ASME International

Tribology

Steven Schmid, *Editor*

Chair's Message

First, a large thanks to all for the support provided by many during my service as Chair. It was greatly appreciated. Rick Cowan will be assuming this position and does so being fully capable after serving in various Executive Committee positions. He brings with him many new ideas along with an extreme interest to continue improving the Division.

This year for the Division's election process, a new Electronic Ballot was developed and used successfully. This new method of communicating with the membership, in regard to elections, should serve us well into the future. It also provides an avenue of feedback for the membership.

The ASME Tribology Division and the Society of Tribologists and Lubrication Engineers (STLE) continue to organize the 2005 World Tribology Congress (WTC) in Washington, D.C. The planned dates for this have been slated to be September 12th thru 16th, 2005. The preliminary organizational work for the conference is underway. Rick Cowan and John Tichy as well as many others will continue to represent the ASME Tribology Division on the conference oversight committee. This will be a challenge, and we will depend on all members of the Executive Committee and the membership of the Tribology Division for assistance.

A new Technical Committee has been formed which will cover the subject of **Contact Mechanics** and the first Technical Session on this subject is being organized at the upcoming Conference in October. This year's International Joint Tribology Conference will be held in Ponte Vedra Beach, Florida, from October 26-29, 2003.

A new publication was developed and released this year, which should be of interest to many in the industrial equipment area. The publication is a design guide for the application of International Standard ISO 281/2 on bearings. Its title is **Life Ratings For Modern Rolling Bearings,** TRIB-Vol. 14. Its publication was a culmination of a work by the Technical Committee on the subject. A thank you is expressed to Roger Barnsby and Ted Harris along with others for their work in this area.

We will continue to maintain our established strengths of technical excellence in publications, conferences, education and service to members. Our Executive Committee meetings are held at the Joint ASME/STLE Tribology Conference (Cancun in October this past year) and at the STLE Annual meetings in May of each year. These meetings are open to all interested ASME members.

My appreciation is extended to the Executive Committee members as well as others who are active in the various Division committees. You have made this year a success for your Division. Please keep up the good work.

As you read the reports from the various committees, enclosed in the newsletter, please share with us your thoughts on how the Division might be of further service to you and others. We welcome your thoughts and most of all we welcome your involvement in committee activity. Volunteer some time for advancing our profession.

Harvey Nixon

New Design Guide

LIFE RATINGS FOR MODERN ROLLING BEARINGS

A Design Guide for the application of ISO 281/2 prepared by ASME Tribology Division Technical Committee

This Design Guide presents a calculation method for applying the most recent life rating procedure for ball and roller bearings, "Rolling Bearings – Dynamic Load Ratings and Rating Life", published by the International Standards Organization (ISO 281/2). It incorporates the latest developments in bearing technology and presents them in a straightforward manner. It includes both surface and subsurface failure modes and the effects on bearing life of material, residual stress, lubrication and contamination in addition to applied loading.

The calculation method is the result of extensive investigation and collaboration between bearing manufacturers and users throughout the world and is intended to provide a common procedure for all bearing practitioners to calculate bearing life on a consistent basis. It defines the generalized bearing stress field and material strength parameters for both oil and grease lubricated applications. It addresses the effects of lubricant properties and the modes of operation in elastohydrodynamic and boundary lubrication regimes. It recognizes the interdependence of all these parameters and calculates a single integrated stress-life factor from the generalized stress field.

A computer program called **ASMELife** is included with the Design Guide to perform the calculations. The procedure has been successfully correlated with numerous data sets over a wide range of applications for all common types of ball and roller bearings. To order, call Information Central at (973) 882-1167, (800) 843-2763, or go to **http://www.asmeny.org/cgi-bin/WEB017C?996104+0001=00+00000+100633**

Education

A survey of US academic institutions was performed to determine how tribology is taught and what kind of pertinent research is pursued in the USA. The main findings of the survey are summarized below.

Teaching

About 60% of the responses indicated that Tribology is taught regularly in their institutions. The number of tribology courses varied typically between 1 and 3 with about 40% of such courses taught on a semester basis.

The main textbooks used are those by K.L. Johnson (*Contact Mechanics*), J. Williams (*Engineering Tribology*), or B. Hamrock (*Fundamentals of Fluid Film Lubrication*). In a few institutions tribology is part of design courses.

About 30% of the responses indicated that their institutions offer tribology short courses either annually (20%) or semi-annually (~10%) with an average class size of 10-20 participants.

Research

The various areas of research pursued in US academic institutions include: boundary-lubricated sliding, micro-lubrication, HD/EHD, rheology, grease lubrication, lubricant degradation, hydrodynamics, combustion engines, seals, dampers, bearings, brakes and clutches, piston-ring assembly, valve train, journal bearings, polymers, rubber-like materials, ceramics, surface modification methods, microstructure effects on friction and wear, contact fatigue, impact wear, tribology in manufacturing processes, bio-tribology, micro-/nano-fretting, MEMS, magnetic recording, tribo-acoustics, tribo-sensors, contact mechanics, FEM modeling of contact problems, modeling of contact adhesion and friction, thermal/thermoelastic problems, electrical and thermal contact resistance, and computational methods.

The main source of funding appears to be primarily from government/national labs (~70%) and secondarily from the private sector (~30%).

The general conclusion is that while tribology education and research at US institutions is at a stable level there is a concern that its growth rate and expansion to new areas is rather limited. It seems that an educational workshop (perhaps under the auspices of NSF and ASME) should be organized in the future to establish a theme and guidelines for a more coordinated effort toward tribological studies and research in USA academic institutions.

Kyriakos Komvopoulos, *Chair*

Honors and Awards

The **Mayo D. Hersey Award** is the highest Tribology honor given by ASME. It is awarded annually to a person who has made distinguished and continued contributions over a substantial period of time to the advancement of lubrication science and engineering. The 2002 Hersey Award winner is *Michael Gardos*, Defense Advanced Research Projects Agency.

The **Burt L. Newkirk Award** is given to an individual under the age of 40 who has made a notable contribution of research and/or development as evidenced by publications advancing the field of tribology. The 2001 Newkirk Award was presented to *Thierry Blanchet*, Rensellaer Polytechnic Institute.

The editor and associate editors of the Journal of Tribology select the best paper that appears in the Journal each year. The paper selected as **Best Paper of 2002** is "Solid Third Body Analysis Using a Discrete Approach: Influence of Adhesion and Particle Size on Macroscopic Properties," by Ivan Iordanoff, Bertrand Seve and Yves Berthier, 124, July 2002, pp.530-546.

The **Marshall B. Peterson Award** is given in even-years to an individual who is under the age of 30 in recognition of early-career achievement in research as evidenced by the authoring of publications advancing the field of tribology. The recipient of the 2002 Marshall B. Peterson Award is *Jiaxin Zhao*, Purdue University.

The **Donald L. Wilcock Distinguished Service Award** is given to an individual for distinguished service to the ASME Tribology Division and the tribology community throughout his or her career. The 2002 Donald L. Wilcock Award recipient is *Roger M. Barnsby*, Pratt and Whitney.

The **2002 Innovative Research Award**, which is presented by the RCT Committee, named Tedric A. Harris and Wei-Kue Yu as the recipients for this annual award.

2002 IJTC Chair Harvey P. Nixon with Newkirk Award recipient Dr. Thierry A. Blanchet

International Coordination

The International Coordination Committee (ICC) has established "Regional Committees" to more effectively coordinate international activities and promote collaboration among the international ASME TD members. To date, Prof. *Jean Frene* from the University of Poitier in France has agreed to lead the European Region, and Prof. *Kuniaki Dohda* from Gifu University in Japan will lead the Asian and Pacific Rim region. We are actively pursuing members to lead the South America, Middle East and Africa, and Australia and New Zealand Committees.

In addition, Prof. *Bo Jacobson* of Lund Institute of Technology in Sweden has been working to inform TD members of future Tribology activities and international conferences on the TD web page.

David Brewe, ***Chair***

Technical Expositions

The Technical Expositions Committee was charged to examine the revised "Conference Rules and Operating Guide" that govern the annual International Joint Tribology Conferences (IJTC), and offer suggestions to the Executive Committee (EC) of the Tribology Division for approval. The TEC first discussed the existing and revised rules in a meeting during the STLE-ASME conference in San Francisco (October 2001). Since then, input was obtained from the committee members as well as several other people.

The existing Conference Rules and Operating Guide was reviewed extensively, and a number of changes were recommended for consideration by the Executive Committee. Most of these recommendations concerned rewording of rules to reflect changes in the structure of the Conference Planning Committee. However, recommendations concerning important issues such as incorporation and organization of one-day symposia at conferences was discussed.

Andreas Polycarpou, ***Chair***

On Knowledge...

"We're drowning in information and starving for knowledge."
(Rutherford D. Rogers)

Scenes from IJTC 2002, Cancun, Mexico

Dr. Yiao-Tee Hsia (far left) and Dr. Andreas Polycarpou (far right) congratulate Drs. David B. Bogy and Frank E. Talke on receiving the First Annual Seagate Award.

Harvey Nixon presents Dr. Ivan Iordanoff with the 2002 Best Paper Award for his work with co-authors Bertrand Seve and Yves Berthier.

2002 IJTC Conference Chair Dr. Hugh A. Spikes with 2002 IJTC Technical Program Chair Dr. Elaine S. Yamaguchi.

Technical Committee Reports

Research Committee on Tribology

The Research Committee on Tribology met during the ASME/STLE International Tribology Conference in Cancun in October, 2002. Officers for 2002-2003 are Chair: Professor Timothy C. Ovaert of the University of Notre Dame, Vice-Chair: Dr. Nelson Forster of AFRL/PRSL, and Secretary: Professor Jane Wang of Northwestern University. Current members include: Dr. Ali Erdemir of Argonne National Laboratories, Professor Thierry A. Blanchet of Rensselaer Polytechnic Institute, Professor Farshid Sadeghi of Purdue University, Professor Luis San Andres of Texas A&M University, Professor Michael D. Bryant of the University of Texas/Austin, and Professor Q. Jane Wang of Northwestern University. A set of revised RCT bylaws was updated and submitted for approval to the TD EC by Tim Ovaert as initiated by Chris Dellacorte.

The results of the Bio-Tribology Workshop were presented in a Surveillance Session at the 2002 meeting in Cancun by Mike Bryant. The feedback on Mike's workshop was very positive, and the workshop summary report has recently been published in the *ASME Trans., Journal of Tribology*, **125**, 2, pp. 217-222, 2003.

A workshop on Virtual Machine Design was held at Purdue University in West Lafayette, IN during the summer of 2003. The organizers are Nelson Forster, Farshid Sadeghi, Jane Wang, and Luis San Andres. In addition, a jointly sponsored surveillance session or sessions at the 2004 ICMCTF (International Conference on Metallurgical Coatings and Thin Films) Conference on dry or near-dry manufacturing is being pursued.

The US Bobsled team was assisted on the design of sled runners. The team was put in contact with researchers at NASA Goddard Space Flight Center who designed a superfinishing device for the blades of the US Olympic speed skating team. The thought was superfinishing might help the bobsled in much the same way that it was instrumental in the speed skating team's excellent medal performance in Salt Lake City.

Tim Ovaert, ***Chair***

Mark Your Calendars!

Upcoming Tribology Events:

ASME / STLE International Joint Tribology Conference 2003
October 26 - 29, 2003 Ponte Vedra Beach, Florida, USA

International Mechanical Engineering Congress and R&D Exposition
November 16 - 21, 2003 Washington, D.C., USA

30th Leeds-Lyon Symposium on Tribology
September 2 - 5, 2003 INSA de Lyon, France.

2nd International Conference on Tribology in Environmental Design 2003-TED2003
September 8 - 10, 2003

Mechanics and Tribology of Transportation Systems
September 11 - 13, 2003 Rostov-on-Don (Russia).

Fourth International Conference on Tribology of Information Storage Devices
December 1 - 3, 2003 Monterey, CA, USA.

14th International Colloquium Tribology, Tribology and Lubrication Engineering
January 13 - 15, 2004 Ostfildern, Germany

2nd International Conference on Tribology in Manufacturing Processes
June 16-18, 2004 Nyborg Denmark

World Tribology Congress and Exhibition
September 12-16, 2005 Washington, D.C., USA

For information on these and other tribology events, see the Tribology division wedsite at http://www.asme.org/divisions/tribology/

Life Ratings for Modern Rolling Bearings

The Technical Committee on Life Ratings for Modern Rolling Bearings has published a Design Guide to calculate the integrated stress-life factor for bearing life ratings. The intent of the Design Guide is to provide a common methodology for calculating bearing life, containing the most recent technology in a consistent user-friendly format. The methodology is directly applicable to the new ISO 281 standard published in February 2000. Key members of the committee conducted a symposium in March 2002, sponsored by the American Bearing Manufacturers Association, where they presented a summary of the Design Guide and its associated computer program to users throughout the bearing industry. The Design Guide addresses competing surface and subsurface failure modes, lubrication and contamination effects and material fatigue stress limits, for all the common types of ball and roller bearings. Final correlation of the computer program is currently underway over a wide range of service applications. For additional information on this effort, please contact Roger Barnsby at barnsbrm@pweh.com.

Roger Barnsby, ***Chair***

Magnetic Storage

The Magnetic Storage Technical Committee of the Tribology Division has been very active since its establishment three and a half years ago. In the past year or so, the magnetic storage industry has been shrinking, so that the Magnetic Storage Symposium at the 2002 Joint Conference had lower attendance than previous years. Nevertheless, the symposium was considered to be a success as it is now established as a premiere event of magnetic storage tribology.

For this year's Joint Conference (2003 Marriott Sawgrass), we are planning a one-day symposium during the conference, as has been approved by the Conference Planning Committee. The symposium is entitled "**Frontiers of Magnetic Hard Disk**

continued on page 6

International Joint Tribology Conference

October 26-29, 2003

Ponte Vedra Beach, Florida

Sawgrass Marriott Resort

1000 PGA Tour Blvd., Ponte Vedra Beach, FL 32082

Phone 904-28-7777 • Fax 904-285-0906

"An international exchange of state-of-the-art knowledge pertaining to engineering practice in research, development, manufacturing, application and teaching of the science and technology of tribology."

Sponsors:

ASME International, Tribology Division and The Society of Tribologists and Lubrication Engineers (STLE)

Cooperating Societies:

The Japan Society of Mechanical Engineers (JSME) and the Japanese Society of Tribologists (JAST).

For further information, please visit **http://www.stle.org/jtc/index.htm**

ANNOUNCEMENT AND INVITATION

Symposium on "Frontiers of Magnetic Hard Disk Drive Tribology and Technology - 2003"

Date: Monday, October 27, 2003 (First day of the STLE/ASME Tribology conference)

Location: Sawgrass Marriott Resort and Beach Club, Ponte Vedra Beach, Florida

Registration: The symposium is part of the STLE/ASME tribology conference and does not require a separate registration fee. For details on the conference visit www.stle.org/secure/jtc/jtc_reg_form.cfm

Organized by the Magnetic Storage Committee of the Tribology Division of ASME

Following the successes of the past Symposia on Interface Tribology and Technology Towards High Areal Densities, we are organizing another symposium this year during the 2003 STLE/ASME International Tribology Conference.

The presentations will be oral presentations. The technical areas are tribological and micro-nanotechnology issues related to magnetic hard disk drives associated with higher recording densities.

Tribology, Microtribology, and nanotribology of the Head disk Interface • MEMS- and Milli- Actuators
Contact-Flyability Issues at Ultra Low Fly Heights • High Tracks Per Inch: Servo-Mechanical Design, Micro-Actuation
Tribomaterials (e.g. self assembled monolayers, carbon) • Thermal Asperities • High RPM Challenges
Perpendicular Recording • Heat Assisted Magnetic Recording • Patterned Media • Spindle and Motor Design

Among the speakers at the Symposium are:

D.B. Bogy, University of California at Berkeley • T. Hirano, Hitach Global • Z. Boutaghou, Seagate
N. Tagawa, Kansai University, Osaka, Japan • F.E. Talke, University of California at San Diego
K. Ono, Tokyo Institute of Technology, Tokyo, Japan

Symposium Organizers

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You may be an engineer if you...

have a wrist watch that has more computing power than a 486DX-50

have an ideal evening consisting of fast-forwarding through the latest sci-fi movie looking for technical inaccuracies

have modified your can-opener to be micro-processor driven

can remember 7 computer passwords but not your anniversary

Magnetic Storage

continued from page 4

Drive Tribology and Technology-2003". All invited talks and extended abstracts will be published into a proceedings volume by ASME. *Dr. Mike Suk* of IBM and *Dr. Yiao-Tee Hsia* of Seagate Research are coorganizing the Symposium.

This past year we have been investigating potential additional events to attract more magnetic storage researchers. This involves organizing specialized workshops and symposia, most likely co-organized with societies such as the National Storage Industry Consortium.

C. Singh Bhatia, *Chair*
Andreas Polycarpou, *Secretary*

Young Engineers Forum – Mentors and Students gather at the IJTC 2002 Conference in Cancun, Mexico

Committees 2003-2004

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Journal of Tribology

During the past year, the ASME *Journal of Tribology* has maintained its position as one of the world's most respected archival journals in the field of tribology. Obviously, I am a prejudiced observer. Various citation indices notwithstanding, I believe the U.S. engineering community almost universally views us as the best journal in the field. I wish to extend my appreciation to the authors, associate editors, and reviewers who have contributed to the Journal's success.

The distribution of papers per subject matter in the Journal has varied only slightly during the past six years, as follows:

The acceptance rate is 53%, slightly higher than last year's figure of 45%, but essentially the same as the 50% average of the last five years. Analysis of the papers published during the past year showed that there was an average delay of 5.0 months between the date of receipt of the paper and the date acceptance or rejection. This is an improvement over last year's average of 5.5 months. Over the previous five years, the average was about 7.0 months. Clearly, the trend is in the right direction, which I attribute to our current roster of Associate Editors.

In many cases, the assignment of a paper to one category or another is fairly arbitrary: a gas bearing paper could be "hydrodynamics" or "-magnetic storage," an adhesion paper could be either "contact mechanics" or "other," etc. The range of type of papers in the "other" category is huge: from our most scientific papers on molecular nanotribology; to the most applied papers on wear in forming processes. A decrease of papers in the magnetic storage area, after a long period of growth, is in evidence. I attribute this to a number of factors: poor economic conditions in that industry, maturity of the field – thus fewer research papers, and the fact that magnetic storage presentations at the ASME/STLE Tribology Conference are given in special sessions, apart from the reviewed papers.

As mentioned in the last newsletter, I encourage perspective authors to submit Technical Briefs. Typically, they are about half the size of a normal journal article, about 3,500 words. Briefs do not need to exhibit "permanent value", a necessary condition for normal journal papers. I plan to publish them in a more timely fashion, appearing in the Journal as soon as they are typeset and proofed.

There are some new newsworthy items. On September 1, 2003, the Journal of Tribology changed from its former all hard copy operation to an all-electronic format. The entire process is electronic: initial submission, review, revision, and final submission for publication. The Journal itself will continue to appear in both electronic and paper form. The ASME software for paper handling is called the 'Journal Tool.'

Manuscripts will be submitted online at the URL address http://journaltool.asme.org The instructions there are quite clear. The first step is that the corresponding author of the paper sets up an account with a password that is retained indefinitely for all ASME publications. In the second step, co-authors of the paper can be added, and the paper submitted as a .pdf file.

For convenience of reviewers, we still require single-column, double-spaced text of at least 10 point font, with adequately sized and clear figures. In the final submission for typesetting both Word and Latex formats will be accepted.

I am sure there will be confusion and problems with these new procedures, so I ask your patience in advance. However, I am certain the new system will soon be more convenient and efficient for all of us. If you have any questions please contact me, but I may not have all the answers just yet.

Second, several years ago, ASME increased the maximum page size without mandatory charges from six to nine pages. This was applauded in most quarters but there is a downside. Almost overnight the average article increased from seven to nine pages in length. We get to publish 900 total pages per year, period. About 220 papers are submitted per year. If papers average nine pages, we can publish 100 of 220. If papers average 7 pages we can publish 128 of 220. I think the second scenario better serves the tribology community. Thus I have been implementing a sort of honor system to have authors keep the page size below 7 pages.

The Journal has a detailed website **http://ww2.asme.org/techpubs/template.cfm?title=Journal%20of%20Tribology** which contains many features such as instructions for paper preparation, addresses of Editorial Board Members, abstracts of papers to be published, etc. There are links to the site from the websites of ASME, RPI, and the Tribology Division (TD).

Again, I am always interested in comments and suggestions and how we can best serve those who are doing, and using research work in tribology. I can be reached at tichyj@rpi.edu

John Tichy, ***Technical Editor***

SUBJECT	DISTRIBUTION (%)					
	01-02	00-01	99-00	98-99	97-98	96-97
Contact mechanics	19					
Friction and wear	13	30	30	26	23	28
Hydrodynamics (including gas)	18	22	28	27	21	26
EHL/rolling elements	28	17	12	12	18	18
Magnetic storage, micro- nano-	12	18	20	17	18	14
Other (including seals, coatings, manufacturing)	10	13	10	18	20	14

ASME and STLE to Host WTC III 2005

The American Society of Mechanical Engineers and the Society of Tribologist and Lubrication Engineers have proposed and presented a bid to host the 2005 World Tribology Congress III in Washington, D.C. The proposal was very well received at WTC II in Vienna and the conference was unanimously approved to be held at the Hilton Washington and Towers on September 12th-16th, 2005.

For 2005, the high-profile environment of Washington, DC presents an extraordinary opportunity to reach beyond the tribology community and demonstrate the impact of tribological research on some of the world's most urgent issues. Those include the conservation of natural resources, reduction of energy waste, protection of the environment and improvement of health and safety. In addition to the strong research forum, a highly focused industry forum is being developed with direct value to representatives from key industries such as transportation, electronics, biotechnology and IT, to name a few.

WTC III is intended to be the international event bringing together tribology scientists, researchers and engineers from over 50 countries and participation from over 33 cooperating associations. The Tribology Division is proud and excited to play a lead role in this prestigious conference. The ASME representatives to the WTC III Oversight Committee are Rick Cowan and John Tichy.

Thank you to the 2002–2003 ASME Tribology Chairs for making significant contributions to the division activities this year.

Executive Committee Officers

Chair: Harvey Nixon

Treasurer: Richard S. Cowan, Ph.D., P.E.

Secretary: Richard S. Cowan, Ph.D., P.E.

Technical Expositions: Andreas Polycarpou, Ph.D.

Publications: Steven R. Schmid, Ph.D., P.E.

Education: Kyriakos Komvopoulos, Ph.D.

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Magnetic Storage: C. Singh Bhatia, Ph.D.

Rolling Bearing Life Ratings: Roger M. Barnsby

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Edison Aulestia
Carol Griffin

Michael Gardos 1939-2003

It is with great sadness that we announce the passing of Dr. Michael N. Gardos on Saturday, March 22, 2003 after a bout with chronic illness. Dr. Gardos was a Program Manager in the Defense Advanced Research Projects Agency (DARPA) where he was responsible for a wide array of technical programs aimed at improving the capabilities of soldiers in the field, including Air and Water Purification and Water Harvesting. He played a significant role in moving a revolutionary water purification pen into the hands of soldiers in Afghanistan and Iraq.

Before joining DARPA, he was a Senior Engineering Fellow of the Raytheon Electronic Systems (formerly Hughes Aircraft Company). During his 36-year tenure there, he was in charge of basic and applied tribology research on moving mechanical assemblies used in advanced space, airborne, terrestrial and undersea weapons systems. He was the author of eighty-five refereed papers, two book chapters and four patents. He was a Fellow of the Society of Tribologists and Lubrication Engineers (STLE). He is the only one in the history of the society to win all four different best published technical paper awards. In 2002 he received the prestigious Mayo D. Hersey Award from the American Society of Mechanical Engineers for technical contributions to the field of Tribology. Michael has no surviving relatives, but will be missed by a large and diverse group of friends and colleagues throughout the U.S. and the international scientific community whose lives he enriched and touched in so many ways.

ASME Tribology Division 02–03 Chair, Harvey Nixon presents Michael N. Gardos with the 2002 Mayo D. Hersey Award.

Larry Fehrenbacher, ***TA&T***
and Steve Wax, ***DARPA***

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