glycols</b> .....	430
<i>Martin Greaves, Nadjet Khelidj, Evelyn Zaugg-Hoozemans, Ronaldvan Voorst, Rinus Meertens</i>	
<b>On the State and Severity of Frictional Sliding Contacts Between Nominally Flat Metallic Surfaces</b> .....	433
<i>L. Chang, H. Zhang</i>	
<b>The Stabilization of Vegetable Oil with Antioxidant Combinations</b> .....	436
<i>Gaston A. Aguilar, Brian W. Stunkel, Ronald J. Hiza</i>	
<b>Comments on Prediction of Flows and Mixing in Vertical Oil Sumps</b> .....	439
<i>Lyle A. Branagan, Parker Wright</i>	
<b>Measurement of Static Friction Coefficients and Comparison to Theoretical Models</b> .....	441
<i>Rebecca Ibrahim, Robert L. Jackson, George T. Flowers, Jyoti Ajitsaria, George Vallone</i>	
<b>Lubrication of <math>Ti_3SiC_2/Si_3N_4</math> Tribo-couple: from Water to Ethanol</b> .....	444
<i>Jinjun Lu, Shufang Ren, Junhu Meng, Shengrong Yang</i>	
<b>Cavitation in Mechanical Seal and Its Effect on Sealing Performance</b> .....	448
<i>Yongjian Li, Weifeng Huang, Shuangfu Suo, Ying Liu, Xiangfeng Liu, Yuming Wang</i>	
<b>Review of Varnish Problems of Modern Gas Turbines</b> .....	451
<i>Akira Sasaki, Hideaki Tobisu</i>	
<b>The Value of Tribology (Part 1), Analyses from a Macroeconomic Viewpoint</b> .....	503
<i>Akira Sasaki, G.L. Sakhrani</i>	
<b>A Study of a Novel Water Lubricated Hybrid High Speed Bearing with Shallow Stepped Recesses</b> .....	543
<i>Shilei Ma, Pan Dai, Qiushan Ma, Hua Xu</i>	
<b>Combined Influence of Journal Misalignment and Wear on the Performance of Orifice Compensated Non-Recessed Hybrid Journal Bearing in Turbulent Regime</b> .....	546
<i>Satish C. Sharma, Nathi Ram, S.C. Jain</i>	
<b>Performance of Noncircular 2-Lobe Multirecess Constant Flow Valve Compensated Hybrid Journal Bearing by Considering Wear</b> .....	550
<i>Satish C. Sharma, Vikas M. Phalle, S.C. Jain</i>	

<b>Methods for Trending Wear Levels in Grease Lubricated Equipment</b> .....	554
<i>Richard N. Wurzbach, Lisa A. Williams</i>	
<b>Experimental Investigation on Marine Main Shaft Bearings with Reduced Length to Diameter Ratio</b> .....	557
<i>Wojciech Litwin</i>	
<b>Grease Analysis with Vibration Analysis to Solve Premature Bearing Failures</b> .....	560
<i>Douglas Elam, William H. Morgan, Rendela Wenzel</i>	
<b>Effect of Coolant Grades on the Machining TI-6AL-4V Alloy with Uncoated Carbide Tools Under High Pressure Coolant Supplies</b> .....	564
<i>E.O. Ezugwu, J. Bonney, A.B Mohd Hadzley</i>	
<b>Impacts on the Friction Force Between Piston and Bushing of Swash-Plate Machines</b> .....	567
<i>Ulf Piepenstock, Stefan Gels, Hubertus Murrenhoff</i>	
<b>CAGEDYN: A Contribution to Roller Bearing Dynamic Calculations Part III: Experimental Validation</b> .....	571
<i>Luc Houpert</i>	
<b>Shaft Waviness Effect on Performance of Lay-Down Radial Lip Seals</b> .....	574
<i>Alex Berdichevsky, Jianbin Jiang, Ting Shih Chieh, Mujahid Azni, Ng Wei Sim</i>	
<b>Advanced Diamond Coatings for Mechanical Seals</b> .....	577
<i>M. Rieger, A. Schrufer, Habil. J. Otschik</i>	
<b>Analysis and Measurement of a Novel Tight-Tolerance Tilt Pad Journal Bearing Design That Provides Increased Stability in Highspeed Turbomachinery</b> .....	580
<i>Kenneth R. Bischof, Jie Zhou</i>	
<b>Effects of Thermally Induced Inhomogeneous Shear and Surface Thermal Boundary Conditions on the Shear Stress in Sliding Elastohydrodynamic Contacts</b> .....	586
<i>L. Chang</i>	
<b>Ferrohydrodynamic Effects on Fluid Flow and Load Carrying Capacity of a Journal Bearing</b> .....	589
<i>Craig A. Laukiavich, Abhilash Chandy, Minel J. Braun</i>	
<b>Trouble Shooting Steam Turbine Control Systems</b> .....	592
<i>Ken Brown, Ted Austin</i>	
<b>The Role and Influence of Carbides in the Tribology of Metal-on-metal Bearings in Total HIP Replacements</b> .....	595
<i>P. Williams, John G. Bowsher, T. Donaldson, I.C. Clarke</i>	
<b>Studies on Friction and Transfer Layer Formation When High Purity Aluminum Pins SLID at Various Numbers of Cycles on Steel Plates of Different Surface Texture</b> .....	598
<i>Pradeep L. Menezes, K. Kishore, Satish V. Kailas, Michael R. Lovell</i>	
<b>Understanding Polyethylene Tribology of Total Joint Replacements from the Quantitative Analysis of Wear Debris Morphology</b> .....	601
<i>P. Williams, John G. Bowsher, I.C. Clarke</i>	
<b>Key Aspects of Choosing Polyalkylene Glycols in Hydraulic Equipment for Environmentally Sensitive Areas</b> .....	604
<i>Leigh Johnson, Martin Greaves, Govind Khemchandani</i>	
<b>Role of Surface Texture on Friction and Transfer Layer Formation During Sliding of PVC Pin on Steel Plate</b> .....	607
<i>Pradeep L. Menezes, K. Kishore, Satish V. Kailas, Michael R. Lovell</i>	
<b>How Does a Zirconia-Reinforced Alumina Ceramic Bearing Wearing in the Patient's Hip Joint Compare to Wear Simulation in the Lab?</b> .....	610
<i>I.C. Clarke, G. Pezzotti, J.Y. Lazennec, A.V. Lombardi, N. Sugano</i>	
<b>An Intelligent Agent for Automated Oil Analysis Evaluation: The Need for Improved Data Evaluation and Commentary</b> .....	615
<i>Michel Murphy, Jack Poley</i>	
<b>Tribological Properties of Fluorinated Carbon Nano/Micro Particles</b> .....	617
<i>P. Thomas, J.L. Mansot, W. Zhang, M. Dubois, K. Guerin, A. Hamwi</i>	
<b>Experimental Investigation of a Compliant 3-Layer Padded Finger Seal</b> .....	620
<i>Stefan I. Moldovan, Ana M. Balasoiu, Minel J. Braun, Ian M Smith</i>	
<b>Retrieval Analysis of Large Ball Metal on Metal Hip Protheses</b> .....	623
<i>S. Gregorius, J. Personius, P. Williams, T. Donaldson, I.C. Clarke</i>	
<b>Thermodynamic Approach to Coulomb Friction, Wear, and Self-Lubrication</b> .....	626
<i>Michael Nosonovsky, Vahid Mortazavi, Chuanfeng Wang</i>	
<b>Tribological Performance of Boron-MoS<sub>2</sub> Nanoparticulate Hybrid System</b> .....	629
<i>Wenyang Zhang, Dmytro Demydov, Ajay P. Malshe, Kuldeep Mistry, Ali Erdemir</i>	
<b>Effect of Shear Heat on Hydrodynamic Lift of Brush Seals in Oil Sealing</b> .....	633
<i>E. Tolga Duran, Mahmut F. Aksit</i>	



<b>Lubricating Performances of Room Temperature Highly Fluorinated Graphite Heat-Treated Under Fluorine Atmosphere</b> .....	638
<i>P. Bilas, P. Thomas, L. Romana, T. Cesaire, J.L. Mansot, C. Delabarre, M. Dubois, K. Guerin, A. Hamwi</i>	
<b>Tribological Properties of Nanoparticles of Lamellar Solid in the Presence of Organic Molecules</b> .....	641
<i>N. Nomedé Martyr, J.L. Mansot, P. Thomas, Y. Bercion, A. Sauldubois, P. Bilas, L. Romana</i>	
<b>Advantages of Using Optical Profilometry in the ASTM D4172 Standard</b> .....	644
<i>A. Hernandez Battez, A. Torres Perez, G. Garcia-Atanje, J.L. Viesca, R. Gonzalez, M. Hadfield</i>	
<b>Wear Mapping Analysis with 28mm CoCr-CoCr Hip Bearings over the Decade</b> .....	647
<i>K. Kubo, I.C. Clarke, K. Yamamoto, J.Y. Lazennec, T. Donaldson</i>	
<b>Parametric Study on Two-Stage Tandem Dry Gas Seals with Closed Interspace</b> .....	649
<i>Weifeng Huang, Tao Wang, Yongjian Li, Shuangfu Suo, Zhi Gao, Anwei Li</i>	
<b>Investigation on Dynamic Rheology Properties of Ultra-Thin Film Using Ultra-Vacuum Non-Contact AFM</b> .....	652
<i>Zhang Xiangjun, Zhang Xiaohao, Chen Tianxing</i>	
<b>Finite Element Simulation and Analysis of Nano-Scale Adhesive Contacts</b> .....	655
<i>Zhang Xiaohao, Zhang Xiangjun</i>	
<b>The True Contact Area for Friction in Chemical Mechanical Polishing</b> .....	660
<i>Joseph A. Levert, Chad S. Korach, Franklin Lynam</i>	
<b>Tribological Improvement of Using Ionic Liquids and Nanoparticles As Oil Additives</b> .....	663
<i>R. Gonzalez, J.L. Viesca, A. Hernandez Battez, A. Torres Perez, G. Garcia-Atanje</i>	
<b>A New Bath-Free Instrumental Technique to Monitor the RPVOT Oxidation Process – Improving Choice and Extended Use of Turbine Oils</b> .....	666
<i>Theodore W. Selby, Gregory C. Müller, Robin Deignan</i>	
<b>Reciprocating Friction and Wear Studies of Bovine Cartilage Sliding Against Cartilage, Polyurethane, Polyethylene and CrCo</b> .....	668
<i>R.A. Erck, O.O. Ajayi, Joseph Gil, Steven Chudik</i>	
<b>Author Index</b>	