



Society of Tribologists and Lubrication Engineers

76th Annual Meeting & Exhibition Advance Program

May 15-19, 2022

Walt Disney World Swan and Dolphin Resort | **Orlando, Florida (USA)**



Time to reconnect!

Register by April 12 and save \$115!



stle
ORLANDO

Message from the Chair

#STLE2022: Time to Reconnect in Orlando!

Dear Industry Professional,

I'd like to extend a personal invitation for you to join me for STLE's 76th Annual Meeting & Exhibition, May 15-19, 2022, at the Walt Disney World Swan and Dolphin Resort in Lake Buena Vista, Florida (outside of Orlando).

I can't wait for the opportunity for us to gather members of the tribology and lubrication community together again as we prepare for the return of a live STLE Annual Meeting. While STLE plans to provide you with timely content and the ability to network with your peers, our top priority remains the health and safety of all conference attendees. All individuals who attend the in-person conference in Orlando will be required to follow established safety and health protocols, as STLE is working to ensure your participation is as safe as possible.

Like previous years, the Annual Meeting will showcase more than 400 technical presentations, lubrication-specific education courses, a professional exhibitor trade show, the popular Commercial Marketing Forum, networking opportunities and more—all valuable in-person content that can't be replicated outside of the live event.

The Annual Meeting is always at the top of the list of benefits derived from STLE membership, and this year's program promises to be stronger than ever. There will be a wealth of information and business

contacts waiting in Orlando for those who attend. STLE's Annual Meeting Program and Education Committees, working together with our headquarters staff and paper solicitation chairs (PSCs) representing STLE's 20 technical committees, have developed an excellent technical program devoted to all areas of tribology research and lubrication best practices, with presenters from academia, government, and industry.

In addition to being recognized as one of the industry's premier technical meetings, the STLE Annual Meeting is also valued as an opportunity for enhancing your professional development through education and certification offerings.

STLE has a well-known tradition of providing continuing education to industry professionals ready to take their careers to the next level and create value to their employers, customers, and peers. In past attendee surveys, participants have rated STLE's education courses as the most valuable portion of the event in terms of meeting their business needs. 12 industry-specific courses will be presented in Orlando, taught by the top experts in their respected fields.

For more experienced professionals, the STLE Annual Meeting is often the place where individuals sit for one of STLE's four technical certification exams: Certified Lubrication

Specialist (CLS)[™], Certified Metalworking Fluids Specialist (CMFS)[™] and Oil Monitoring Analyst I & II (OMA)[™].

To learn more about the industry's newest technologies, products, and services, make sure to visit the exhibition, which is included in the meeting registration. More than 120 companies will have booths, demonstrations, and information—all under one roof—looking to do business with you to find cost-saving solutions that will help improve your company's bottom line.

Program details, housing and other information about the meeting are all included in this brochure for your convenience. If you require further information or assistance, please contact STLE headquarters at (847) 825-5536 (USA) or visit the conference website at www.stle.org/annualmeeting for program updates.

I look forward to seeing you in Orlando in May!

Sincerely,

Rob

Robert Jackson, Ph.D.
Auburn University
2022 Annual Meeting Program
Committee Chair



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General Information & Policies

The 2022 STLE Annual Meeting and Exhibition is sponsored by:

Society of Tribologists and Lubrication Engineers

840 Busse Highway, Park Ridge, Illinois (USA) 60068

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

Email: information@stle.org • Web: www.stle.org



Hotel Information

Most events for STLE's 2022 Annual Meeting & Exhibition are being held in the:

Walt Disney World Swan and Dolphin Resort

1500 Epcot Resorts Blvd.

Lake Buena Vista, Florida (USA) 32830

Phone: (407) 934-4000

You can make your hotel room reservations by registering online at www.stle.org (see page 6 for housing information).

About STLE

The Society of Tribologists and Lubrication Engineers (STLE) is a not-for-profit professional society founded in 1944 to advance the science of tribology and the practice of lubrication engineering in order to foster innovation, improve the performance of equipment and products, conserve resources and protect the environment. Headquartered in Park Ridge, Illinois (a Chicago suburb), STLE is the leading technical organization serving more than 13,000 industry professionals and 250 companies and organizations that comprise the tribology and lubrication engineering business sector.

STLE offers its members industry-specific education and training, professional resources, technical information, certification programs and career development.

Attendee Roster

Check out the official attendee and exhibit booth staff rosters on the STLE website (www.stle.org).

About Our Annual Meeting & Exhibition

STLE's conference is where some 1,600 members of the tribology research and lubrication engineering communities gather for five days of industry-specific technical education and professional development. Highlights include some 400 paper presentations, a 120-exhibitor trade show, the popular Commercial Marketing Forum, and an opportunity to establish business contacts and friendships with your peers from around the world.

Annual Meeting & Education Course Policies

- All attendees must register.
- All attendees receive a badge with their registration materials. The badge must be worn at all times and is required for admittance to any technical session, education course and the trade show.
- Badges may not be exchanged. Attendees who loan their badges to others will have their badges confiscated and their annual meeting privileges rescinded.
- Annual Meeting registration includes admittance to the trade show, technical sessions, Commercial Marketing Forum and all social events, including the Monday evening Networking Reception and Tuesday afternoon President's Awards Luncheon.
- Distributing handouts at technical sessions is not permitted. Handouts will be given to education course attendees.
- Disseminating material or conducting business in the exhibit hall is not permitted if you are not an official exhibitor.

Recording & Photography Policies

Audio or video recording is not permitted in any of the annual meeting technical sessions or Commercial Marketing Forum presentations. Audio recording is permitted in the education courses with advance permission of the instructor. No video of any kind is permitted. STLE's official photographer will take photos of select technical sessions, Commercial Marketing Forum presentations, social events and the trade show on Tuesday, May 17.

These photos will be used to promote the 2023 STLE Annual Meeting & Exhibition in Long Beach, California (USA). If you do not wish to have your photograph taken and published, please step out of the photo frame, or notify the photographer afterward if your photo has been taken so the image can be deleted.

Dress Code

Business casual dress is appropriate for STLE events at the annual meeting. Technical session and education course speakers often choose attire that is more formal on the day of their presentations.

STLE 365 App

Find all the conference details and program updates in the Annual Meeting section of the STLE 365 App. Download free from the iOS App Store or the Google Play Store (just search for STLE).

Registration Information

Registration entitles you to all the technical sessions, trade show admission (Monday through Wednesday), Commercial Marketing Forum and all social events, including the Monday evening Networking Reception and Tuesday afternoon President’s Awards Luncheon (ticket required). STLE Education courses are \$430 per course with full registration except for NLGI Grease Course (\$830). **Please see the registration form on page 7.**

2022 STLE Annual Meeting Individual Registration Rates				
Individual			Ala Carte	
	Early Bird by April 12 (Save \$115!)	After April 12	General Single Day Registration	Single Education Course*
STLE Members	\$780	\$895	\$350	\$605
Speakers	\$780	\$895		
Presenters	\$780	\$895		
Non-members	\$1,130	\$1,245	\$520	\$775
Life Members	\$175	\$175		
Student Members	\$115	\$115		

**Annual Meeting registration not required or included.*

Cancellations

Requests must be received in writing at STLE’s headquarters no later than April 12, 2022, to receive refund less \$115 handling charge. **No refunds will be issued after April 12.**

Payment Method

STLE accepts U.S. currency, check drawn on a U.S. bank and major credit cards: Mastercard, Visa (preferred), American Express and Discover.

Onsite Registration

You may register onsite at the Walt Disney World Swan and Dolphin, beginning at Noon on Saturday, May 14, 2022.

The STLE registration desk is open daily thereafter through Thursday, May 19. Onsite registrants incur a \$115 surcharge. Advance registrants may pick up badges

and registration materials at the registration desk during the following hours:

- **Sunday, May 15** – 7 am – 6 pm
- **Monday, May 16** – 7 am – 6 pm
- **Tuesday, May 17** – 7 am – 6 pm
- **Wednesday, May 18** – 7 am – 6 pm
- **Thursday, May 19** – 7 am – Noon

Non-Members Welcome

Two Options for Attending: STLE’s core annual meeting audience is our membership of tribology researchers and lubrication professionals from around the globe. However, non-members are welcome at the conference and encouraged to attend. Participating in our conference is the best way to gain an overview of STLE’s many products and services and meet your peers in the

tribology and lubrication engineering communities.

STLE offers full and one-day annual meeting registration options. Because non-members pay a higher meeting registration rate, the best way to attend is by joining the society. Cost of membership is less than the difference between the member and non-member annual meeting registration rates. So, you actually save money by joining STLE and coming to the meeting as a member than you would if you came as a non-member—plus you get all the other benefits of STLE membership!

However, if your company does not permit you to join a professional society, another option is to pay the non-member registration rate for the annual meeting. If you do, **you’ll also receive a complimentary one-year STLE membership—a \$170 value.**

How To Register:



Online

Visit www.stle.org to register at your convenience, 24/7.



Phone

Call STLE headquarters at (847) 825-5536 and register using a major credit card.



Mail

Use the registration form on page 7 and send your completed form and payment to STLE headquarters.



Fax

Complete the enclosed registration form (see page 7) and submit via fax to (847) 825-1456.

By the Numbers:

Did you know about the STLE Annual Meeting

95% of surveyed attendees indicated that STLE's Annual Meeting met or exceeded their overall expectations.

40+ COUNTRIES REPRESENTED

500 EDUCATION COURSE PARTICIPANTS

40 STUDENT POSTERS

400 TECHNICAL PRESENTATIONS

1,600 INDUSTRY PROFESSIONALS

120 EXHIBITORS

40 COMMERCIAL MARKETING FORUM SESSIONS



Top 5 Lubricant-Related Markets Attending

- Oil Analysis
- Metalworking Fluids
- Automotive
- Manufacturing
- Bearings

Attendee Profile

5% Academia	6% Government
5% Students	18% Other
66% Industry	

Conference Takeaways:

- Industry networking
- Professional training & certification opportunities
- Explore latest new technologies
- Innovative research

“*It (the STLE Annual Meeting) is the best industry conference that I attend, and the business networking is very valuable.*”

Follow us on Social!

Stay connected and keep up with the chatter using the conference hashtag **#STLE2022** and stay up-to-date with the latest annual meeting programming information and much more!



Twitter | [@STLE_Tribology](https://twitter.com/STLE_Tribology)



Facebook | [Facebook.com/STLE](https://www.facebook.com/STLE)



Instagram | [@STLE_Tribology](https://www.instagram.com/STLE_Tribology)



LinkedIn | www.linkedin.com



Future Industry Meeting Dates

7th World Tribology Congress

Lyon Convention Centre • **July 10-15, 2022**, Lyon, France

2022 STLE Tribology Frontiers Conference

Cleveland Marriott Downtown at Key Tower • **November 13-15, 2022**
Cleveland, Ohio (USA)

77th STLE Annual Meeting & Exhibition

Long Beach Convention Center • **May 21-25, 2023**, Long Beach, California (USA)

78th STLE Annual Meeting & Exhibition

Minneapolis Convention Center • **May 19-23, 2024**, Minneapolis, Minnesota (USA)



To learn more about the benefits of STLE and to access a membership application, log on to www.stle.org or call STLE headquarters at 847-825-5536.

Need a Visa?

International attendees can request an invitation letter for the 2022 STLE Annual Meeting & Exhibition. For more information, contact Merle Hedland at (630) 428-2133, mhedland@stle.org.

Housing & Room Reservations

Housing for the 2022 STLE Annual Meeting & Exhibition is at:



Walt Disney World Swan and Dolphin Resort
1500 Epcot Resorts Blvd.
Lake Buena Vista, Florida (USA) 32830
(407) 934-4000

In the heart of the Walt Disney World® Resort, the award-winning **Walt Disney World Swan and Dolphin** is your gateway to Orlando's greatest theme parks and attractions. The Swan and Dolphin hotel is conveniently located in between Epcot® and Disney's Hollywood Studios™, and nearby many other popular Orlando attractions so you can stay close to the action.

The Swan and Dolphin hotel is a short 20-minute drive from the Orlando International Airport. Once on property, guests have access to complimentary scheduled transportation around the Walt Disney World® Resort. Guests can take a leisurely cruise on a Disney water taxi to Epcot® and Disney's Hollywood Studios™ or take the Epcot Resort Hotels shuttle bus to all other attractions and Disney resorts within the Walt Disney World® complex. Transportation arrives at the Swan and Dolphin hotel approximately every 15-20 minutes, so you can come and go as you please with very little wait time.

Walt Disney World Swan and Dolphin Amenities

- Spacious guest rooms with refrigerator, safe, flat-screen TVs, and high-speed Internet access. Some rooms have lake views. Suites come with pull-out sofas, walk-in closets, wet bars and/or balconies
- Multiple dining options, including upscale seafood, sushi, and Italian eateries
- Five pools, a beach, lavish spa services and two fitness gyms, plus golf tee time perks
- Disney theme park shuttle service

*STLE Annual Meeting Rates

- \$234 traditional single/double occupancy (1 or 2 people)
- \$244 resort view with double occupancy
- \$264 resort view with single occupancy
- \$264 balcony resort view with double occupancy
- \$284 balcony resort view with single occupancy
- \$304 Alcove Suite with single occupancy
- \$344 Premium Studio (Dolphin only)
- \$454 One-bedroom Grand

Attendees are encouraged to stay at the Walt Disney World Swan and Dolphin Resort, as doing so helps STLE reduce the costs of future annual meetings. The cutoff date to receive discounted pricing is **April 12, 2022**, however, STLE cannot guarantee housing at the Swan and Dolphin will be available through April 12. Reservations are made on a first come, first served basis. If you plan on attending the 2022 STLE Annual Meeting, you are urged to make your room reservations as soon as possible.

Reserve Your Room By April 12, 2022

- Call to make hotel reservations at (800) 227-1500. General reservation office hours are 8 am-6 pm (Monday-Friday) and 8:30 am – 5 pm (Saturday-Sunday)
- Be sure to provide the group code: **ST5082**
- Make all hotel reservation changes or cancellations directly with the Swan and Dolphin Resort
- Visit www.stle.org/annualmeeting for a shortcut to the hotel registration site

**Room rates are quoted exclusive of applicable state and local taxes or applicable service, or hotel specific fees in effect at the Walt Disney World Swan & Dolphin Resort at the time of the meeting. U.S. Government rate rooms are limited; proof of federal government employment must be shown at check-in or higher rate will be charged. U.S. Government rate is the prevailing government rate.*

2022 STLE Annual Meeting & Exhibition Registration Form

Walt Disney World Swan and Dolphin Resort • Orlando, FL (USA) • May 15-19, 2022



IN A HURRY? Register online at www.stle.org/annualmeeting

MAIL OR FAX THIS FORM TO: STLE, 840 Busse Highway, Park Ridge, IL (USA) 60068. Fax: 847-825-1456.

Registration Information (Please complete separate forms for each individual from your organization). • **My STLE Member # is:** _____

Title: ___ Mr. ___ Mrs. ___ Ms. ___ Dr. ___ Professor First name for badge: _____

First Name: _____ Last Name: _____

Company/Institution Name: _____

Address: _____

City: _____ State/Province: _____

Zip/Mail Code: _____ Country: _____

E-mail: _____ Fax: _____

Phone: _____ Onsite Cell Phone #* _____

Emergency Contact Name* _____ Emergency Contact Phone #* _____

***STLE does not sell conference attendee cell phone numbers. This information is requested for use only by STLE for conference updates and in case of onsite emergencies.**

Speaker or Presenter? Session Number or Paper Title: _____

NOTE: Registration includes technical sessions, trade show admission, Networking Reception, Commercial Marketing Forum, plus one complimentary ticket to the President's Luncheon. STLE Education Courses are \$430 with full meeting registration except for NLGI Grease Course (\$830).

Cancellation requests must be received in writing no later than April 12, 2022, to receive refund less \$115 handling fee. No refunds issued after that date. Mail or fax this form to: STLE, 840 Busse Highway, Park Ridge, IL (USA) 60068 Fax: (847) 825-1456. Questions? Call (847) 825-5536.

Annual Meeting Registration Rates

Members/Speakers/Presenters: \$780 – Non-members: \$1,130

Life Members: \$175 – Student Members: \$115

After April 12 add \$115

STLE Education Courses: Discounted rate with full meeting registration (\$430 per course) except for NLGI Grease Course (\$830). Lunch included.

Sunday Education Courses, May 15, 2022 (8 am – 5 pm)

Please ✓ one course only!

- Advanced Lubrication 301: Advanced Additives
- Basic Lubrication 101
- Electric Vehicles
- NLGI – Grease 101
- Metalworking 115: Metal Removal Fluids
- Synthetic Lubricants 203: Non-Petroleum Fluids and Their Uses

Wednesday Education Courses, May 18, 2022 (8 am – 5 pm)

Please ✓ one course only!

- Advanced Lubrication 302: Advanced Lubrication Regimes
- Automotive Lubrication 202: Gasoline
- Basic Lubrication 102
- Hydraulics 201: Hydraulic Fluids and System Overview
- Metalworking 240: MWF Formulation Concepts
- Synthetic Lubricants 204: Base Stock Selection and Applications

Social Functions (Please ✓ all that apply)

- Monday, May 16 – Networking Reception (free). Qty: _____
- Tuesday, May 17 – President's Luncheon (*one complimentary ticket included*).
- Tuesday, May 17 – Additional President's Luncheon guest ticket (\$50)

Ala Carte Offerings

- STLE education course and lunch only. Annual Meeting registration not required or included. **Members:** \$605 per course. **Non-members:** \$775 per course.
- NLGI Grease Course (\$830) with or without separate meeting registration. Lunch included.

Single-Day Registration Admission

Members: \$350. **Non-members:** \$520

- Monday, May 16 (Technical Sessions & Trade Show Only)
- Tuesday, May 17 (Technical Sessions & Trade Show Only)
- Wednesday, May 18 (Technical Sessions & Trade Show Only)
- Thursday, May 19 (Technical Sessions Only)

Payment Information

Payment Enclosed Payment Type: _____

Credit Card #: _____

Exp. Date: _____

Name on Card: _____

Payment Amount: \$ _____ . _____

Signature: _____



WELCOME TO ORLANDO

It's true: Orlando is a magical place. And it's not just because it's home to Cinderella's castle at Walt Disney World. There's an incredible mix of fun things to do in Orlando that make it an ideal vacationing spot for not only families, but young singles, baby boomers, foodies, outdoor adventurous types, luxury shoppers and international visitors.

While the city was built on theme park fame, the number and variety of Orlando attractions have grown to include world-famous restaurants, high-end outlet shopping centers, theatrical performances, and amazing concert and sporting event venues.

Golfers love the challenging and historic courses throughout the city, and art-lovers enjoy the Orlando Museum of Art, the Mennello Museum of American Art, as well as several small, funky galleries and art studios sprinkled throughout the area. Orlando is a place known for hospitality, and that extends to its many hotels, spas and services that suit every budget and taste.

If you're looking for quirky, interesting things to do in a half-day, afternoon or evening, Orlando has a number of fun spots that make for great memories and neat stories. There's no limit to the many adventures and exciting times that await you in this world-class meeting and entertainment destination, which is inspired by dreams and wonder.

NOTABLE ATTRACTIONS

Walt Disney World Parks

Universal Orlando Resort

SeaWorld

Lake Eola Park

Harry P. Leu Gardens

Ripley's Believe It or Not! Orlando

John F. Kennedy Space Center

Orlando Science Center



EXPERIENCE ORLANDO

Explore the sights and experience the food and nightlife of this magical city.
Find out what to eat, drink, see and do at www.visitorlando.com.



2022 Program-at-a-Glance

*As of Dec. 13, 2021

Please visit www.stle.org/annualmeeting for the latest program information and detailed schedule.

Saturday, May 14

Noon – 6 pm
Onsite Registration

Sunday, May 15

7 am – 6 pm
Onsite Registration
7 – 7:45 am
Education Course Speakers
Breakfast



8 am – 5 pm
Education Courses*

6:30 – 8 pm
Student Networking
Reception (Invitation Only!)

***Registration required**
All annual meeting events are held at the Walt Disney World Swan and Dolphin Resort.

Monday, May 16

7 am – 6 pm
Onsite Registration
7 – 8 am
Speakers Breakfast
8 – 10 am
Technical Sessions and
Commercial Marketing Forum

10 – 10:30 am
Refreshment Break

10:30 am – Noon
Opening General Session –
Keynote Address

Noon – 1:30 pm
Lunch (on your own)

Noon – 5 pm
Commercial Exhibits and
Student Posters

1:30 – 6 pm
Technical Sessions and
Commercial Marketing Forum

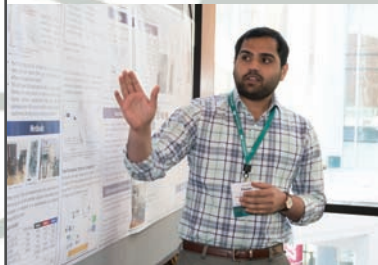


3 – 4 pm
**Exhibitor Appreciation
Break**

6:30 – 8 pm
Networking Reception

Tuesday, May 17

7 am – 6 pm
Onsite Registration
7 – 8 am
Speakers Breakfast
8 – 10 am
Technical Sessions and
Commercial Marketing Forum



9:30 am – Noon
Commercial Exhibits and
Student Posters

10 – 10:30 am
Refreshment Break

Noon – 2 pm
President's Awards Luncheon/
Business Meeting

2 – 5:30 pm
Commercial Exhibits and
Student Posters

2 – 6 pm
Technical Sessions and
Commercial Marketing Forum

3 – 4 pm
**Exhibitor Appreciation
Break**

4 – 6 pm
Roundtable Discussions

Wednesday, May 18

7 am – 6 pm
Onsite Registration
7 – 8 am
Speakers Breakfast
8 am – 5 pm
Education Courses*
8 – 10 am
Technical Sessions and
Commercial Marketing Forum

9:30 am – Noon
Commercial Exhibits and
Student Posters

10 – 10:30 am
Refreshment Break

Noon – 1:30 pm
Lunch (on your own)

1:30 – 6 pm
Technical Sessions and
Commercial Marketing Forum

3 – 3:30 pm
Refreshment Break

Thursday, May 19

7 am – Noon
Onsite Registration

7 – 8 am
Speakers Breakfast

8 am – Noon
Technical Sessions

8:30 am – 12:30 pm
STLE Certification Exams*



10 – 10:30 am
Refreshment Break

Noon – 1:30 pm
Lunch (on your own)

1:30 – 6 pm
Technical Sessions

3 – 3:30 pm
Refreshment Break



Choose from more than 400 papers and presentations!

The following is the preliminary 2022 STLE Annual Meeting technical program that will be updated right up until the meeting in Orlando. Please visit www.stle.org/annualmeeting for the latest program information. Registrants will also receive a Program Guide at the meeting with updated information.

***As of December 13, 2021 – Subject to change.**

Monday, May 16, 2022

☀ Session 1A
ELECTRIC VEHICLES I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3666962: Novel, Bio-Based Group V Basestocks for EV Applications: Customizable Performance with Reduced CO₂ Footprint

Ben Deweert, Oleon, Evergem, Belgium

8:30 – 9 am

3659666: Advancing EV Fluid Development with Next-Gen Base Oil

Babak Lotfi, ExxonMobil, Baytown, TX

9 – 9:30 am

3669418: Next Generation Basefluids for Electrical Vehicles – Optimizing the Performance Balance

David Gillespie, Croda, Inc., New Castle, DE

9:30 – 10 am

3664452: Do Esters Make Sense for Fluids in Electric Vehicles?

Matthias Hof, Emery Oleochemias GmbH, Monheim, NRW, Germany

10 – 10:30 am – Break

☀ Session 1B

LUBRICATION FUNDAMENTALS I – CONTACT MODELS I

Session Chair: Qian (Jane) Wang, Northwestern University, Evanston, IL

Session Vice Chair: TBD

8 – 8:30 am

3640353: The Lubrication at the Piston-Ring and Liner Interface as a Subject of Trade-Off Between Competing Factors

Polychronis Dellis, ASPETE, Athens, Attiki, Greece

8:30 – 9 am

3658966: Flow Around a Contacting Asperity Modeled in the Macro-, Micro- and Nanometer Scales

Shuangbiao Liu, Henry Soewardiman, Nicole Dorcy, Jannat Ahmed, Yip-Wah Chung, Qian (Jane) Wang, Northwestern University, Evanston, IL, Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD

9 – 9:30 am

3669142: Micro-Hydrodynamic Lubrication of Rough Thermoplasts in Parallel Sliding – The Role of Asperities, Cavitation, and Elasticity

Dilek Bulut, Norbert Bader, Gerhard Poll, Leibniz University of Hannover, Hannover, Germany

9:30 – 10 am

3668941: A Fully Conservative Thermo-Elastohydrodynamic Lubrication Model for Counterformal Contacts

Suhaib Ardah, Daniele Dini, Imperial College London, London, United Kingdom, Francisco Profito, Polytechnic School of the University of São Paulo, São Paulo, Brazil

10 – 10:30 am – Break

☀ Session 1C

COMMERCIAL MARKETING FORUM I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am – Open Slot

8:30 – 9 am

3668939: Oil Filtration Systems: Remote System Monitoring & Purification of Lubrication Oil Reservoirs

Tom Lisy, Ken Kaihlanen, Oil Filtration Systems, Boerne, TX

9 – 9:30 am

3647758: Biosynthetic Technologies: Estolides – High Performance Sustainable Base Oils for Lubricant and Metalworking Formulations

Matthew Kriech, Biosynthetic Technologies, Indianapolis, IN

9:30 – 10 am

King Industries, Inc.

10 – 10:30 am – Break

☀ Session 1D
TRIBOTESTING I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3641067: Study of Friction and Lubrication in Wire-Drawing Process

Marie-Louise Schlichting, Marc Masen, Amir Kadiric, Imperial College London, London, United Kingdom, Stijn De Pauw, Hendrik Van Hoecke, Marc Derdeyn, NV Bekaert SA, Ingelmunster, Belgium

8:30 – 9 am

3642543: The Assessment of Tribological Effects of Nanofluid Flow on Heat-Exchanger Materials

Gustavo Molina, Fnu Aktaruzzaman, Mosfequr Rahman, Valentin Soloiu, Georgia Southern University, Statesboro, GA

9 – 9:30 am

3642999: An In-Situ Study of Lubricants and Their Thermal Properties

Peter Renner, Yan Chen, Hong Liang, Texas A&M University, College Station, TX

9:30 – 10 am

3643909: Influence of Structural Depth of Laser-Patterned Steel Surfaces on the Solid Lubricity of Carbon Nanoparticle Coatings

Timothy MacLucas, Lukas Daut, Maria Agustina Guitar, Sebastian Suarez, Frank Mücklich, Saarland University, Saarbrücken, Germany, Philipp Grützmacher, Carsten Gachot, TU Wien, Vienna, Austria, Volker Presser, INM – Leibniz Institute for New Materials, Saarbrücken, Germany

10 – 10:30 am – Break

 **Session 1E**

SURFACE ENGINEERING I

Session Chair: Sougata Roy, University of North Dakota, Grand Forks, ND

Session Vice Chair: Ali Beheshti, George Mason University, Fairfax, VA

8 – 8:30 am

3669511: Additively Manufactured Inconel 625 Subjected to Surface Strength Improvements – Part I: Surface Integrity and Microstructural Characterization

Ali Beheshti, Manisha Tripathy, George Mason University, Fairfax, VA, Keivan Davami, The University of Alabama, Tuscaloosa, AL, Lloyd Hackel, Curtiss-Wright Surface Technology, Livermore, CA

8:30 – 9 am

3648360: Additively Manufactured Inconel 625 Subjected to Surface Strength Improvements – Part II: Elevated Temperature Fretting Wear Analysis

Manisha Tripathy, Ali Beheshti, George Mason University, Fairfax, VA, Lloyd Hackel, Curtiss-Wright Surface Technology, Livermore, CA, Keivan Davami, The University of Alabama, Tuscaloosa, AL

9 – 9:30 am

3646318: A Comprehensive Characterization of Laser Sintered Polyamide – 12 Surfaces

Kieran Nar, University of Sheffield, Sheffield, United Kingdom

9:30 – 10 am

3667955: Investigating the Tribomechanical Behavior of Hot Rolled and Additively Manufactured NiTi Alloy

Sougata Roy, Hyunsuk Choi, University of North Dakota, Grand Forks, ND

10 – 10:30 am – Break

 **Session 1F**

SEALS I: ROTARY ROD SEALS

Session Chair: Hongmei Zhao, The Lubrizol Corporation, Wickliffe, OH

Session Vice Chair: Jing Yang, Texas A&M University, College Station, TX

8 – 8:30 am

3641477: Friction of Rod Seals at Pre-Defined Thin Lubricant Films Analyzed with a New Measurement Procedure

Oliver Feuchtmüller, Lothar Hörl, Frank Bauer, University of Stuttgart, Stuttgart, Germany

8:30 – 9 am

3643939: Wear on Rotary Shaft Seals: Tribological Correlation Between Wear at Sealing Edge and Wear of Shaft

Lukas Merkle, Matthias Baumann, Frank Bauer, University of Stuttgart, Stuttgart, Germany

9 – 9:30 am

3646391: Modeling of Mixed Friction on Rotary Shaft Seals Under Consideration of Real Measured Surface Data

Jeremias Grün, Simon Feldmeth, Frank Bauer, University of Stuttgart, Stuttgart, Germany

9:30 – 10 am

3646402: Approach to the Description of Macro Lead Formation by Means of Kinematics Simulation

Georg Haffner, Matthias Baumann, Frank Bauer, University of Stuttgart, Stuttgart, Germany

10 – 10:30 am – Break

 **Session 1G**

GREASE I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3647897: High Performance Greases Toolbox: Synthetic Basestock Effect – A Study of the Influence of Synthetic Base Fluids on High Performance Greases

Luca Salvi, ExxonMobil Chemical, Baytown, TX, Joe Kaperick, Afton Chemical Corporation, Richmond, VA

8:30 – 9 am

3648467: The Churning Mechanism in Grease Lubricated Rolling Bearings: Identification and Characterization

Sathwik Chatra K R, SKF, Houten, Netherlands, Piet Lugt, SKF Research and Technology Development, Houten, Utrecht, Netherlands, Jude Osara, University of Twente, Enschede, Netherlands

9 – 9:30 am

3647990: A Model to Study Lubricating Grease Rheology: Exploring Molecular Dynamics Simulations

Femke Hogenberk, Sissi de Beer, Jude Osara, University of Twente, Enschede, Overijssel, Netherlands, Piet Lugt, SKF Research and Technology Development, Houten, Utrecht, Netherlands

9:30 – 10 am

3646574: Scale Up of a Preformed Polyurea Thickener for Grease

Lauren Huffman, John Cuthbert, Kevin Capaldo, Bruce Hook, Dow Chemical, Midland, MI

10 – 10:30 am – Break

☀ Session 1I

BIOTRIBOLOGY I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3668367: A Multiphysics Modeling Approach to Wear and Lifetime Prediction of Dual Mobility Hip Implants

Nia Christian, C. Fred Higgs III, Rice University, Houston, TX

8:30 – 9 am

3668774: Structural Insights Into the Interaction Between Hyaluronan and Phospholipids

Tooba Shoaib, Wei-Ren Chen, Changwoo Do, Oak Ridge National Laboratory, Knoxville, TN, Justin Silberman, University of Florida, Gainesville, FL, Rosa Espinosa-Marzal, University of Illinois at Urbana-Champaign, Urbana, IL

9 – 9:30 am

3668230: The Dynamic Fluid Equilibrium of Articular Cartilage During Activity

Steven Voinier, David Burris, University of Delaware, Newark, DE

9:30 – 10 am

3645584: Exploring the Biotribological Characteristics of Surface Functionalised PEEK for Focal Cartilage Resurfacing

Robert Elkington, Andrew Beadling, Richard Hall, Michael Bryant, University of Leeds, Leeds, United Kingdom, Hemant Pandit, Chapel Allerton Hospital, University of Leeds, Leeds, United Kingdom

10 – 10:30 am – Break

☀ Session 1J

WEAR I

Session Chair: TBD

Session Vice Chair: TBD

Session Starts at 8:30 am

8:30 – 9 am

3637599: Innovative Next-Generation Anti-Wear for New Industry Challenges

Christelle Chretien, Solvay, Bristol, PA

9 – 9:30 am

3642599: Lubricity Improvements of N-Butanol Mixing in Ultra-Low-Sulfur Diesel: A Wear, Friction and Viscosity Study

Gustavo Molina, John Morrison, Valentin Soloiu, Cesar Carapia, Georgia Southern University, Statesboro, GA

9:30 – 10 am

3642540: Wear Effects of Mineral Oil Dilution by Biodiesels: Is Viscosity Change or Methyl Ester Composition the Driving Factor?

Gustavo Molina, Emeka Onyejizu, Valentin Soloiu, Georgia Southern University, Statesboro, GA

10 – 10:30 am – Break

☀ Session 1K

2D MATERIALS + SUPERLUBRICITY – MATERIALS TRIBOLOGY AND NANOTRIBOLOGY I

Session Chair: TBD

Session Vice Chair: TBD

8 – 9 am

3669344: Mechanism of Graphite Lubrication Under High Mechanical Load

Martin Dienwiebel, Carina Morstein, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany

9 – 9:30 am

3669354: Role of Environment on the Shear Driven Structural Evolution of MoS₂ and Impact on Aging

Tomas Babuska, Tomas Grejtak, Lehigh University, Bethlehem, PA, John Curry, Michael Dugger, Sandia National Laboratories, Albuquerque, NM, Alexander

Kozen, Sam Klueter, University of Maryland, College Park, MD, David Ramos, Florida A&M University, Tallahassee, FL, Kylie Van Meter, Brandon Krick, Florida State University, Tallahassee, FL

9:30 – 10 am

3669363: Robust Vibration-Activated Lubricity

Arnab Bhattacharjee, David Burris, University of Delaware, Newark, DE, Nikolay Garabedian, Karlsruhe Institute of Technology, Karlsruhe, Germany, Brian Borovsky, St. Olaf College, Minnesota, MN

10 – 10:30 am – Break

☀ Session 1L

POWER GENERATION I

Session Chair: TBD

Session Vice Chair: Salvatore Rea, LANXESS Corporation, Perkasie, PA

8 – 8:30 am

3644441: Demonstration of the Benefits of SAE 30 Monograde Stationary Gas Engine Oil

Zoe Fard, HollyFrontier Lubricants and Specialties, Mississauga, Ontario, Canada

8:30 – 9 am

3647478: Gas Engine Oils with Enhanced Solvency Based on Novel Base Oil Blends

Thomas Norrby, Jinxia Li, Nynas AB, Nynashamn, Sweden, Franz Novotny-Farkas, Lubex Consulting OG, Schwechat, Austria, Christoph Schneidhofer, Jasmin Pichler, AC2T Research GmbH, Wiener Neustadt, Austria

9 – 9:30 am

3668946: The Three Rs: A Sustainable Approach to Turbine Lubricant Maintenance

Matthew Hobbs, EPT, Calgary, Alberta, Canada

9:30 – 10 am

3646311: Power Plant Lubrication Reliability

Anshuman Agrawal, Minimac Systems Pvt Ltd., Pune, Maharashtra, India

10 – 10:30 am – Break

 Session 1M

ROLLING ELEMENT BEARINGS I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3637818: In-Situ Measurement of the Oil Film Meniscus at the Entry and Exit of a Rolling Bearing Contact

William Gray, Rob Dwyer-Joyce, The University of Sheffield, Sheffield, United Kingdom

8:30 – 9 am

3646294: In-Situ Measurement of Roller Skew and Lubricant Film Change Within a Rolling Element Bearing

William Gray, Rob Dwyer-Joyce, The University of Sheffield, Sheffield, United Kingdom

9 – 9:30 am

3645188: Grease Performance in Ball and Roller Bearings for All-Steel and Hybrid Bearings

Piet Lugt, Marco Van Zoelen, Charlotte Vieillard, SKF Research and Technology Development, Houten, Netherlands, Frank Berens, SKF France, St-Cyr-sur-Loire, France, Robert Gruell, Paul Meaney, SKF Germany, Schweinfurt, Germany, Gerwin Preisinger, SKF Austria, Steyr, Austria

9:30 – 10 am

3645644: Analyzing Ball Bearing Capacitance Using Single Steel Ball Bearings

Steffen Puchtler, Julius van der Kuip, André Harder, Eckhard Kirchner, TU Darmstadt, Darmstadt, Germany

10 – 10:30 am – Break

 Session 2A

ELECTRIC VEHICLES II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3669482: Additives for Improving Efficiency and Durability of Drivetrain Lubricants for Electric Vehicles

Alexei Kurchan, Jacob Wegbreit, Croda Inc., Princeton, NJ

2 – 2:30 pm

3669347: Polymeric Additives as an Optimum Solution for Performance and Compatibility Challenges in E-Drive Fluid Design

Peter Moore, Dmitriy Shakhvorostov, Stefan Wieber, Andreas Hees, Roland Wilkens, Evonik Oil Additives, Horsham, PA

2:30 – 3 pm

3648063: The Performance of Low Viscosity and Ex-High VI Engine Oils with MoDTC Under Hybrid Electric Vehicles

Kenji Yamamoto, Shinji Iino, Yukiya Morizumi, ADEKA Corporation, Arakawa, Tokyo, Japan

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3669304: A Study of the Effects of Foam and Defoamer Performance in Electric Vehicle Fluids

Safia Peerzada, Stefanie Velez, Munzing Chemie GmbH, Bloomfield, NJ

4:30 – 5 pm

3663659: Impact of High Speed Operation on Lubricant Aeration in an Electric Drive Unit

Cole Frazier, Marshall Hudson, Caroline Mueller, Southwest Research Institute, San Antonio, TX

5 – 5:30 pm

3647009: How New E-Fluid Formulation Enable Efficiency and Better Performance Under High Speed Conditions

Torsten Murr, Shell Global Solutions Germany, Hamburg, Germany

5:30 – 6 pm

3669345: Enabling Next Generation E-Fluids for Mobility, Electronics and Energy

Kai Wirz, Evonik Corporation, Richmond, VA

 Session 2B

LUBRICATION FUNDAMENTALS II – CONTACT MODELS II

Session Chair: Gerhard Poll, Leibniz University Hannover, Hanover, Germany

Session Vice Chair: TBD

1:30 – 2 pm

3646378: Numerical Study of the Validity of the Reynolds Equation in the Nanoscale

Andrea Codrignani, Kerstin Falk, Michael Moseler, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany

2 – 2:30 pm

3648103: Numerical Simulation of Contacts Working Under Mixed Lubricating Conditions

Ruchita Patel, Zulfiqar Khan, Adil Saeed, Bournemouth University, Bournemouth, Dorset, United Kingdom, Vasilios Bakolas, Schaeffler Technologies AG & Co. KG (Schaeffler Group), Herzogenaurach, Germany

2:30 – 3 pm

3664184: Lubrication-Contact Interface Conditions and Novel Mixed/Boundary Lubrication Modeling Methodology

Shuangbiao Liu, Qian (Jane) Wang, Yip-Wah Chung, Northwestern University, Evanston, IL, Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3664197: Analyzing Transient Mixed Elastohydrodynamic Lubrication Considering Lubrication-Contact Interface Conditions

Shuangbiao Liu, Nicole Dorcy, Qian (Jane) Wang, Yip-Wah Chung, Northwestern University, Evanston, IL, Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD



☀ Session 2B

4:30 – 5 pm

3669192: Thermal Investigations into EHL Contacts – Determination of Solid Body Temperature at Lubricant Interface

Norbert Bader, Haichao Liu, Dilek Bulut, Gerhard Poll, Leibniz University Hannover, Germany, Germany

5 – 5:30 pm

3640731: Tribology for the Soul – How the Science of Tribology Can Help Companies (and People) Succeed

Michael Holloway, 5th Order Industry, Highland Village, TX

☀ Session 2C

COMMERCIAL MARKETING FORUM II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

Clariant Corporation

2 – 2:30 pm

Kao Chemicals Europe

2:30 – 3 pm

The Lubrizol Corporation

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

ANGUS Chemical Company

☀ Session 2D

TRIBOTESTING II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3650703: Prediction of Retention of Fuel Economy Capability in Aged Fully Formulated Fuel Economy Engine Oils Containing Soluble Molybdenum Friction Modifiers Using Laboratory Scale Bench Tests and Correlation with the Field Performance

Sanjay Kumar, Y Rao, David Hall, Chidambaram C T, Jancen Arivannoor, Vinod D, Vinith Kumar, Gulf Oil International, Chennai, Tamil Nadu, India

2 – 2:30 pm

3644378: Electrical Impedance Spectroscopy to Study Sooty Engine Oils

Thomas Kirkby, Tom Reddyhoff, Imperial College London, London, United Kingdom, Mark Fowell, Volvo Group Trucks Technology, Göteborg, Sweden, Joshua Smith, Jacqueline Berryman, Infineum UK Ltd., Abingdon, United Kingdom

2:30 – 3 pm

3645314: Adhesive Wear Performance of Specialty Bearing Steels

Daulton Isaac, Mathew Kirsch, Alexander Fletcher, AFRL Turbine Engine Division, Wright Patterson Air Force Base, OH, Hitesh Trivedi, UES Inc., Dayton, OH

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3645609: Novel Compatibility Test of Seal Materials and Lubricants Under a Dynamic Stress Collective

Ameneh Schneider, Optimol Instruments, München, Germany

4:30 – 5 pm

3677562: Novel Method for Evaluating Lubricants in HD Bearing Interfaces

Michael Moneer, Peter Lee, Carlos Sanchez, Southwest Research Institute, San Antonio, TX

5 – 5:30 pm

3647051: How Can We Evaluate the Frictional and Wear Performance of Shock Absorbers on the Lab-Scale: A New Tribological Approach

Emmanuel Georgiou, Dirk Drees, Lais Lopes, Michel De Bilde, Falex Tribology, Rotselaar, Belgium

5:30 – 6 pm

3664941: Evaluation of Cryogenic Pin-on-Disk Test to Improve Sliding Friction Interaction of Cryogenic Solid-Lubrication

Wonil Kwak, Yongbok Lee, Korea Institute of Science and Technology, Seoul, Republic of Korea

☀ Session 2E

SURFACE ENGINEERING II

Session Chair: Auezhan Amanov, Sun Moon University, Asan, Republic of Korea

Session Vice Chair: Suvrat Bhargava, TE Connectivity, Middletown, PA

1:30 – 2 pm

3677795: Effect of Ultrasonic Needle Peening on Subsurface of Bronze Casting Alloy Caused by Fretting Wear

Seunghyon Song, Auezhan Amanov, Sun Moon University, Asan, Republic of Korea; Insik Cho, Mboria, Asan, ChungNam, Republic of Korea

2 – 2:30 pm

3663198: Post-Thermal Spray Coating Surface Modification for Sliding Wear and Adhesion Strength

Auezhan Amanov, Sun Moon University, Asan, Republic of Korea; Stephen Berkebile, US DEVCOM Army Research Laboratory, Aberdeen Proving Ground, MD

2:30 – 3 pm

3669371: Development of Self-Lubricating Metal Alloys Using Laser Metal Deposition

Manel Rodriguez Ripoll, Hector Torres, AC2T Research GmbH, Wiener Neustadt, Austria

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3669286: A Study on the Influence of Spray Parameters on Adhesion of Cr₃C₂-NiCr Plasma Coating on Steel Substrate

Cuong Pham, Hanoi University of Industry, Hanoi, Vietnam

4:30 – 5 pm

3668698: Enhancing the Tribology of TWAS-Coated Cylinder Bores by Using the Triboconditioning® Process

Boris Zhmud, David Chobany, Applied Nano Surfaces Sweden AB, Uppsala, Sweden, Eduardo Tomanik, USP, Sao Paulo, Brazil

5 – 5:30 pm

3669312: Tribological Test of Tungsten Disulfide Solid Lubrication Exposed to Simulated Space Environment

Ayaka Takahashi, AIST, Tsukuba, Ibaraki, Japan

 Session 2F

SEALS II: MECHANICAL AND ELASTOMERIC SEALS

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3669268: Machine Vibration and Noise Effects on the Dynamics of Mechanical Face Seal

Itzhak Green, Georgia Institute of Technology, Atlanta, GA

2 – 2:30 pm

3645972: Numerical Transient Study of Two-Phase Flow in Inward Pumping Grooved Mechanical Seal

Abdel Salem Medjahed, Antoinette Blouin, Institut Pprime, Chasseneuil-du-Poitou, France, Noel Brunetiere, CNRS, Chasseneuil du Poitou, France, Balint PAP, Safran Transmission System, Colombes, France

2:30 – 3 pm

3647075: Measurement of Oil Film Thickness in Reciprocating Rubber Seals Using the Ultrasound

Rob Dwyer-Joyce, Xiangwei Li, Scott Beamish, Juanjuan Zhu, University of Sheffield, Sheffield, United Kingdom

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3645600: 3D Printed Surface Textured Seals with Superior Friction Properties

Markus Brase, Matthias Wangenheim, Leibniz University Hannover, Garbsen, Germany

4:30 – 5 pm

3647448: Bio-Inspired Pneumatic Sealing Disc of Fluid-Driven Pipeline Robot

Chunmei Yue, China University of Petroleum, Beijing, China

5 – 5:30 pm

3648363: High Temperature Sealing Advancements Utilizing Non-Contacting Gas Seal Technology

Robert McManus, John Crane Inc., Portsmouth, RI

 Session 2G

GREASE II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3647445: Measuring Flim Thickness in Starved Grease Lubricated Bearings: An Improved Capacitance Method

Pramod Shetty, Robert Meijer, Jude Osara, University of Twente, Enschede, Netherlands, Rihard Pasaribu, Shell, Rotterdam, Netherlands, Piet Lugt, SKF Research and Technology Development, Houten, Utrecht, Netherlands

2 – 2:30 pm

3647029: How Does Temperature Affect Grease Adhesion and Tackiness?

Emmanuel Georgiou, Lais Lopes, Michel De Bilde, Dirk Drees, Falex Tribology, Rotselaar, Belgium, Erik Willett, Functional Products, Macedonia, OH, Michael Anderson, Falex Corporation, Sugar Grove, IL

2:30 – 3 pm

3646282: Calcium Sulfonate Greases – Improving Biodegradable Solution Thanks to 1-Step Process

Guillaume Notheaux, SEQENS, Porcheville, France

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3649678: Grease Material Properties from First Principles Thermodynamics

Jude Osara, University of Twente, Enschede, Netherlands, Sathwik Chatra K R, SKF, Houten, Netherlands, Piet Lugt, SKF Research and Technology Development, Houten, Utrecht, Netherlands

4:30 – 5 pm

3651539: Polyglycols as High Performing Base Oil Components in Modern Greases

Cristina Schitco, Clariant Corporation, Frankfurt, Germany, Stephanie Cole, Clariant, Mount Holly, NC

5 – 5:30 pm

3663806: On the Flow Dynamics of Polymer Grease

Josep Farré-Lladós, Jasmina Casals-Terre, UPC – Technical University of Catalonia, Terrassa, Spain, Lars Westerberg, Luleå University of Technology, Luleå, Sweden

5:30 – 6 pm

3688156: Fictitious Grease Lubrication Performance in a Four-Ball Tester

Sravan Josyula, Debdutt Patro, Deepak Halenahally Veeregowda, Ducom Instruments, Groningen, Netherlands

6 – 6:30 pm – Grease Business Meeting

 Session 2H

TRIBOCHEMISTRY I

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3644606: Aging Mechanisms of Molybdenum Disulfide: A Fundamental Surface Spectroscopic Study

Filippo Mangolini, Robert Chrostowski, The University of Texas at Austin, Austin, TX, John Curry, Michael Dugger, Sandia National Laboratories, Albuquerque, NM

2 – 2:30 pm

3644588: Tailoring the Surface Reactivity and Tribological Performance of Phosphonium-Based Ionic Liquids by Varying the Anion Chemistry

Filippo Mangolini, Zixuan Li, Hugo Celio, Andrei Dolocan, Nicolás Molina, Jude Kershaw, Oscar Morales-Collazo, Joan Brennecke, The University of Texas at Austin, Austin, TX

2:30 – 3 pm

3645158: Principle Frictional Properties in Boundary Lubrication by Ideal Nanoscale Gap Using MEMS

Wataru Yagi, Tomoko Hirayama, Kyoto University, Kyoto, Japan

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3644334: Understanding the Boundary Lubrication Tribochemistry of Tetrahedral Amorphous Carbon Coatings by Quantum Molecular Dynamics

Michael Moseler, Takuya Kuwahara, Gianpietro Moras, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany

☀ Session 2H

4:30 – 5 pm

3645199: In-Situ Tribochemical Formation of Superlubricious Interfaces in Vacuum and Boundary Lubrication

Takuya Kuwahara, Michael Moseler, Gianpietro Moras, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany

5 – 5:30 pm

3647723: Dynamic Tribo-Pair of PS400 and DLC for Planet Venus Application

Vasilis Tsigkis, Andreas Polycarpou, Texas A&M University, College Station, TX, Pixiang Lan, ATSP Innovations, Houston, TX

☀ Session 2I

BIOTRIBOLOGY II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3651966: Effects of Plant-Based and Dairy Proteins on Oral Lubrication and Mouthfeel

Sorin Vladescu, Connor Myant, Tom Reddyhoff, Imperial College London, London, United Kingdom, Maria Gonzalez Agurto, Guy Carpenter, King's College London, London, United Kingdom, Michael Boehm, Stefan Baier, Motif FoodWorks, Boston, MA, Gleb Yakubov, University of Nottingham, Nottingham, United Kingdom

2 – 2:30 pm

3651983: Measurement of Foot Plantar Skin Strain Using Digital Image Correlation Methods for Diabetic Foot Assessment

Sarah Crossland, Heidi Siddle, Claire Brockett, Peter Culmer, University of Leeds, Leeds, West Yorkshire, United Kingdom, Alexander Jones, David Russell, Leeds Teaching Hospitals NHS Trust, Leeds, United Kingdom

2:30 – 3 pm

3645981: The Effect of Hyaluronic Acid Concentration in Lubricant and Counter Material on Friction Behaviour of a Hydrogel Composite

Rahul Ribeiro, Alliance University, Bengaluru, Karnataka, India

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm – Biotribology Business Meeting

☀ Session 2J

WEAR II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3669390: Understanding and Mitigation of Knife Mill Wear in Biomass Preprocessing

Jun Qu, Jim Keiser, Oak Ridge National Laboratory, Oak Ridge, TN, Jeffrey Lacey, Vicki Thompson, Idaho National Laboratory, Idaho Falls, ID, George Fenske, Oyelayo Ajayi, Argonne National Laboratory, Lemont, IL, Ed Wolfrum, National Renewable Energy Laboratory, Golden, CO, Peter Blau, Blau Tribology Consulting, Enka, NC

2 – 2:30 pm

3648427: Elevated Temperature Helium Tribology of Inconel 617 Subjected to Laser Shock Peening and Thermal Engineering

Vasilis Tsigkis, Saifur Rehman, Andreas Polycarpou, Texas A&M University, College Station, TX, Lloyd Hackel, Curtiss-Wright Surface Technology, Livermore, CA, Keivan Davami, The University of Alabama, Tuscaloosa, AL, Ali Beheshti, George Mason University, Fairfax, VA

2:30 – 3 pm

3647034: An Investigation into the Tribological Performance of Wear Resistant PVD Coatings Atop Various Tool Steels Used in Injection Moulding Applications

Roshan Lal, Michael Adams, Zhenyu Jason Zhang, University of Birmingham, Wolverhampton, United Kingdom

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3669385: New Anti-Wear Additives

Nathan Eckert, Nickie Norton, The Shepherd Chemical Company, Norwood, OH

4:30 – 5 pm

3646934: Is the Miller ASTM G75 Abrasivity Test Obsolete?

Dirk Drees, Emmanuel Georgiou, Luis Lopes, Michel De Bilde, Falex Tribology, Rotselaar, Belgium, Michael Anderson, Falex Corporation, Sugar Grove, IL

☀ Session 2K

2D MATERIALS + SUPERLUBRICITY – MATERIALS TRIBOLOGY AND NANOTRIBOLOGY II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2:30 pm

3642860: Energy Dissipation Studies on a Local Scale

Ernst Meyer, University of Basel, Basel, Switzerland

2:30 – 3 pm

3669471: Spectral and Frictional Analysis of Alkane Mixtures on Graphitic Surfaces

Behnoosh Sattari Baboukani, Thomas Bui, Medini Rajapakse, Luis Velarde, Prathima Nalam, SUNY University at Buffalo, Buffalo, NY

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3669467: Molecular Dynamics Investigation of Adhesion Between MoS₂ Coated Scanning Probes

James David Schall, Sathwik Toom, North Carolina A&T University, Greensboro, NC, Takaaki Sato, Robert Carpick, University of Pennsylvania, Philadelphia, PA, Yeau-Ren Jeng, National Chung Cheng University, Chiayi, Taiwan

4:30 – 5 pm

3647885: MD Simulation on Enhanced Wear Resistance of Nature Rubber Composites by Applications of Carbon Nanotube

Fei Teng, Jian Wu, Benlong Su, Youshan Wang, Harbin Institute of Technology, Weihai, Shandong, China

 Session 2L

POWER GENERATION II

Session Chair: Matthew Hobbs, EPT, Calgary, Alberta, Canada

Session Vice Chair: TBD

1:30 – 2 pm

3669338: Case Study on Autodegradation of Turbine Oil and Varnish Removal

Jorge Alarcon, Bureau Veritas, Stafford, TX

2 – 2:30 pm

3646994: Determination of Relative Concentrations of Phosphate Ester Isomers in Turbine Control Systems by Matrix Assisted Laser Desorption Ionization – High Resolution Mass Spectrometry (MALDI-HRMS)

John Duchowski, Johannes Staudt, HYDAC FluidCareCenter GmbH, Sulzbach, Saar, Germany, Gerard Palmer, HYDAC Technology Ltd., Witney, Oxfordshire, United Kingdom

2:30 – 3 pm

3669543: Filter Debris Analysis (FDA) of Solid Particles Trapped in Pencil Filter of Servo Control Valve in Steam Turbine Power Plant in Thailand

Surapol Raadnui, KMUTNB, Bang Sue, Bangkok, Thailand

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm – Power Generation Business Meeting

 Session 2M

ROLLING ELEMENT BEARINGS II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3641055: Towards a Grain-Scale Modeling of Crack Initiation in Rolling Contact Fatigue

Lucas Fourel, Fabrice Ville, Xavier Kleber, Philippe Sainsot, INSA Lyon, Villeurbanne, France, Jean-Philippe Noyel, Etienne Bossy, ECAM Lyon, Lyon, France

2 – 2:30 pm

3642431: Prediction of Surface Crack Propagation Under Rolling Contact

Bjoern Kunzelmann, Amir Kadiric, Imperial College London, London, United Kingdom, Guillermo Morales-Espejel, SKF, Houten, Netherlands

2:30 – 3 pm

3668690: Fatigue Life Calculation of a Cylindrical Roller Bearing with Surface Damage

Armand Tamouafo Fome, Jan Hendrick Kehl, Norbert Bader, Gerhard Poll, Leibniz University Hannover, Hanover, Germany

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3648478: An Investigation of the Effects of Grain Refinement on Rolling Contact Fatigue

Steven Lorenz, Farshid Sadeghi, Purdue University, West Lafayette, IN

4:30 – 5 pm

3667586: Fluid Structure Interaction Modeling of Surface Cracks in Elastohydrodynamically Lubricated Line Contact

Kushagra Singh, Farshid Sadeghi, Purdue University, West Lafayette, IN

5 – 5:30 pm

3647699: Fluid-Solid Interaction Modeling of Point EHL Contacts

Wyatt Peterson, Farshid Sadeghi, Purdue University, West Lafayette, IN

 Session 2N

METALWORKING FLUIDS I

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3645759: Metal Working Fluids Containing Hydroxyproline Rich, Natural Proteins Have Reduced Drag Out and Provide for Cleaner Machines and Workpieces

Eric Yezdimer, Gelita USA, Sergeant Bluff, IA; Matthias Reihmann, Gelita AG, Eberbach, Germany

2 – 2:30 pm

3647104: Formulating Aluminum Metal Working Fluids – Which Additives Provides Essential Benefits?

Michael Stapels, Kao Chemicals GmbH, Emmerich, Germany

2:30 – 3 pm

3651204: Post Machining Cleaning – How to Pick the Right Surfactant For the Job

Ashley Milton, Stephanie Cole, Clariant, Mount Holly, NC

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3667154: Polyglycol as Performance Wear Lubricant and Synergism with Extreme Pressure Additives on Neat Oil Metalworking Fluid

Eduardo Lima, FASB – Philosophy and Sciences College, São Paulo, Brazil

4:30 – 5 pm

3669361: How Did You Come Up With That? A Comparison Study of the Different Innovation Methods Between Large Corporations and Small & Medium Sized Enterprises (SME)

E Jon Schnellbacher, Formulas & Solutions, LLC, Allen Park, MI



Tuesday, May 17, 2022

☀ Session 3A

ELECTRIC VEHICLES III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3644979: The Impact of Bearing Currents on the Failure Modes of Motor Bearings in Electric Vehicles

Duncan Nicoll, University of Southampton, Portsmouth, Hampshire, United Kingdom

8:30 – 9 am

3648072: An Experimental Study of Load-Independent Power Losses in an Electric Vehicle Gearbox at High Speeds

Alexander MacLaren, Amir Kadiric, Imperial College London, London, United Kingdom

9 – 9:30 am

3645195: Investigation of the Voltage Induced Fluting Pattern Progression in Thrust Ball Bearings

André Harder, Steffen Puchtler, Eckhard Kirchner, TU Darmstadt, Darmstadt, Germany

9:30 – 10 am

3688134: Innovative Design of Electrical Lubricants Test Rig for E-Grease and E-Fluids

Deepak Halenahally Veeregowda, Debdutt Patro, Ducom Instruments, Bangalore, India

10 – 10:30 am – Break

10:30 – 11 am

3663058: Electrified Driveline Fluid Durability Testing and Profiling

Marshall Hudson, Southwest Research Institute, San Antonio, TX

11 – 11:30 am

3669349: Electrification Effects on the Tribological Behavior of Electric Vehicles Drivetrain Gear Materials

Leonardo Farfan-Cabrera, Julio Cao-Romero-Gallegos, Tecnológico de Monterrey, Monterrey, Nuevo Leon, Mexico, Ali Erdemir, Texas A&M University, College Station, TX

11:30 am – Noon

3663243: Importance and Challenges of Greases in Electrical Vehicles – ICE versus EV Testing Requirements

Richard Baker, TriboTonic Ltd., London, United Kingdom

☀ Session 3B

LUBRICATION FUNDAMENTALS III – STABILITY

Session Chair: Brendan Miller, Chevron Oronite Company, Richmond, CA

Session Vice Chair: TBD

8 – 8:30 am

3645610: Antioxidants for Next Generation Automotive Lubricants

Jun Dong, Songwon Industrial Group, Glen Allen, VA

8:30 – 9 am

3647545: Development of Liquid Aminic Additives as Effective Antioxidants

Kevin Sterling, Brian Casey, Vincent Gatto, Vanderbilt Chemicals LLC, Norwalk, CT

9 – 9:30 am

3640725: Which Lubrication Certification is Right For Me?

Michael Holloway, 5th Order Industry, Highland Village, TX

9:30 – 10 am

3643544: Varnish Resistance Prediction Indicator (VRPI) for Group I-IV Lubricants

Joseph Fotue, TotalEnergies Cameroon, Douala, Cameroon

10 – 10:30 am – Break

10:30 – 11 am

3669107: Mechanism of Antioxidant Action of Fullerenes in Lubricating Oil

Daiki Takasaki, Tomomi Honda, University of Fukui, Fukui, Japan

11 – 11:30 am

3669459: About the Nature of Precursors to Oil Varnish

Nicole Doerr, Christoph Schneidhofer, Krisztian Dubek, AC2T Research GmbH, Wiener Neustadt, Austria

11:30 am – Noon

3653667: Multiscale Molecular Modeling of Deposit Control

Anil Agiral, The Lubrizol Corporation, Wickliffe, OH, Esra Kan, Erol Yildirim, Middle East Technical University, Ankara, Turkey, Binbin Guo, The Lubrizol Corporation, Wickliffe, OH

☀ Session 3C

COMMERCIAL MARKETING FORUM III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am – Open Slot

8:30 – 9 am

Lubrication Specialties, Inc.

9 – 9:30 am

3647752: Biosynthetic Technologies: Biocea™ – Sustainable, Safe and Performance-Driven Metalworking Fluid Additives for Real-World Formulations

Jeffrey Mackey, Biosynthetic Technologies, Indianapolis, IN

9:30 – 10 am

MÜNZING

10 – 10:30 am – Break

10:30 – 11 am

Colonial Chemical Company

11 – 11:30 am

The Lubrizol Corporation

11:30 am – Noon

BASF Corporation

 **Session 3D**
TRIBOTESTING III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3666623: Finite Element Analysis of Dynamic Contact Pressure on Rotary Shear Biomass Comminution System

Lianshan Lin, Jim Keiser, Jun Qu, Oak Ridge National Laboratory, Oak Ridge, TN, David Lanning, Forest Concepts, Auburn, Washington, Åland Islands

8:30 – 9 am

3647499: In-Situ Digital Holographic Microscopy for Polymer Transfer Film Characterization

Kian Kun Yap, Marc Masen, Imperial College London, London, United Kingdom, Pushkar Deshpande, Kilian Wasmer, Swiss Federal Laboratories for Materials Science and Technology, Thun, Switzerland, Jennifer Vail, DuPont, Wilmington, DE

9 – 9:30 am

3662733: New Methodologies Indicating Adhesive Wear in SRV Load Step Tests

Gregor Patzer, Optimol Instruments GmbH, Munich, Bavaria, Germany, Mathias Woydt, Matrilub, Berlin, Germany

9:30 – 10 am

3665014: Development of a Two-Body Abrasion Test for Cemented Carbides (Hard Metals)

Kenneth Budinski, Bud Labs, Rochester, NY

10 – 10:30 am – Break

10:30 – 11 am

3667828: Designing a Simple Test to Measure and Rate Lubricant Controlled Friction Reduction

Marc Ingram, Ingram Tribology Ltd., Carmarthen, United Kingdom, Izzy Roots, Thomas Welham, Clive Hamer, PCS Instruments, London, United Kingdom

11 – 11:30 am

3667558: Digitalization & Tribology: Advances in Tribofilm Image Processing

Oluwaseyi Ogunsola, Shell Global Solutions (US) Inc., Houston, TX, Chaitanya Pradhan, Aarthi Thyagarajan, Vishal Ahuja, Nitish Nair, Shell India Markets Pvt. Ltd., Bangalore, India

11:30 am – Noon

3667852: Maintaining Safe and Quiet Railways with “Top of Rail Materials”

Marc Ingram, Ingram Tribology Ltd., Carmarthen, United Kingdom, Matthew Smeeth, PCS Instruments, London, United Kingdom, Anup Chalisey, Rail Safety and Standards Board, London, United Kingdom

 **Session 3E**
SURFACE ENGINEERING III

Session Chair: Suvrat Bhargava, TE Connectivity, Middletown, PA

Session Vice Chair: Kora Farokhzadeh, Bruker Nano Surfaces, San Jose, CA

8 – 8:30 am

3640374: Surface Functionality Prediction via Curvature Analysis

Mark Malburg, Digital Metrology Solutions, Columbus, IN

8:30 – 9 am

3669032: Effect of Surface Texture on Lubricant Film Thickness and Frictional Behavior at EHL to Boundary Lubrication Regime

Yuji Yuhara, Seiya Watanabe, Shinya Sasaki, Tokyo University of Science, Higashikanamachi, Katsushika-ku, Tokyo, Japan

9 – 9:30 am

3665854: Effect of Surface Texture Pattern on Friction Anisotropy Under Insufficient Lubrication

Atsuta Harada, Kaisei Sato, Seiya Watanabe, Shinya Sasaki, Tokyo University of Science, Katsushika-ku, Tokyo, Japan

9:30 – 10 am

3669368: Surface Textures: Design Principle and Applications

Stephen Hsu, George Washington University, Germantown, MD

10 – 10:30 am – Break

10:30 – 11 am

3645120: Concurrent Design of Nanostructured Surfaces with Quasi-Random Geometries for Adhesion Optimization

Chengiao Yu, Hebei University of Technology, Tianjin, China, Shuangcheng Yu, Xingyi Metal Group, Haining, China

11 – 11:30 am

3647434: Tribological Properties of Fingerprint-Like Texture on Soft Surface

Tianze Hao, Huaping Xiao, Shuhai Liu, China University of Petroleum-Beijing, Beijing, China

 **Session 3F**

SEALS III: HYDRAULIC AND TWO-PHASE SEALS

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3647512: Leakage and Rotordynamic Characteristics for Two Types of Novel Hole-Pattern Seals Operating in Supercritical CO₂ Turbomachinery

Zhigang Li, Zhi Fang, Jun Li, Xi'an Jiaotong University, Xi'an, ShaanXi, China

8:30 – 9 am

3668666: Analysis of Sealing Performance of Elastohydrodynamic Seal for sCO₂

Jing Tang, Hanping Xu, Ultool LLC, Duluth, GA, Sevki Cesmeçi, Ikenna Ejiogu, Georgia Southern University, Statesboro, GA, Jordan (Shuangbiao) Liu, Northwestern University, Evanston, IL

9 – 9:30 am

3645190: Simulation of Transient Processes of a Hydraulic Seal with Elastohydrodynamic Lubrication

Arne Leenders, Institute of Dynamics and Vibration Research, Garbsen, Germany

9:30 – 10 am

3647339: A Grooved Rotor-Smooth Surface Stator Seal versus a Smooth Surface Rotor-Grooved Stator Seal: Comparison of Measured Leakage and Effective Force Coefficients

Jing Yang, Luis San Andres, Dara Childs, Texas A&M University, College Station, TX

10 – 10:30 am – Break

10:30 – 11 am

3652885: Fretting Wear and Tightness Assessment of Natural Gas Flange Sealing

Zheng Zhang, Deguo Wang, Yanbao Guo, China University of Petroleum, Beijing, China



☀ Session 3G

GREASE III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3669200: Performance Enhancement of Hybrid Bearings at Grease Lubrication

Daniel Merk, Schaeffler Technologies AG & CO. KG, Schweinfurt, Germany

8:30 – 9 am

3669341: Thermal Stability and Spectroscopic Studies of Grease Formulations Using Isothermal and Variable Heating Methods

Keith Schomburg, PerkinElmer, Magnolia, TX

9 – 9:30 am

3669351: Fully Loaded: A Study of Additive Response in Meeting NLGI's New HPM + HL Grease Specification

Joe Kaperick, Shawne Edwards-Zollar, Amanda Stone, Afton Chemical Corporation, Richmond, VA

9:30 – 10 am

3669435: Extreme Tribology (II): How to Apply to Preform Chemistry in Grease

Liwen Wei, Novitas Chem Solutions, Houston, TX

10 – 10:30 am – Break

10:30 – 11 am

3688165: Evaluation of Railway Greases in Four-Ball Tester Under Purpose-Specific Test Protocols

Fabio Alemanno, Deepak Halenahally Veeragowda, Ducom Instruments, Groningen, Netherlands

11 – 11:30 am

3687373: Role of the Grease Components on the Overall Frictional Response of a Greased Contact Subjected to Low-Sliding Velocity Conditions

Ilaria Ghezzi, Davide Tonazzi, Francesco Massi, Sapienza Università di Roma, Rome, Lazio, Italy, Michael Rovere, Cédric Le Coeur, Jeremy Chorier, SOMFY SAS, Cluses, France, Yves Berthier, University of Lyon, INSA-Lyon, CNRS, Villeurbanne, France

11:30 am – Noon

3669786: Comparative Study of the Behavior Solid Lubricants in Various Type of Lubricating Greases

Mehdi Fathi-Najafi, Jinxia Li, Nynas AB, Gothenburg, Sweden, George Diloyan, Nanotech Industrial Solutions Inc., Avenel, NJ

☀ Session 3H

TRIBOCHEMISTRY II

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3640146: Understanding the Effect of Forces on Tribochemical Reaction Rates

Wilfred Tysoe, University of Wisconsin-Milwaukee, Milwaukee, WI

8:30 – 9 am

3663351: Tribocatalysis for In-Situ Formation of Zero-Friction and Zero-Wear Lubricating Carbon Films

Diana Berman, Asghar Shirani, Kelly Jacques, University of North Texas, Denton, TX, Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD

9 – 9:30 am

3664579: Tribo-Catalytic Coatings with Self-Repair Behavior in Alkane Environment

Asghar Shirani, Yuzhe Li, Diana Berman, The University of North Texas, Denton, TX, Osman Eryilmazb, Argonne National Laboratory, Lemont, IL

9:30 – 10 am

3668938: In-Situ Formation of Carbon Tribofilms During Relative Motion of Steels in Boundary Lubrication

Tobias Martin, Arman Khan, Jannat Ahmed, Harry Wise, Shuangbiao Liu, Qian (Jane) Wang, Yip-Wah Chung, Northwestern University, Evanston, IL, Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD

10 – 10:30 am – Break

10:30 – 11 am

3675933: Effects of Cyclopropanecarboxylic Acid and Chromium on In-Situ Formation of Tribofilms on Steel Interfaces

Harry Wise, Tobias Martin, Jannat Ahmed, Arman Khan, Shuangbiao Liu, Qian (Jane) Wang, Yip-Wah Chung, Northwestern University, Evanston, IL, Stephen Berkebile, US DEVCOM ARL, Aberdeen, MD

11 – 11:30 am

3669939: What Stress Components Drive Tribofilm Formation? A Study with ZDDP

Lu Fang, Martin Webster, Robert Carpick, University of Pennsylvania, Philadelphia, PA, Spyridon Korres, ExxonMobil Research and Engineering, Clinton, NJ

11:30 am – Noon

3669356: Reactive Molecular Dynamics Simulations of Thermal and Shear Driven Tribopolymerization

Fakhrul Hasan Bhuiyan, Ashlie Martini, University of California, Merced, Merced, CA, Seong Han Kim, Pennsylvania State University, University Park, PA

☀ Session 3I

BIOTRIBOLOGY III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3669318: Fragile Biological Interfaces

Angela Pitenis, Dixon Atkins, Jonah Rosas, Allison Chau, Yen-Tsung Chen, University of California, Santa Barbara, Santa Barbara, CA

8:30 – 9 am

3645834: Tuning Polymer Architecture at the Hydrogel Surface to Impact Lubricity

Allison Chau, Patrick Getty, Christopher Bates, Craig Hawker, Angela Pitenis, University of California, Santa Barbara, Santa Barbara, CA

9 – 9:30 am

3667643: Biomimicking Hydrogel 'Skin' Layer Dimensions Controlled by Composition

Alison Dunn, Christopher Johnson, Md Mahmudul Hasan, University of Illinois at Urbana-Champaign, Urbana, IL

9:30 – 10 am

3663679: Superficial Modulus, Water Content, and Mesh-Size at Hydrogel Surfaces

W. Gregory Sawyer, Research Institute of Industrial Science and Technology, Gainesville, FL, Brent Sumerlin, University of Florida, Gainesville, FL

10 – 10:30 am – Break

10:30 – 11 am

3667573: The Role of Surface Roughness in Mediating Tissue Homeostasis

Jonah Rosas, Yen-Tsung Chen, Ricardo Espinosa-Lima, Rachel Bae, Allison Chau, Dixon Atkins, Samantha Chan, Angela Pitenis, University of California, Santa Barbara, Santa Barbara, CA

11 – 11:30 am

3667604: Transcriptomics Analysis of Breast Epithelia in the Tissue-Implant Interface

Dixon Atkins, Angela Pitenis, Jonah Rosas, Allison Chau, Yen-Tsung Chen, Samantha Chan, Rachel Bae, Daniela Semaan, University of California, Santa Barbara, Santa Barbara, CA

11:30 am – Noon

3668797: Investigating the Mechanical Properties of Unilamellar Vesicles Using NSE and SANS

Tooba Shoaib, Ronger Huang, Changwoo Do, Wei-Ren Chen, Oak Ridge National Laboratory, Knoxville, TN

☀ Session 3J

WEAR III

Session Chair: TBD

Session Vice Chair: TBD

Session Starts at 8:30 am

8:30 – 9 am

3645819: Investigate Wear Transition of CoCrMo Alloy after the Heat Treatment

Jiahui Qi, The University of Sheffield, Sheffield, United Kingdom

9 – 9:30 am

3665129: Tribological Behavior of Electrical Connector Coatings Under Reciprocating Motion

Na Tyrer, Gary Barber, Fan Yang, Bingxu Wang, Bo Pang, Oakland University, Rochester, MI

9:30 – 10 am

3669504: Modeling the Abrasive Wear Using Discrete Element Method

Muhammad Sameer, C. Fred Higgs III, Rice University, Houston, TX

10 – 10:30 am – Break

10:30 – 11 am

3668913: Tribological Behavior of PEEK and PLA-Based Composites in Different Tribological Environments

Surojit Gupta, Sabah Javaid, Caleb Matzke, University of North Dakota, Grand Forks, ND

11 – 11:30 am

3648353: Elevated Temperature Fretting Wear Study of Additively Manufactured 17-4 PH Stainless Steel

Manisha Tripathy, Ali Beheshti, George Mason University, Fairfax, VA, Pooriya Nezhadfar, Nima Shamsaei, Auburn University, Auburn, AL, Keivan Davami, The University of Alabama, Tuscaloosa, AL

11:30 am – Noon

3652075: Stress Activates Wear at Multi-Asperity Interfaces

Cyrian Leriche, Bart Weber, Steve Franklin, ARCNL, Dlemen, Noord-Holland, Netherlands

☀ Session 3K

CONTACT MECHANICS I

Session Chair: TBD

Session Vice Chair: TBD

Session starts at 8:30 am

8:30 – 9 am

3669135: Energy Dissipation as a Tool to Quantify Three Different Friction Models

Iyabo Lawal, The University of Texas at Austin, Austin, TX, Matthew Brake, William Marsh, Rice University, Houston, TX

9 – 9:30 am

3669362: Plane Elastic Cylindrical Line Contact Theory and Comparison to Finite Element Predictions

Chiraag Samal, Robert Jackson, Auburn University, Auburn, AL

9:30 – 10 am

3668826: Contacting Asperity of a Surface

Shuangbiao Liu, Nicole Dorcy, Qian (Jane) Wang, Yip-Wah Chung, Northwestern University, Evanston, IL; Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD

10 – 10:30 am – Break

10:30 – 11 am

3644301: Combined Numerical and Experimental Approach for Scuffing Prediction in Aeronautical Power Transmission

Nicolas Grenet – de Bechillon, Fabrice Ville, Jérôme Cavoret, LaMCoS, Villeurbanne, France, Thomas Touret, Christophe Changenet, LabECAM, Lyon, France, Dhafer Ghribi, Safran Transmission Systems, Colombes, France

11 – 11:30 am

3667928: Elevated Temperature Contact Creep and Friction of Nickel-Based Inconel 617 Superalloy: Indentation Experiments and Finite Element Analysis

Ali Beheshti, Sepehr Salari, Farnaz Behnia, George Mason University, Fairfax, VA, Md Saifur Rahman, ATSP Innovations, Houston, TX, Andreas Polycarpou, Texas A&M University, College Station, TX

☀ Session 3L

GEARS I

Session Chair: Jeffrey Ewin, Naval Air Warfare Center, Patuxent River, MD

Session Vice Chair: Pinzhi Liu, ExxonMobil Research and Engineering, Annandale, NJ

8 – 8:30 am

3637554: Effects on the Wear and Micro-Pitting Behavior of Nitrided External and Internal Gears

Michael Geitner, Bernd Zornek, Thomas Tobie, Karsten Stahl, Gear Research Center (FZG), Technical University of Munich, Garching bei München, Germany, Stefanie Hoja, Leibniz Institute for Materials Engineering (IWT), Bremen, Germany

8:30 – 9 am

3642844: Dynamic Seals for Future Industrial Gear Products

Paul Norris, Andrew Gant, Afton Chemical Corporation, Bracknell, Berkshire, United Kingdom, Arturo Carranza, Grant Pollard, Joseph Remias, Afton Chemical Corporation, Richmond, VA

9 – 10 am – Invited Talk

10 – 10:30 am – Break



☀ Session 3L

10:30 – 11 am

3644372: On the Transition Between Micropitting and Pitting Damage in Rolling-Sliding Rough Surface Contacts

Benjamin Wainwright, Amir Kadiric, Imperial College London, London, United Kingdom

11 – 11:30 am

3651997: Effect of Lubricant Viscosity on Dynamics of High-Precision Gear Considering Lubricant-Induced Backlash Reduction Under Deterministic and Uncertain Conditions

Zhou Chen, Zhejiang University, Hangzhou, China

11:30 am – Noon – Gears Business Meeting

☀ Session 3M

ROLLING ELEMENT BEARINGS III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3649632: Grease Lubricated Steel Ball on Flat Fretting Test Results

Robert Erck, Nicholas Demas, Scott Mueller, Argonne National Laboratory, Lemont, IL

8:30 – 9 am

3658289: Improving Wear and Fatigue Resistance of Large Size Rolling Bearings by Tailored Forming

Felix Saure, Timm Coors, Yusuf Faqiri, Florian Pape, Thomas Hassel, Gerhard Poll, Leibniz University Hannover, Garbsen, Lower Saxony, Germany

9 – 9:30 am

3669297: The Effect of Transverse Vibrations on the Performance of Rolling-Sliding Lubricated Contacts

David Uribe, Amir Kadiric, Imperial College London, London, United Kingdom, Armando Felix-Quinonez, SKF, Houten, Netherlands

9:30 – 10 am

3647986: In-Situ Measurement of Bearing Load from a Field Wind Turbine Gearbox Bearing

Gary Nicholas, Ben Clarke, Tom Howard, Rob Dwyer-Joyce, University of Sheffield, Sheffield, United Kingdom, Jon Wheals, Ricardo Innovations, Leamington Spa, United Kingdom

10 – 10:30 am – Break

10:30 – 11 am

3662731: Experimental and Simulative Investigations Into the Fatigue Life of Cylindrical Roller Bearings Under Mixed Lubrication with Differently Finished Inner Rings

Lukas R uth, Flavien Foko, Bernd Sauer, Pascal Ostermayer, Bastian Blinn, Tilmann Beck, TU Kaiserslautern, Kaiserslautern, Germany

11 – 11:30 am

3668715: Investigation of Asperity Conformation Between Varied Slip Conditions During Running-In of Rolling-Sliding Contacts Under Mixed Lubrication Regime

Maruti Sai Dhiraj Sakhamuri, Terry Harvey, Robert Wood, University of Southampton, Southampton, United Kingdom, Bernd Vierendeel, Schaeffler Technologies AG & Co. KG, Schweinfurt, Germany

11:30 am – Noon

3647674: An Experimental and Analytical Investigation of Cage Pocket Lubrication

Thomas Russell, Farshid Sadeghi, Purdue University, West Lafayette, IN

☀ Session 3N

METALWORKING FLUIDS II

Session Chair: TBD

Session Vice Chair: TBD

Session starts at 9 am

9 – 9:30 am

3649866: Improve Metalworking Fluid Performance and Longevity with Sustainable Tank-Side Additives

Harish Potnis, Denis Buffiere, ANGUS Chemical Company, Mumbai, Maharashtra, India

9:30 – 10 am

3667456: Do Biofilms in Metalworking Fluid Systems Matter?

Frederick Passman, Biodeterioration Control Associates, Inc., Princeton, NJ

10 – 10:30 am – Break

10:30 – 11 am

3645159: Study and Development of Free-Biocides Metalworking Fluids

Marco Bellini, Simone Pota, Bellini SpA, Zanica, Italy

11 – 11:30 am

3668798: Investigation of Tribological Properties of Water Based Metal Removal Fluids and Lubricity Additives on Titanium Machining

Yixing Philip Zhao, Quaker Houghton Company, Conshohocken, PA

11:30 am – Noon

3667018: A Novel Approach to Understanding Metalworking Fluid Distribution on Machined Surfaces

Michael Jones, Eleanor Riches, Gordon Jones, Caitlyn Da Costa, Jeff Goshawk, Waters Corporation, Wilmslow, United Kingdom

☀ Session 4A

ELECTRIC VEHICLES IV

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

3667787: Improvement of Performances of Transaxle Fluids for Electric Vehicles

Hiroyuki Tatsumi, Kazushige Matsubara, Daisuke Takekawa, Keiichi Narita, Idemitsu Kosan Co., Ltd., Ichihara-shi, Chiba, Japan

2:30 – 3 pm

3663017: Multi-Physics and Multi-Scale Prediction of Tribological Behaviour of Electric Powertrain

Mahdi Mohammadpour, Loughborough University, Loughborough, United Kingdom

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm – TBD

4:30 – 5 pm

3665967: Electric Vehicle Transmission Efficiency Prediction Using a Thermally Coupled Lubrication Model

Joseph Shore, Amir Kadiric, Imperial College London, London, United Kingdom

5 – 5:30 pm

3669257: Thermal Management Aspects for Hybrid & Battery Electric Vehicles

Thomas Wellmann, Kiran Govindswamy, Dean Tomazic, FEV North America, Inc., Auburn Hills, MI

☀ Session 4B

LUBRICATION FUNDAMENTALS IV – ANTIWEAR & FRICTION CONTROL

Session Chair: Nicole Doerr, AC2T Research GmbH, Wiener Neustadt, Austria

Session Vice Chair: TBD

2 – 2:30 pm

3668999: Ashless Anti-Wear Synergies with ZDDP

Brendan Miller, Robinson Flaig, Ramoun Mourhatch, Chevron Oronite Company, Richmond, CA

2:30 – 3 pm

3663146: Mechanism of Synergistic and Antagonistic Interaction Between TiO₂ and ZDDP Under Boundary Lubrication

Pranesh Aswath, Vinay Sharma, Richard Timmons, The University of Texas at Arlington, Arlington, TX, Ali Erdemir, Texas A&M University, College Station, TX

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3645381: Formation Kinetics and Mechanical Properties of ZDDP Tribofilms

Victor Kontopanos, University of Virginia, Charlottesville, VA, William Anderson, Afton Chemical Corporation, Richmond, VA

4:30 – 5 pm

3669003: Improved Friction Performance in Fresh and Aged Conditions

Brendan Miller, Robinson Flaig, Ramoun Mourhatch, Chevron Oronite Company, Richmond, CA

5 – 5:30 pm

3647257: Pushing the Ultra-Low Viscosity Limit for Heavy Duty Diesel Engine Oil Beyond 0W-20

Gwenaelle Philibert, Oluwaseyi Ogunsola, Jason Brown, Matthew Urbanak, Sarah Remmert, Shell Global Solutions (US) Inc., Houston, TX

☀ Session 4C

COMMERCIAL MARKETING FORUM IV

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

The Lubrizol Corporation

2:30 – 3 pm

Clariant Corporation

3 – 4 pm – Exhibitor Appreciation Break

☀ Session 4D

TRIBOTESTING IV

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

3668929: Tribological Performance of Al₂O₃-B₂O₃ Composites: Role of CuO and CaO Constituents

Ashish Kasar, Brian D'Souza, Kevin Watson, Pradeep Menezes, University of Nevada, Reno, Reno, NV

2:30 – 3 pm

3668952: Improvement in Tribological Performance of Plastic Oil by Incorporating Solid Lubricant Additives

Soumya Sikdar, Md Hafizur Rahman, Pradeep Menezes, University of Nevada, Reno, Reno, NV

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3669397: Investigation of the Use of Demulsifier to Manage Gas-Phase-Synthesized Graphene Separation in Base Oils

Gordon Krauss, Albert Dato, Ethan Carroll, Max Castro, Harvey Mudd College, Claremont, CA, Matthew Siniawski, Loyola Marymount University, Los Angeles, CA

4:30 – 5 pm

3668944: Tribological Properties of Porous Aluminum Borate Composite Infiltrated With Liquid Lubricants

Ashish Kasar, Brian D'Souza, Md Hafizur Rahman, Pradeep Menezes, University of Nevada, Reno, Reno, NV

5 – 5:30 pm

3669514: Assessment of Wear-Corrosion in a Controlled Testing Environment

Carlos Sanchez, Southwest Research Institute, San Antonio, TX, Jeremy Moloney, Alex Koerner, Champion X, Houston, TX

5:30 – 6 pm – Tribotesting Business Meeting



☀ Session 4E

NANOTRIBOLOGY I

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

3675453: Time Dependent Analysis of the Thermal Oscillations of AFM Cantilevers During Force Spectroscopy Measurements

Philip Egberts, Zahra Aboolizadeh, University of Calgary, Calgary, Alberta, Canada, Johanna Blass, Guenther Kraemer, Roland Bennewitz, INM-Leibniz Institute for New Materials, Saarbruecken, Saarland, Germany

2:30 – 3 pm

3669446: Adhesion, Friction, and Wear Mechanisms in Si Tip and Si Substrate Indentation and Sliding

Judith Harrison, US Naval Academy, Annapolis, MD, Zachary Milne, Sandia National Laboratories, Albuquerque, NM, Robert Carpick, University of Pennsylvania, Philadelphia, PA, James David Schall, North Carolina AT&T University, Greensboro, NC

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3644465: In-Situ Atomic Force Microscopy Evaluation of Pressure-Induced Changes in Structural Morphology of Phosphonium Phosphate Ionic Liquids

Filippo Mangolini, Zixuan Li, Oscar Morales-Collazo, Robert Chrostowski, Joan Brennecke, The University of Texas at Austin, Austin, TX

4:30 – 5 pm

3637797: Surface-Grafted Poly(Ionic Liquid) That Lubricates in Both Polar and Non-Polar Solvents

David Burgess, Zhenyu Jason Zhang, Peter Fryer, University of Birmingham, Birmingham, United Kingdom, Ian McRobbie, Jacqueline Reid, Innospec, Ellesmere Port, United Kingdom

5 – 5:30 pm

3669366: Reviewing the Thermal Conductivity Benefits of Dispersed Nano Particles in Lubricants for EVs and Other Applications

Todd Cawley, LSI Chemical, Mount Gilead, OH

5:30 – 6 pm – Nanotribology Business Meeting

☀ Session 4H

TRIBOCHEMISTRY III

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

3638908: Anomalous Friction and Wear Behavior of Hydrocarbon Oils on Precipitation-Hardened Steels

Andrew Clough, Peter Frantz, Edith Leung, Stephen Didziulis, The Aerospace Corporation, Culver City, CA

2:30 – 3 pm

3668863: Tribocorrosion of Wrought and AM Stainless Steels: Understanding and Overcoming Wear-Enhanced Corrosion

Mary Parker, Christopher Chervin, Andrew Birnbaum, Anna Rawlings, John Steuben, Kathryn Wahl, Derek Horton, US Naval Research Laboratory, Alexandria, VA

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3645982: On the Lubricity Mechanism of Carbon-Based Nanofluid Fuels

Frank Hong, Haoyi Wang, Nawaf Alghamdi, S. Mani Sarathy, Kaust, Thuwal, Makkah, Saudi Arabia

4:30 – 5 pm

3669252: Modelling the Mechanochemistry of Lubricant Additives: A ReaxFF Investigation of Phosphate Esters Confined Between Sliding Iron Surfaces

Carlos Ayestaran Latorre, Hugh Spikes, Daniele Dini, James Ewen, Imperial College London, London, United Kingdom, Joseph Remias, Afton Chemical Corporation, Richmond, VA

5 – 5:30 pm

3647041: Interfacial Bonding Controls Friction in Diamond-Rock Contacts

Jagjevan Bhamra, James Ewen, Daniele Dini, Imperial College London, London, United Kingdom, John Bomidi, Marc Bird, Baker Hughes, The Woodlands, TX

☀ Session 4I

BIOTRIBOLOGY IV

Session Chair: TBD

Session Vice Chair: TBD

Session Information TBD

☀ Session 4J

WEAR IV

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

3668811: Multi-Scale Wear of Helical Gear Pairs

Jack Walker, Mahdi Mohammadpour, Stephanos Theodossiades, Loughborough University, Loughborough, United Kingdom, Stephen Bewsher, Guenter Offner, Hemant Bansal, Michael Leighton, Michael Braunstingl, Heinz-Georg Flesch, AVL List GmbH, Graz, Austria

2:30 – 3 pm

3644953: Detection of Micropitting Initiation Using Acoustic Emission and Electrostatic Sensing Techniques

Zaihao Tian, Shuncai Wang, Robert Wood, University of Southampton, Southampton, Hampshire, United Kingdom; Daniel Merk, Schaeffler Technologies AG & Co. KG, Schweinfurt, Germany

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3641733: On the Mechanism of Abrasion

Kenneth Budinski, Bud Labs, Rochester, NY

4:30 – 5 pm

3690593: Enhanced Wear Performance of Lubricants with a Balanced Holistic Approach

Hong Gao, Shell, Houston, TX

5 – 5:30 pm – TBD

5:30 – 6 pm – Wear Business Meeting

☀ Session 4K

CONTACT MECHANICS II

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

3669314: Under the Surface: Observing Subsurface Response Using 2D DIC

Kyle Schulze, Auburn University, Auburn, AL, Alexander McGhee, University of Wisconsin-Madison, Madison, WI, Eric McGhee, University of Florida, Gainesville, FL

2:30 – 3 pm

3668777: Controlling Dry Adhesion Through Multi-Scale Surface Texturing via Grayscale Lithography

Luke Thimons, Arushi Pradhan, Tevis Jacobs, University of Pittsburgh, Pittsburgh, PA, Nickolay Lavrik, Ivan Kravchenko, Oak Ridge National Laboratory, Oak Ridge, TN

3 – 4 pm – Exhibitor Appreciation Break

4 – 5 pm – Contact Mechanics Business Meeting

☀ Session 4L

GEARS II

Session Chair: TBD

Session Vice Chair: TBD

Session Information TBD

☀ Session 4M

ROLLING ELEMENT BEARINGS IV

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

3644765: Formation Mechanisms of Dark Etching Region in Bearing Steels Due to Rolling Contact Fatigue

Mostafa El Laithy, Ling Wang, Terry Harvey, University of Southampton, Southampton, Hampshire, United Kingdom, Alexander Schwedt, Joachim Mayer, RWTH Aachen University, Aachen, Germany, Bernd Vierneusel, Schaeffler Technologies AG & Co. KG, Schweinfurt, Germany

2:30 – 3 pm

3663200: Formation of WEA/WEC: Mechanism and Driver of Premature Bearing Failure – Insight to the Damage Mechanism Within WEA/WEC Formation

Adrian Mikitisin, Central Facility for Electron Microscopy, Aachen, Germany, Florian Steinweg, Institute for Materials Applications in Mechanical Engineering, Aachen, North Rhine-Westphalia, Germany

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3647440: Change in Metal Structure by Sliding and Debris Formation Process

Kenji Matsumoto, Honda R&D Co., Ltd., Nerima-ku, Tokyo, Japan, Naoaki Yoshida, Kyushu University, Kasuga, Fukuoka, Japan, Akira Sasaki, Maintech, Yokohama, Kanagawa, Japan

4:30 – 5 pm

3659098: Analytical Investigations of the Tribological Layers in WEC Failed Specimens – Influence of the Oil Formulation

Florian Steinweg, Institute for Materials Applications in Mechanical Engineering, Aachen, North Rhine-Westphalia, Germany

4 – 6 pm

Roundtable Discussions

A scientific brainstorming and networking event is organized on the basis of discussion roundtables (DRTs) by the STLE Rolling Element Bearing Technical Committee together with other technical committees. This event aims to encourage open discussions between experts of different disciplines on various topics of interest. The format of the DRTs is very fruitful to facilitate a creative atmosphere on complex topics and to find technical impulses by brainstorming. The topics are proposed by the table hosts themselves and are based on current interests. A typical property of DRTs is the writable table cloth to inspire the discussion as well keep notes for subsequent discussions. The benefit of DRTs goes beyond the technical impulses. During the DRTs, the hosts will guide the discussion only and not give a lecture. Active participation, including experience sharing of each participant, is one of the main features of this event, providing a unique opportunity to connect and learn.

☀ Session 4N

METALWORKING FLUIDS III

Session Chair: TBD

Session Vice Chair: TBD

2 – 2:30 pm

3669258: Lubrication Behavior of Metalworking Fluids on Tribometer and in Cutting Process

Haichao Liu, Florian Pape, Lars Ellersick, Berend Denkena, Gerhard Poll, University of Hannover, Garbsen, Germany

2:30 – 3 pm

3645789: Boundary Lubricant Additive Response Comparisons on Copper Alloys Using Twist Compression Tests (TCT)

Ted McClure, Sea-Land Chemical Co. / SLC Testing Services, Westlake, OH; Alexes Morgan, Sea-Land Chemical Co., Westlake, OH

3 – 4 pm – Exhibitor Appreciation Break

4 – 4:30 pm

3669331: Optical Characterization of Metal Working Fluids (MWF) for Robust Formulations, Improved Batch Lifespan and MWF Recycling

Ravinder Elupula, Charles Nider, Formulaction, Piscataway, NJ

4:30 – 5 pm

3663177: The Application of Electrochemical Analysis in Metalworking Fluids (MWFs) Evaluation

Tian Zhang, Feng Jiang, Huaqiao University, Xiamen, Fujian, China



Wednesday, May 18, 2022

☀ Session 5A

ENGINE AND DRIVETRAIN V

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3668676: The Effect of Lubricant Choice on Valvetrain Tappet Performance

Rai Notay, William Barton, The Lubrizol Corporation, Derby, United Kingdom

8:30 – 9 am

3668832: Development of Turbocharger Bearing Systems Compatible with Low-HTHS Oils

Zachary Ashton, Raj Chandramohan, BorgWarner, Arden, NC

9 – 9:30 am

3669348: Confirmation of Radioactive Tracer Testing (RATT®) Technique

Peter Lee, Southwest Research Institute, San Antonio, TX

9:30 – 10 am

3641292: Failure Characteristics of Friction Clutches for Limited Slip Differential Application

Thomas Schneider, Katharina Völkel, Hermann Pflaum, Karsten Stahl, Technische Universität München, München, Bayern, Germany

10 – 10:30 am – Break

10:30 – 11 am

3648091: Retention of Fuel Economy Performance of Engine Oils Formulated Using Comb Polymers

JoRuetta Ellington, Peter Moore, Evonik Oil Additives USA, Inc., Horsham, PA, Thorsten Bartels, Selin Manukyan, Evonik Operations GmbH, Darmstadt, Germany, Alan Flamborg (retired), Blue Bell, PA

11 – 11:30 am

3663259: Reducing GHG Through Innovative Engine Oil Development

Jeremy Styer, Glenn Mazzamaro, Vanderbilt Chemicals, LLC, Norwalk, CT

11:30 am – Noon

3669382: Tribology By Design

Vern Wedeven, William Black, Graham Wedeven, Robert Homan, Anita Patterson, Wedeven Associates, Inc., Edgmont, PA

☀ Session 5B

LUBRICATION FUNDAMENTALS V – NEW CHEMISTRIES

Session Chair: Pranesh Aswath, The University of Texas at Arlington, Arlington, TX

Session Vice Chair: TBD

8 – 8:30 am

3669325: Microencapsulation of Lubricant Additives

Stephen Hsu, George Washington University, Germantown, MD

8:30 – 9 am

3647941: Mechanism of Low Friction of Multi-Layer Graphene in Ambient Air Condition

Hitoshi Washizu, Ryo Matsuoka, Yoshiki Ishii, University of Hyogo, Kobe, Hyogo, Japan

9 – 9:30 am

3648899: Improving Weld Load of Lubricating Oil Using Magnetic Nanoparticles and Performance Enhancing Additive

Kinjal Trivedi, P D Patel Institute of Applied Sciences, Anand, India

9:30 – 10 am

3652639: Oil-Miscible ZnS Nanoparticles as High-Performance Antiwear Additive

Chanaka Kumara, Jun Qu, Oak Ridge National Laboratory, Oak Ridge, TN, Inwoong Lyo, HongWook Lee, Hyundai Motor Corporation, Seoul, Republic of Korea

10 – 10:30 am – Break

10:30 – 11 am

3669464: On the Requirements for Tribofilms From Green Lubricants

Nicole Doerr, Serhiy Budnyk, Marcella Ferauscher, AC2T Research GmbH, Wiener Neustadt, Austria

11 – 11:30 am

3669342: Synthetic Lubricants Derived from Plastic Waste and Their Tribological Performance

Istiaque Alam, Seungjoo Lee, Ali Erdemir, Texas A&M University, College Station, TX, Ryan Hackler, Massimiliano Delferro, Argonne National Laboratory, Lemont, IL, Wang Yi-Yu, Ranjan Behera, Wenyu Huang, Aaron Sadow, Iowa State University, Ames, IA

11:30 am – Noon

3640719: Selecting Suppliers for Your Lubricants

Michael Holloway, 5th Order Industry, Highland Village, TX

☀ Session 5C

COMMERCIAL MARKETING FORUM V

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am – Open Slot

8:30 – 9 am – Open Slot

9 – 9:30 am

3648488: SEQENS: Introducing LOSMA® CARB M, A New Multifunctional Additive for Water-Based Metalworking Fluids

Marie Legatte, SEQENS, Porcheville, France

9:30 – 10 am

Falex Corporation

10 – 10:30 am – Break

10:30 – 11 am

The Lubrizol Corporation

11 – 11:30 am

BYK-Chemie GmbH

11:30 am – Noon – Open Slot

 Session 5D

CONDITION MONITORING I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3637642: The Assumptions of the Lubricant Supply Chain – Fact or Fiction

Michael Roe, MJR Lubricant Distribution Consulting & Auditing, Cypress, TX

8:30 – 9 am

3640176: Adjusting Oil Analysis to Quad Z Thresholds

Henry Neicamp, Polaris Laboratories LLC, O'Fallon, IL

9 – 9:30 am

3640717: How to Improve Any Lubricant Analysis Program

Michael Holloway, 5th Order Industry, Highland Village, TX

9:30 – 10 am

3644138: Electrical Impedance Spectroscopy Enabled In-Depth Lubrication Condition Monitoring

Min Yu, Jie Zhang, Thomas Kirkby, Tom Reddyhoff, Imperial College London, London, United Kingdom, Arndt Joedicke, Shell Global Solutions (Deutschland) GmbH, Hamburg, Germany

10 – 10:30 am – Break

10:30 – 11 am

3646654: A Novel Method for Bearing Fault Diagnosis Based on High-Frequency Resonance Technique and Cepstrum Pre-Whitening

Amirmasoud Kiakojouri, Ling Wang, Honor Powrie, University of Southampton, Southampton, United Kingdom, Zudi Lu, Southampton Statistical Sciences Research Institute (S3RI), School of Mathematical Sciences, University of Southampton, Southampton, United Kingdom, Patrick Mirring, Schaeffler Aerospace, Schweinfurt, Germany

11 – 11:30 am

3648688: Advances in the Analysis of New and Used Lubricating Oils by High-Resolution ICP-OES

Siqi Sun, Analytik Jena US LLC, Beverly, MA

11:30 am – Noon

3662738: Combining Tribological Properties with Analytical Sciences for Condition Monitoring

Ameneh Schneider, Optimol Instruments, München, Germany, Mathias Woydt, Matrilub, Berlin, Germany, Franz Novotny-Farkas, Ingenieurbüro für Erdölwesen, Schwechat, Austria

 Session 5E

NANOTRIBOLOGY II

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3637644: Nanotribology in Dynamic Crosslinked Polymers: Experiments and Simulations

Zhijiang Ye, Nethmi De Alwis Watuthantrige, Mehdi Zanjani, Dominik Konkolewicz, Miami University, Oxford, OH, Jian Wu, Harbin Institute of Technology, Weihai, China

8:30 – 9 am

3668235: Squeezing Behaviors of Octamethylcyclotetrasiloxane (OMCTS) Under Extreme Compression

Gunan Zhang, Rong-Guang Xu, Yongsheng Leng, George Washington University, Washington, DC

9 – 9:30 am

3668526: Friction Simulation of a Polycrystalline Platinum Tip on a Gold(111) Surface

Rong-Guang Xu, Gunan Zhang, Yuan Xiang, Yongsheng Leng, George Washington University, Washington, DC

9:30 – 10 am

3669303: Understanding the Corrosion and Wear at Nanoscale Interface Using Machine Learning Technique

Saugat Tripathi, Ashutosh Pitkar, Ran Zhang, Miao Wang, Zhijiang Ye, Miami University, Oxford, OH

10 – 10:30 am – Break

10:30 – 11:30 am

3678670: An Atomistic Perspective on the Nanoscale Behavior of Corrosion Inhibitors and Friction Modifiers

Chiara Gattinoni, London South Bank University, London, United Kingdom

11:30 am – Noon

3647953: Molecular Dynamics Simulation of Tribology – The Influence of Porous Surfaces on Wall Slip and Bulk Shear

Seyedmajid Mehrnia, David Dexheimer, Peter Pelz, Technische Universität Darmstadt, Darmstadt, Germany

 Session 5F

WIND TURBINE TRIBOLOGY I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3648028: Investigation of Skidding in a Wind Turbine Double Row Spherical Roller Main-Bearing

Elisha de Mello, Rob Dwyer-Joyce, University of Sheffield, Rugby, United Kingdom, Edward Hart, University of Strathclyde, Glasgow, United Kingdom

8:30 – 9 am

3648275: Foaming in Wind Turbine Gearboxes: Causes, Impacts and Treatment

Michael Blumenfeld, ExxonMobil Research and Engineering, Annandale, NJ, André Doucette, Majid Morshedisadeh, Marianne Rodgers, Peder Schlanbusch, Wind Energy Institute of Canada, Tignish, Prince Edward Island, Canada, Kurt Hartlen, Andrea Williamson, Imperial Oil, Sarnia, Ontario, Canada

9 – 9:30 am

3667455: Bio-Based Ionic Liquid Additives for Ester-Based Synthetic Oils for Wind Turbine Applications

Md Hafizur Rahman, Soumya Sikdar, Pradeep Menezes, University of Nevada, Reno, Reno, NV, Ting Liu, Ashlie Martini, University of California, Merced, Merced, CA, Manish Patil, Nano Additive Technology Inc., Austin, TX, Ramesh Navaratnam, Patech Fine Chemical, Dublin, OH

9:30 – 10 am

3669444: Efficiency and Lifetime Improvement for Wind Turbines by Using Silicon-Based Additive Technology

Stefan Bill, Croda, Plainsboro, NJ

10 – 10:30 am – Break



☀ Session 5F

10:30 – 11 am

3669399: Wear Process of the Gearbox Bearing Due to the Loos of the Yellow Metal Passivator

Jorge Alarcon, Bureau Veritas, Stafford, TX

☀ Session 5G

ENVIRONMENTALLY FRIENDLY FLUIDS I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3644013: Structure-Property Relationship of Phosphonium Ionic Liquids: A Molecular Dynamics Study

Ting Liu, Pawan Panwar, Ashlie Martini, University of California, Merced, Merced, CA, Md Hafizur Rahman, Pradeep Menezes, University of Nevada, Reno, Reno, NV

8:30 – 9 am

3644791: Biomimetic Water-Based Lubricant Development: Nanoencapsulation with Liposomes

Manoj Murali, Marc Masen, Philippa Cann, Imperial College London, London, United Kingdom

9 – 9:30 am

3644879: How Low Can You Go? Esters for Arctic Applications

Jared Nelson, Emery Oleochemicals, Cincinnati, OH

9:30 – 10 am

3646093: On the Origins of Lubricity and Surface Cleanliness in Ethanol-Diesel Fuel Blends

Frank Hong, Eshan Singh, S. Mani Sarathy, Kaust, Thuwal, Makkah, Saudi Arabia

10 – 10:30 am – Break

10:30 – 11 am

3646350: Sustainable Metalworking Fluid Additives

Jeffrey Mackey, Biosynthetic Technologies, Indianapolis, IN

11 – 11:30 am

3646474: The Importance of Sustainability and Carbon Negative Footprint in the Lubricants Industry

Julie Austin, Biosynthetic Technologies, Indianapolis, IN

11:30 am – Noon

3646312: Tribological Testing of Possible Plant Oil-Based Lubricants With Environmentally Friendly Viscosity Improvers

Andrew Sakyi, University of Pretoria, Pretoria, Gauteng, South Africa

☀ Session 5H

2D MATERIALS + SUPERLUBRICITY – MATERIALS TRIBOLOGY AND NANOTRIBOLOGY III

Session Chair: TBD

Session Vice Chair: TBD

Session starts at 8:30 am

8:30 – 9 am

3647493: Tip-on-top Manipulations of Superlubric Gold Islands on Graphite: From Friction “Switches” to Contact Aging

Wai Oo, Mehmet Baykara, University of California, Merced, Merced, CA

9 – 9:30 am

3648067: Tribological Behaviour of Graphene Quantum Dots as Novel Additives for Green Lubrication

Mitjan Kalin, Irfan Nadeem, University of Ljubljana, Ljubljana, Slovenia

9:30 – 10 am

3669069: Nanoscale Tribology of 2D MXene Flakes

Eui-Sung Yoon, Prashant Pendyala, Seon Joon Kim, Korea Institute of Science and Technology, Seoul, Seoungbuk-gu, Republic of Korea

10 – 10:30 am – Break

☀ Session 5I

BIOTRIBOLOGY AT NANOSCALE I

Session Chair: Alison Dunn, University of Illinois at Urbana-Champaign, Urbana, IL

Session Vice Chair: Arzu Colak, Clarkson University, Potsdam, NY

Session starts at 8:30 am

8:30 – 9 am – TBD

9 – 9:30 am

3641261: Interfacial Friction in Hair – Hair Contacts from a Molecular Perspective

Erik Weiland, James Ewen, Stefano Angioletti-Uberti, Daniele Dini, Imperial College London, London, United Kingdom; Steven Page, Yuri Roiter, Peter König, The Procter and Gamble Company, Cincinnati, OH

9:30 – 10 am

3663676: Gel Forming Mucin Improves Lubricity Across Model Gemini Epithelial Cell Interfaces

W. Gregory Sawyer, Research Institute of Industrial Science and Technology, Gainesville, FL, Brent Sumerlin, University of Florida, Gainesville, FL

10 – 10:30 am – Break

10:30 – 11 am

3666490: Molecular Control of Tactile Sensations for Haptics and Touch

Charles Dhong, University of Delaware, Newark, DE

11 – 11:30 am

3668979: Nanostructure and Frictional Response of Charged Copolymer Gels

Rosa Espinosa-Marzal, Alexander Deptula, University of Illinois at Urbana-Champaign, Urbana, IL

11:30 am – Noon

3650757: Visualization of Hydration Layer on the Surface of Contact Lens Before and After Friction by FM-AFM

Ayaka Nakajima, Kaisei Sato, Seiya Watanabe, Shinya Sasaki, Tokyo University of Science, Tokyo, Japan

 Session 5J

MATERIALS TRIBOLOGY I

Session Chair: TBD

Session Vice Chair: TBD

8 – 9 am – Invited Speaker

9 – 9:30 am

Presentation by John Curry

9:30 – 10 am

3667647: Mitigation of Biomass Fouling by Non-Adhesion Coatings for High-Temperature Biomass Conversion

Xin He, Jim Keiser, Jun Qu, Oak Ridge National Laboratory, Oak Ridge, TN, Rick Wang, Texas A&M University, College Station, TX, Jaya Shankar, Idaho National Laboratory, Idaho Falls, ID, Jens Darsell, Aashish Rohatgi, Daniel Howe, Pacific Northwest National Laboratory, Benton County, WA

10 – 10:30 am – Break

10:30 – 11 am

3669321: Investigation of Tribological Behavior in Molten Salts for Power Plants

Xin He, Chanaka Kumara, Kevin Robb, Dino Sulejmanovic, Nidia Gallego, Jim Keiser, Jun Qu, Oak Ridge National Laboratory, Oak Ridge, TN

11 – 11:30 am

3647486: Linked Experimental Data in Tribology for Machine Learning Applications

Nikolay Garabedian, Christian Greiner, Karlsruhe Institute of Technology, Karlsruhe, Germany

11:30 am – Noon

3647295: Probing Process-Structure-Property Relationships of Ultralow Wear Plasma Enhanced Atomic Layer Deposited Nitrides

Kylie Van Meter, David Ramos, Santiago Lazarte, Brandon Krick, Florida State University, Tallahassee, FL, Md. Chowdhury, Nicholas Strandwitz, Tomas Babuska, Tomas Grejtak, Lehigh University, Bethlehem, PA, Mark Sowa, Veeco, Waltham, MA, Alexander Kozen, University of Maryland, College Park, MD

 Session 5M

ROLLING ELEMENT BEARINGS V

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3647040: Comparison of Power Losses and Temperatures Between an All-Steel and a Hybrid Cylindrical Roller Bearing for Aero-Engine Applications

Rami Kerrouche, Azzedine Dadouche, National Research Council Canada, Ottawa, Ontario, Canada, Salah Boukraa, University of Blida, Ottawa, Ontario, Canada

8:30 – 9 am

3650160: Influence of Different Manufacturing Processes on Ceramic Roller Surface Textures and Hybrid Bearing Life

Nikhil Londhe, Carl Hager, The Timken Company, Canton, OH

9 – 9:30 am

3669402: Neural Networks Apply to Main and Blade Bearing Grease Analysis

Jorge Alarcon, Bureau Veritas, Stafford, TX

9:30 – 10 am

3669420: Lunar Dust Effects on Space Mechanisms Ball Bearings for Sustained Human Lunar Operations

Samuel Howard, Christopher Dellacorte, NASA, Cleveland, OH

10 – 10:30 am – Break

10:30 – 11 am

3668947: Influence of New Emerging E-Fluids Technologies on Rolling/Sliding Contacts

Christine Matta, Aidan Kerrigan, Xiaobo Zhou, Robertina Filocomo, Roel Van der Zwaan, Muhammad Faizan Rabbani, SKF Research and Technology Development Center, Houten, Netherlands, Frank Berens, SKF Research Development Operations, Saint-Cyr-sur-Loire, France, Alberto Carlevaris, SKF Automotive Blue Lab, Airasca, Italy

11 – 11:30 am

3644061: Parasitic Currents in Electric Drive and Their Effect on Rolling Element Bearings

Azeez Abdul, SKF, Houten, Utrecht, Netherlands

11:30 am – Noon

3668719: Fatigue Life Investigations on Tailored Forming CRBs with AISI 52100 Cladding

Timm Coors, Jonas Urban, Felix Saure, Florian Pape, Gerhard Poll, Leibniz University Hannover, Garbsen, Lower Saxony, Germany

 Session 6A

ENGINE AND DRIVETRAIN VI

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3646414: Seeded Fault Experiments to Determine Unique Acoustic Emission Signatures in Diesel Engine High Pressure Fuel Pumps

Nikhil Murthy, Vincent Coburn, Jana Quan, Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD

2 – 2:30 pm

3647231: Surface Texturing of a Fuel Pump Plunger for Enhanced Tribological Performance

Henry Soewardiman, David Pickens, Blake Johnson, Yip-Wah Chung, Qian (Jane) Wang, Northwestern University, Evanston, IL, Nikhil Murthy, Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD

2:30 – 3 pm

3668801: Analysis of In-Service Coolants with ICP-OES Technology Following ASTM D6130

Anthony Palermo, PerkinElmer, Johns Creek, GA

3 – 3:30 pm – Break

3:30 – 4 pm – Engine and Drivetrain Business Meeting



☀ Session 6B

**LUBRICATION
FUNDAMENTALS VI**

Session Chair: Nicole Doerr, AC2T Research GmbH, Wiener Neustadt, Austria

Session Vice Chair: TBD

1:30 – 2 pm

3664147: Analysis of Engine Oils Using Modulated Thermogravimetric Analysis (mTGA)

James Browne, Waters TA Instruments, New Castle, DE

2 – 2:30 pm

3669388: When Ionic Liquids Meet Polar Lubricants and Hard Coatings

Jun Qu, Oak Ridge National Laboratory, Oak Ridge, TN

2:30 – 3 pm

3643608: Shear-Driven Decomposition of Organosulfur Compounds on Ferrous Surfaces

Karen Mohammadtabar, Ashlie Martini, University of California, Merced, Merced, CA, Stefan Eder, Nicole Doerr, AC2T Research GmbH, Wiener Neustadt, Austria

3 – 3:30 pm – Break

3:30 – 4 pm

3647491: Tribology of Liquid Lubricants in Inert Atmospheres

Hugh Spikes, Jie Zhang, Janet Wong, Imperial College London, London, United Kingdom

4 – 4:30 pm

3673176: Performance Review of Lubricants for Automotive Air Conditioning

Bridgett Rakestraw, CPI Fluid Engineering, Swartz Creek, MI

4:30 – 5 pm

3671816: Thermodynamic Studies and the Effect of Base Oil Chemical Structure on Refrigerant Solubility in the Development of Refrigeration Lubricants

Ian Burton, The Lubrizol Corporation, Midland, MI

5 – 5:30 pm

3691258: Anomalous Engine Oil Nitration in Stoichiometric Natural Gas Engines

Fred Girshick, Infineum USA, L.P., Linden, NJ

5:30 – 6 pm – Lubrication Fundamentals Business Meeting

☀ Session 6C

**COMMERCIAL MARKETING
FORUM VI**

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm – Open Slot

2 – 3 pm

Afton Chemical Key Drivers Seminar

☀ Session 6D

CONDITION MONITORING II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3640712: Predictive Maintenance versus Corrective Maintenance: Choosing the Right Strategy

Michael Holloway, 5th Order Industry, Highland Village, TX

2 – 2:30 pm

3666834: Development of Oil Monitoring System for Construction Machinery

Hidecki Akita, Akira Kurasako, Hitachi Construction Machinery Co., Ltd., Tsuchiura City, Ibaraki, Japan, Hisanori Kuwayama, Haruna Nagai, Mitsuhiko Honda, Hitachi Construction Machinery Co., Ltd., Koutou Ku, Tokyo, Japan

2:30 – 3 pm

3647489: The Oil Chute: Development of a Novel Thermal Stress Test Rig

Thomas Norrby, Nynas AB, Nynashamn, Sweden, Franz Novotny-Farkas, Lubex Consulting OG, Schwechat, Austria, Christoph Schneidhofer, Jasmin Pichler, AC2T Research GmbH, Wiener Neustadt, Austria

3 – 3:30 pm – Break

3:30 – 4 pm

3663833: Real-Time Multi-Parametric Oil Condition Monitoring Technology

Leonardo Mattioli, Marco Cozzolino, Denise Pezzuoli, SanChip, Wantage, United Kingdom

4 – 4:30 pm

3647003: Prevention of Electrostatic Charge Generation in Filtration of Low Conductive Oils by Surface Modification of Modern Filter Media

John Duchowski, Johannes Staudt, HYDAC FluidCare Center GmbH, Sulzbach, Saar, Germany, Stephan Leyer, University of Luxembourg, Luxembourg

4:30 – 5 pm

3667451: Combining the Characterization of Both Particles and Total Metal Content Into a Single Analysis of In-Service Lubricants

Ryan Purcell-Joiner, Autumn Wassmuth, PerkinElmer, Shelton, CT

5 – 5:30 pm

3645962: Oil Flushing: Case Studies with Challenges

Anshuman Agrawal, Minimac Systems Pvt Ltd., Pune, Maharashtra, India

5:30 – 6 pm – Condition Monitoring Business Meeting

 Session 6E

NANOTRIBOLOGY III

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3644371: Atomic-Scale Insights Into the Friction of Hydrogenated and Fluorinated Carbon: The Role of Steric Effects

Thomas Reichenbach, Leonhard Mayrhofer, Takuya Kuwahara, Michael Moseler, Gianpietro Moras, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany

2 – 2:30 pm

3644430: Triboepitaxy – Solid-Phase Silicon Homoepitaxy via Shear-Induced Amorphization and Recrystallization: Evidence From Atomistic Simulations

Gianpietro Moras, Thomas Reichenbach, Michael Moseler, Fraunhofer Institute for Mechanics of Materials IWM, Freiburg, Germany; Lars Pastewka, University of Freiburg, Freiburg, Germany

2:30 – 3 pm

3650706: Interfacial Adsorption of Additive Molecules and Reduction of Friction Coefficient in the Organic Friction Modifier-ZDDP Combination

Weiqi Shen, Tomoko Hirayama, Masato Adachi, Kyoto University, Kyoto, Japan, Yamashita Naoki, Tokyo University of Science, Chiba, Japan, Tadashi Oshio, Hideo Tsuneoka, Kazuo Tagawa, Kazuhiro Yagishita, ENEOS Corporation, Yokohama, Japan, Norifumi Yamada, High Energy Accelerator Research Organization, Tsukuba, Japan

3 – 3:30 pm – Break

 Session 6F

AI AND MACHINE LEARNING IN TRIBOLOGY I

Session Chair: TBD

Session Vice Chair: TBD

The availability of large databases of observations, for example, of the behavior of individuals on the Internet or available from continually monitoring sensors has enabled them to be analyzed to allow the correlations with various parameters (descriptors) to be obtained merely by using the large computer power currently available to test all available parameters. Testing these correlations uses conditional probabilities of a particular descriptor, or Bayesian probabilities, to assess the importance of each descriptor. As such, the computer “learns” which parameters can be used to predict future behavior and this ability of computers to seem to learn has also been dubbed “artificial intelligence,” or AI or Machine Learning (ML).

It is clear that machine learning methodologies are developing quickly and economies and industries that do not take these developments seriously will run the risk of falling behind. It is evident that there should be a role for professional societies such as STLE in the promotion and development of machine learning to the tribology community and for tribology-related industries. However, the data required to use machine learning in tribology for the discovery of new tribological materials tends to be sparse because the measurements of friction or wear, for example, are often difficult and are made under a wide range of conditions. They are often collected by industrial laboratories who may be reluctant to share their data. In addition, any data that are published in the open literature tend to be the “best” results, while the ideal machine learning database should include all data, irrespective of whether it is good or bad. The goal of this symposium is to discuss these issues and to introduce the concepts behind machine learning and its potential for rapidly designing new tribological materials. Machine learning

has already proven to be effect for establishing the key parameters for lubricious two-dimensional thin films and to design superior viscosity improvers. The symposium will have tutorial lectures on the capabilities of machine learning and how it could be used to design new materials related to tribology, followed by examples on the way that it has already been successfully used. This will be followed by a townhall-style meeting to discuss how STLE can assist the tribology community to implement machine learning tools.

 Session 6G

ENVIRONMENTALLY FRIENDLY FLUIDS II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3646269: Lubricity Improvement of Diesel Fuel With Plant Oils

Andrew Sakyi, University of Pretoria, Pretoria, Gauteng, South Africa

2 – 2:30 pm

3646679: Impact of Ionic Liquid Additive and Inorganic Fullerene-Like Tungsten Disulfide on Steel Friction and Wear Under Aqueous and Abrasive Environments

Ayesha Asif, Andreas Polycarpou, Ahmad Amiri, Texas A&M University, College Station, TX, Hyun Jo Jun, ExxonMobil, Annandale, NJ, Saifur Rehman, ATSP Innovations, Houston, TX, Yong Zheng, Applied Materials, Santa Clara, CA

2:30 – 3 pm

3646976: Sustainability in the Value Chain of Lubricants

Inga Herrmann, VSI Verband Schmierstoff-Industrie e.V., Hamburg, Germany

3 – 3:30 pm – Break

3:30 – 4 pm

3647583: Design of Environmental Acceptable Lubricants (EALs) for an Extended Life-Service

Mar Combarros, Ariadna Emeric, Gerard Cañellas, Angel Navarro, Marc Alumà, Taro Ehara, IQL, Castellgalí, Barcelona, Spain



☀ Session 6G

4 – 4:30 pm

3653611: Sulfur-Based Estolides for the Development of Anti-Wear Additives for Finished Lubricants

Marlon Lutz, Biosynthetic Technologies, Indianapolis, IN

4:30 – 5 pm

3653834: Optimizing Pour Point and Oxidation Stability in Estolides

Alex Kitchel, Biosynthetic Technologies, Indianapolis, IN

5 – 5:30 pm – Environmentally Friendly Fluids Business Meeting

☀ Session 6H

2D MATERIALS + SUPERLUBRICITY – MATERIALS TRIBOLOGY AND NANOTRIBOLOGY IV

Session Chair: TBD

Session Vice Chair: TBD

Session Information TBD

☀ Session 6I

FLUID FILM BEARINGS I

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3647913: Computational Fluid Dynamics Modeling of Direct Lubrication versus Conventional Tilting Pad Journal Bearings

Cori Watson-Kassa, Minhui He, Roger Fittro, Houston Wood, University of Virginia, Charlottesville, VA

2 – 2:30 pm

3646264: Enhancement of Lubricant Replenishment for Starved Lubrication by Laser-Induced Wettability Gradient Surface

Patrick Pat-Iam Wong, City University of Hong Kong, Kowloon, Hong Kong, Chenglong Liu, F Guo, X. Li, Qingdao University of Technology, Qingdao, China

2:30 – 3 pm

3647131: Transitional Turbulence in Thrust Bearings

Xin Deng, Cori Watson, Minhui He, Roger Fittro, Bob Rockwell, Houston Wood, University of Virginia, Charlottesville, VA

3 – 3:30 pm – Break

3:30 – 4 pm

3647907: Understanding the Mechanism of Load Capacity in Centrally Pivoted Thrust Bearings

Cori Watson-Kassa, Minhui He, Roger Fittro, Houston Wood, University of Virginia, Charlottesville, VA

4 – 4:30 pm

3669447: An Experimental Investigation of the Load Capacity of Thrust Wave Bearings

Ahmed Paridie, Nicoleta Ene, Florin Dimofte, University of Toledo, Toledo, OH

4:30 – 5 pm

3651697: Computational Fluid Dynamic Study of Fluid Film Tiling-Pad Journal Bearings: Influence of Supply Geometry on Groove Flow

Zihao Huang, Cori Watson-Kassa, Minhui He, Chris Goynes, University of Virginia, Charlottesville, VA

5 – 5:30 pm

3669229: Influence of the Lubricant Rheology and Thermal Effects on the Design of Journal Bearings

Diego Sacomori, Murillo Santana, Nidec Global Appliance, Joinville, Brazil

5:30 – 6 pm – Fluid Film Bearings Business Meeting

☀ Session 6J

MATERIALS TRIBOLOGY II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3668172: Tribological Evaluation of Metal Particle Filled Fluoropolymer Against Different Counter Surfaces

Faysal Haque, Sifat Ullah, Mark Sidebottom, Robin Bridges, Miami University, Oxford, OH

2 – 2:30 pm

3668986: Effects of Metal-Oxide Fillers on Dry Sliding Wear of Novel PTFE Nanocomposites

Quang (Mark) Pham, Brenden Miller, Harman Khare, Gonzaga University, Spokane, WA

2:30 – 3 pm

3669440: The Effects of Processing Conditions on the Wear of PTFE-PEEK Composites

Kylie Van Meter, David Ramos, Brandon Krick, Florida State University, Tallahassee, FL, Christopher Junk, CJ Ideas, LLC, Wilmington, DE, Tomas Babuska, Kasey Campbell, Lehigh University, Bethlehem, PA

3 – 3:30 pm – Break

3:30 – 4 pm

3666393: Investigation of Surface Finish and Applied Force on the Tribological Performance of Graphite-Filled Polyimides

Sarah Herbruck, Faysal Haque, Sifat Ullah, Mark Sidebottom, Miami University, Oxford, OH, Edwin Goyzueta, Jennifer Vail, DuPont Company, Wilmington, DE

4 – 4:30 pm

3667368: Tribological Study of Advanced ATSP- and PEEK-Based Polymer Coatings for Moon and Mars Applications

Kian Bashandeh, Vasilis Tsigkis, Andreas Polycarpou, Texas A&M University, College Station, TX, Pixiang Lan, ATSP Innovations, Houston, TX

4:30 – 5 pm

3648047: Hard Coatings in Elastohydrodynamically Lubricated Contacts with Engineering Plastics

Stefan Reitschuster, Enzo Maier, Thomas Lohner, Karsten Stahl, Chair of Machine Elements – Technical University of Munich, Garching, Germany

5 – 5:30 pm – Materials Tribology Business Meeting

Wednesday, May 18

☀ Session 6M

ROLLING ELEMENT BEARINGS VI

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3648438: Condition Monitoring of Rolling Element Bearing Having Defect at Outer Trace Using Machine Learning

Pallavi Khaire, Vikas Phalle, Veermata Jijabai Technological Institute, Mumbai, Maharashtra, India

2 – 2:30 pm

3669182: Numerical Investigations Towards Friction-Optimized Design of Microdimple-Textured Surfaces for Tapered Roller Bearing Flange Surfaces

Josephine Kelley, Norbert Bader, Florian Pape, Gerhard Poll, Leibniz University Hannover, Garbsen, Germany

2:30 – 3 pm

3650178: Tribological Prospects and Progress for NiTi Bearings for Aerospace Applications

Christopher Dellacorte, Samuel Howard, NASA, Cleveland, OH

3 – 3:30 pm – Break

3:30 – 4 pm

3662736: The Use of Coatings to Improve Bearings Performance and Reliability

Esteban Broitman, SKF B.V., Houten, Netherlands

4 – 4:30 pm

3669073: Feasibility Study of Dynamic and Electrical Performance as a Combined Generator Module Mounted on Ball Bearing

Wonil Kwak, Yongbok Lee, Korea Institute of Science and Technology, Seoul, Republic of Korea

4:30 – 5 pm

3669395: Innovative Bearing Solutions for Electric Current Protection in E-mobility Applications

Jitesh Modi, Schaeffler Group USA, Troy, MI

5 – 5:30 pm – Rolling Element Bearings Business Meeting

Thursday, May 19, 2022

☀ Session 7A

NONFERROUS METALS I

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3663048: Hybrid Formulation Impact on Copper Corrosion

Arturo Carranza, David Edwards, Joseph Remias, Huifang Shao, Brian Sears, Jose Montenegro, Afton Chemical Corporation, Richmond, VA

8:30 – 9 am

3663820: Stability of Emulsions for Aluminum Hot Rolling

Ariane Viat, Constellium Technology Center, Voreppe Cedex, France

9 – 9:30 am

3668803: Investigation of Lubricity Performance of Self Emulsifying Lubricant for Aluminum MWF by Using Molecular Modelling

Ronald Hoogendoorn, Ramesh Navaratnam, Patech Fine Chemical, Dublin, OH

9:30 – 10 am

3668860: An Experimental Method for Comparing Relative Tendencies of Cold Rolling Base Oils to Generate VOCs

James Anglin, Allegheny Petroleum Products Company, Monroeville, PA

10 – 10:30 am – Break

10:30 – 11 am

3669196: Nuclear Magnetic Resonance Spectroscopy as a Useful Tool for Estimating Formulation Variations of Emulsions Used for Aluminum Hot Rolling

Josef Leimhofer, AMAG Rolling GmbH, Ranshofen, Austria

11 – 11:30 am

3669414: In Aluminum Rolling What Are the Effects on Surface Quality

Andrea Knopp, Constellium, Ravenswood, WV

11:30 am – Noon

3644040: Field Performance Simulation Pilot Mill Testing for Aluminum Hot Rolling Oils

Thomas Oleksiak, Ze Feng, Bas Smeulders, Michiel van Breemen, Pablo Bakermans, Wim Filemon, Zhiming Ma, Kai Ye, Peter DeBruyne, Wenbing Jiang, Quaker Houghton, Oswego, IL

☀ Session 7B

LUBRICATION FUNDAMENTALS VII – MEASUREMENT

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3669357: The Measurement of Tribofilm Formation Using a Combination of Visible and Infrared Light

Matthew Smeeth, Clive Hamer, PCS Instruments, London, United Kingdom

8:30 – 9 am

3664409: In-Situ Chemical Characterization of Degraded Lubricant During Rubbing

Bastien Bolle, Janet Wong, Pavlos Aleiferis, Imperial College London, London, United Kingdom

9 – 9:30 am

3647567: Study of Tribological Contact Condition Using the Non-Linear Behaviour of Longitudinal Ultrasonic Waves

Saeid Taghizadeh, Rob Dwyer-Joyce, University of Sheffield, Sheffield, United Kingdom

9:30 – 10 am

3669413: The Effect of Surface Structure on Friction and Film Thickness in Running-In Phase

Petr Sperka, Ivan Krupka, Martin Hartl, Brno University of Technology, Brno, Czechia

10 – 10:30 am – Break

10:30 – 11 am

3688903: Traction, Stribeck and Scuffing Characteristics of Lubricants in Rolling-Sliding Contacts Using Twin Disc

Debdutt Patro, Sravan Josyula, Harish Prasanna, Deepak Halenahally Veeregowda, Ducom Instruments, Bangalore, India



☀ Session 7B

11 – 11:30 am

3646586: Novel Test Methods for Electric Transmission Fluid Development

Yungwan Kwak, Afton Chemical Corporation, Richmond, VA

11:30 am – Noon

3665915: Structural Analysis of PFPE and MAC Space Lubricants

Gordon Jones, David Douce, Waters Corporation, Wilmslow, Cheshire, United Kingdom, Michael Buttery, Rachel Bingley, European Space Tribology Laboratory, Warrington, United Kingdom

☀ Session 7D

CONDITION MONITORING III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3669144: Condition Monitoring Method for Oxidation of Biodegradable Hydraulic Oils

Tomomi Honda, University of Fukui, Fukui, Japan

8:30 – 9 am

3669267: Ageing and Reconditioning of Gearbox Oils: The Tribological Perspective

Arnaud Ruellan, Aldara Naveira-Suarez, SKF Group, Gothenburg, Sweden

9 – 9:30 am

3669316: By Lubes

Antonio Lopes, Axel Royal LLC, Panama City, Panamá

9:30 – 10 am

3669322: A Novel Technique Combining Automated Liquid Particle Counting and Elemental Analysis by ICP-OES

Keith Schomburg, PerkinElmer, Magnolia, TX

10 – 10:30 am – Break

10:30 – 11 am

3670334: Improved Oil Condition Monitoring of Industrial Lubricating Oils

Ruediger Krethe, OilDoc GmbH, Brannenburg, Germany

11 – 11:30 am

3678842: A Novel Homogenizing ICP Sample Introduction Approach

Steven Twining, Elemental Scientific, Inc., Navasota, TX

11:30 am – Noon

3671792: Determination of Nitrite Levels in Engine Coolant by UV/Vis Spectroscopy

Nicholas Lancaster, PerkinElmer, High Wycombe, Buckinghamshire, United Kingdom

☀ Session 7E

NANOTRIBOLOGY IV

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3649988: Evaluating Fuel Lubricant Additives – Relating the Nano to the Macro Scales

David Burgess, Zhenyu Jason Zhang, Peter Fryer, University of Birmingham, Birmingham, United Kingdom, Jacqueline Reid, Ian McRobbie, Innospec, Ellesmere Port, United Kingdom

8:30 – 9 am

3645202: Nanoscale Frictional Behavior on Electrochemically Corroded Hard Carbon-Based Film: Roles of Surface Topography and Vapor Environment

Chen Xiao, Fiona Elam, Feng-Chun Hsia, Bart Weber, Steve Franklin, Advanced Research Center for Nanolithography, Amsterdam, Netherlands

9 – 9:30 am

3646121: In-Situ Observation of ZDDP Tribofilm Growth by Changing Surface Morphology Using Atomic Force Microscopy

Kaisei Sato, Seiya Watanabe, Shinya Sasaki, Tokyo University of Science, Tokyo, Japan

9:30 – 10 am

3646517: Sintered Tribofilm Growth as a Function of Steel Substrate Microstructure

Steven Thrush, US Army DEVCOM GVSC, Warren, MI

10 – 10:30 am – Break

10:30 – 11 am

3678885: A Study on the Formation and Characterization of Tribofilms Derived from Inorganic Nanoparticles in Boundary Lubricated Sliding Contact

Kora Farokhzadeh, Steve Papanicolaou, Bruker Nano Surfaces, San Jose, CA, Ian Armstrong, Bruker, Santa Barbara, CA, Steve Shaffer, Shaffer Tribology Consulting, San Jose, CA

11 – 11:30 am

3653280: Tribology of Plasma Functionalized CaCO₃ Nanoparticles in the Presence of Thiophosphate Antiwear Additives

Pranesh Aswath, Kimaya Vyavhare, Richard Timmons, The University of Texas at Arlington, Arlington, TX, Ali Erdemir, Texas A&M University, College Station

11:30 am – Noon

3647872: Presentation TBD

Pranjal Nautiyal, Robert Carpick, University of Pennsylvania, Philadelphia, PA

☀ Session 7G

ENVIRONMENTALLY FRIENDLY FLUIDS III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3658516: Blending with Sustainable Base Oils and Other Oils to Achieve Biodegradable Finished Lubricants: A Little Bit Goes a Long Way!

Michael Woodfall, Biosynthetic Technologies, Indianapolis, IN

8:30 – 9 am

3664256: Science & Technology of Next-Generation Fuels & Lubricant Additives

Prem Pal, REDA Chemicals, Edmonton, Alberta, Canada

9 – 9:30 am

3658810: HX-1-Approved Biobased Hydraulic Fluids

Mark Miller, Biosynthetic Technologies, Indianapolis, IN

9:30 – 10 am

3664549: Breaking the Viscosity Ceiling: Development of Readily Biodegradable High Viscosity EAL Synthetic Base Fluids

Ramesh Navaratnam, Patech Fine Chemical, Dublin, OH

10 – 10:30 am – Break

10:30 – 11 am

3658832: Innovations and Regulations for Biobased and Sustainable Lubricants and Additives

Mark Miller, Biosynthetic Technologies, Indianapolis, IN

11 – 11:30 am

3668828: Feasibility of Bio-Lubricants Under Mixed Lubrication Conditions

Sam Davison, University of Sheffield, Sheffield, South Yorkshire, United Kingdom

☀ Session 7H

SYNTHETIC LUBRICANTS AND HYDRAULICS I

Session Chair: Ryan Fenton, BASF Corporation, Tarrytown, NY

Session Vice Chair: Lauren Huffman, Dow Chemical, Midland, MI

8 – 8:30 am

3668716: High VI Industrial Lubricants and Their Impact on Equipment Efficiency

Ricardo Gomes, Frank-Olaf Maehling, Thorsten Bartels, Lucas Voigt, Phil Hutchinson, Evonik Oil Additives, Horsham, PA

8:30 – 9 am

3668356: Modeling the Effect of Polymer Structure and Chemistry on Viscosity Index, Thickening Efficiency, and Traction Coefficient

Pawan Panwar, Ashlie Martini, University of California, Merced, Merced, CA, Emily Schweissinger, Stefan Maier, Stefan Hilf, Sofia Sirak, Evonik Industries, Hanau, Germany

9 – 9:30 am

3644828: Quantifying Wet Brake Chatter Using Accelerometers

Michael Botkin, Caroline Mueller, Southwest Research Institute, San Antonio, TX

9:30 – 10 am

3648474: VI Improvers for Energy Efficient Compressor Oils

Justin Kontra, Frank-Olaf Maehling, Lucas Voigt, Bin Xu, Evonik Oil Additives, Horsham, PA

10 – 10:30 am – Break

10:30 – 11 am

3670950: Metallocene Catalysts on Ethylene Propylene Oligomer as Synthetic Base Oil and Viscosity Modifier

Dianta Ginting, DL Chemical, Daejeon, Yuseung Gu, Republic of Korea

11 – 11:30 am

3667495: High Viscosity Index Tractor Hydraulic Fluids that Meet Multiple OEM Specifications

Durga Prasad Chalasani, Ricardo Gomes, Justin Langston, Frank-Olaf Maehling, Evonik Oil Additives, Horsham, PA

11:30 am – Noon

3670662: Development of a New Fuel Efficient, Shear Stable Axle Lubricant to Meet New US GHG Requirements

Arjun Goyal, BASF Corporation, Florham Park, NJ

☀ Session 7I

FLUID FILM BEARINGS II

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3668712: Simulation of the Dynamic Force and Torque Characteristics of Annular Gaps – Rotordynamic Relevance of the Tilt and Moment Coefficients

Maximilian Kuhr, Peter Pelz, Technische Universität Darmstadt, Darmstadt, Hessen, Germany

8:30 – 9 am

3668648: Identification of the Dynamic Force and Torque Characteristic of Annular Gaps

Maximilian Kuhr, Peter Pelz, Technische Universität Darmstadt, Darmstadt, Hessen, Germany

9 – 9:30 am

3663212: A Bayesian Approach for Shaft Centre Localization in Journal Bearings

Christopher Lindley, Scott Beamish, Rob Dwyer-Joyce, Nikolaos Dervilis, Keith Worden, The University of Sheffield, Sheffield, United Kingdom

9:30 – 10 am

3642865: Measuring Oil Films in Dynamically Loaded Journal Bearings

Scott Beamish, Rob Dwyer-Joyce, University of Sheffield, Sheffield, United Kingdom

10 – 10:30 am – Break

10:30 – 11 am

3668808: CAPM – A New Model for Design of Media-Lubricated Journal Bearings Under Turbulent and Laminar Flow Conditions

Robin Robrecht, Peter Pelz, Technische Universität Darmstadt, Darmstadt, Hessen, Germany

11 – 11:30 am

3669020: Hybrid Fluid Film Bearings for Liquid Rocket Engine Turbopumps: Test Rig Development and Performance Prediction

Keun Ryu, Kyuman Kim, Howon Yi, Chanwoo Lee, Hyunsung Jung, Homin Lim, Seki Sin, Seungcho Choi, Junwon Heo, Minsoo Wee, Hanyang University, Ansan, Gyeonggi-do, Republic of Korea

11:30 am – Noon

3639364: Non-Newtonian Couple-Stress Squeeze Film Behaviour Between Oscillating Anisotropic Porous Circular Discs with Sealed Boundary

Benyebka Bou-Said, INSA Lyon, Villeurbanne, France, Mustapha Lahmar, Bilal Boussaha, Guelma University, Guelma, Algeria

☀ Session 7J

MATERIALS TRIBOLOGY III

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3645630: Experimental and Numerical Study of the Friction of Carbon Fiber Tows

Noel Brunetiere, Kiran Bhantrakuppe Narayanappa, Olga Smerdova, CNRS, Universite Poitiers, ISAE-ENSMA, Chasseneuil du Poitou, France

8:30 – 9 am

3663350: Comparison of Scuffing and Wear of Hard Materials in Four Low-Lubricity Fuels

Stephen Berkebile, Monica Ferrera, Nikhil Murthy, US DEVCOM ARL, Aberdeen Proving Ground, MD, Kelly Jacques, Maddox Dockins, Euan Cairns, Aditya Ayyagari, Diana Berman, Samir Aouadi, Andrey Voevodin, The University of North Texas, Denton, TX, Auezhan Amanov, Ruslan Karimbaev, Sun Moon University, Asan, Republic of Korea

9 – 9:30 am

3668923: Investigation of the Evolution in Chemistry and Physical Steel Contacts During the Scuffing Process

Kelly Jacques, Andrey Voevodin, Samir Aouadi, Thomas Scharf, Diana Berman, The University of North Texas, Denton, TX, Rose Pesce-Rodriguez, Stephen Berkebile, US DEVCOM ARL, Aberdeen, MD

9:30 – 10 am

3644063: High-Throughput Investigation of a High Strength Additively Manufactured Multi-Principal Element Alloy

Morgan Jones, Irene Beyerlein, University of California, Santa Barbara, Santa Barbara, CA, Nicolas Argibay, Iver Anderson, Emma White, Prashant Singh, Duane Johnson, Ames Laboratory, Ames, IA, Andrew Kustas, Frank DelRio, Ping Lu, Sandia National Laboratories, Albuquerque, NM

10 – 10:30 am – Break

10:30 – 11 am

3642145: Crystal Rotation Kinematics During Dry Sliding on High-Purity Copper

Christian Greiner, Christian Haug, Peter Gumbsch, Karlsruhe Institute of Technology, Karlsruhe, Germany, Dimtri Molodov, RWTH Aachen University, Aachen, Germany

11 – 11:30 am

3647024: Evolution of Surface Cracks Under Rolling Contact: 3D Crack Morphology and Influence of Material Composition

Chiara Bertuccioli, Amir Kadiric, Imperial College London, London, United Kingdom; Kenred Stadler, SKF, Schweinfurt, Germany

11:30 am – Noon

3670524: Tribological Performance of Sliding Parts in Low Viscosity Fluids

Aditya Ayyagari, Maddox Dockins, Euan Cairns, Diana Berman, The University of North Texas, Denton, TX, Stephen Berkebile, US DEVCOM ARL, Aberdeen Proving Ground, MD

☀ Session 7L

TRIBOLOGY OF BIOMATERIALS I

Session Chair: Alison Dunn, University of Illinois at Urbana-Champaign, Urbana, IL

Session Vice Chair: Kylie Van Meter, Florida State University, Tallahassee, FL

8 – 8:30 am

3669024: Tribology of Soft Contacts Lubricated by Particulate Suspensions

Christopher Serfass, Catherine Hill, Elias Kerstein, Yug Saraswat, Lilian Hsiao, North Carolina State University, Raleigh, NC, Shraavan Pradeep, University of Pennsylvania, Philadelphia, PA

8:30 – 9 am

3669423: Interfacial Wear of Soft Hydrogels Due to Repeated High-Speed Cavitation Events

Alexander McGhee, Jin Yang, Elizabeth Bremer, Christian Franck, University of Wisconsin-Madison, Madison, WI

9 – 9:30 am

3669352: Patterned Elastomeric Materials in Lubricated Tribology
Lilian Hsiao, Yunhu Peng, Christopher Serfass, North Carolina State University, Raleigh, NC

9:30 – 10 am

3669442: In-Situ Observation of Interface Between a Glass Syringe and Elastomer Stopper for Low Temperature Storage of Biologics

Kylie Van Meter, Pont de Claix, France; Brandon Krick,

Florida State University, Tallahassee, FL, Nestor Rodriguez, Eloise Perrin, BD Medical-Pharmaceutical Systems, Avinash Tiwari, Bo Persson, Peter Grubber Institute, FZ Julich, Julich, Germany

10 – 10:30 am – Break

10:30 – 11 am

3669232: Tribological Performance of Additive Manufactured Partial Implants Sliding Against Articular Cartilage Assessed Using In Vitro Experiments

Manel Rodriguez Ripoll, Timea Varadi, Rosa Eder, Markus Kronberger, Friedrich Franek, AC2T Research GmbH, Wiener Neustadt, Austria, Christoph Bauer, Stefan Nehrner, Danube University Krems, Krems, Austria

11 – 11:30 am

3669398: Evolution-Structure-Property Relationships of Tissues Drive Functionality in Slicing and Grinding Dentitions

Tomas Grejtak, Tomas Babuska, Lehigh University, Bethlehem, PA, Tyler Hunt, Stephen Kuhn-Hendricks, Gregory Erickson, Florida State University, Tallahassee, FL, Soumya Varma, Deeksha Kodangal, Siddhartha Pathak, Iowa State University, Ames, IA, Mark Norell, American Museum of Natural History, New York, NY, Santiago Lazarte, Brandon Krick, Florida A&M University-Florida State University, Tallahassee, FL, Manish Jain, Swiss Federal Laboratory for Materials Science and Technology, Thun, Switzerland

☀ Session 7M

ROLLING ELEMENT BEARINGS VII

Session Chair: TBD

Session Vice Chair: TBD

8 – 8:30 am

3666064: Modelling Geometrical Raceway Deviations of Roller Bearings in Multi-Body Simulation

Patrick Wingertzahn, Onur Atalay, Bernd Sauer, TU Kaiserslautern, Kaiserslautern, Germany

8:30 – 9 am

3641287: Analysis of an Angular Contact Ball Bearing with Flexible Cage

Karine Petuya, Daniel Nelias, Univ Lyon, INSA Lyon, CNRS, LaMCoS, Villeurbanne, Rhône, France, Alexandre Leblanc, Artois University, Béthune, Pas-de-Calais, France

9 – 9:30 am

3643444: Planet Bearing Performance Analysis Focused on Potential Cage Stress and Roller Sliding Damage

Travis Shive, SKF USA Inc., Lansdale, PA

9:30 – 10 am

3640401: Minimum Energy Hypothesis in Quasi-Static Equilibrium Solutions for Angular Contact Ball Bearings

Pradeep Gupta, PKG Inc., Clifton Park, NY

10 – 10:30 am – Break

10:30 – 11 am

3667790: Simulation of Noise and Vibration of Systems with Real Rolling Bearings

Hannes Grillenberger, Schaeffler Technologies, Herzogenaurach, Germany

11 am – 11:30 am

3666372: Vibration Isolation Strategy for Reducing Noise in Large Diameter Thin Section Ball Bearings

Joel Lawrence, Phil Jones, Jason Williams, Penn State Behrend, Erie, PA, Bryan Allison, SKF, Falconer, NY

11:30 am – Noon

3669113: The Role of the Cage for Track Replenishment in Oscillating Rolling Element Bearings

Sebastian Wandel, Leibniz University Hannover, Hannover, Lower Saxony, Germany

☀ Session 8A

NONFERROUS METALS II

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3651522: Structure-Performance Evaluation of Synthetic Metalworking Fluid Additives

Stephanie Cole, Tiffany Meyers, Clariant, Mount Holly, NC

2 – 2:30 pm

3647312: Correlating Viscosity of 2-Ethylhexyl Oleic Estolide Esters to Their Molecular Weight

Grigor Bantchev, Steven Cermak, USDA-ARS, Peoria, IL

2:30 – 3 pm

3647700: Formulating for High-Efficiency Cleaning and Protection Performance for Both Ferrous and Non-Ferrous Metal Surfaces

Clayton Cooper, ANGUS Chemical Company, Buffalo Grove, IL

3 – 3:30 pm – Break

3:30 – 4 pm – Nonferrous Metals Business Meeting

☀ Session 8B

LUBRICATION FUNDAMENTALS VIII – RHEOLOGY

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3641504: Effect of the Architecture of Polymeric Additives on the Rheological Response of Lubricants in the Elastohydrodynamic Lubrication Regime

Eliane Gendreau, Janet Wong, Imperial College London, London, United Kingdom, Sarah Matthews, Shell Global Solutions (UK) Ltd., London, United Kingdom

2 – 2:30 pm

3645217: Impact of Flexibility and Molecular Architecture on the Shear Thinning Response of Viscosity Modifier Polymers

Amran Mohamed, Janet Wong, Imperial College London, London, United Kingdom, Sarah Matthews, Shell Global Solutions, London, United Kingdom, Luca Mare, University of Oxford, Oxford, United Kingdom

2:30 – 3 pm

3649386: Principles for Designing Very High VI Fluids

Erik Willett, Jacob Scherger, Functional Products Inc., Macedonia, OH

3 – 3:30 pm – Break

3:30 – 4 pm

3647712: Measuring Mid-Shear Viscosity Using Tapered Bearing Simulator Viscometer for Viscosity Maps

Gwenaelle Philibert, Priyanka Desai, Sarah Remmert, Shell Global Solutions (US) Inc., Houston, TX

4 – 4:30 pm

3669336: Predicting Processability of Engine Oils by Identifying the True Rheological Behavior Using Microfluidic Rheometer

Ravinder Elupula, Charles Nider, Formulation, Piscataway, NJ

4:30 – 5 pm

3669484: Electromagnetic Tuning of Friction Levels in GBLM Lubricated Tribosystems: An Experimental Investigation

Maria Victoria Granja Oramas, C. Fred Higgs III, Rice University, Houston, TX

☀ Session 8E

NANOTRIBOLOGY V

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3646636: Sliding-Induced Friction Hysteresis on Graphitic Surfaces in Solvated N-Hexadecane Layers

Prathima Nalam, Behnoosh Sattari Baboukani, SUNY University at Buffalo, Buffalo, NY, Ashutosh Pitkar, Zhijiang Ye, Miami University, Oxford, OH

2 – 2:30 pm

3647603: Experimental Study and Numerical Modelling of Sliding Contact Wear in Nanocomposite Coatings

Zulfiqar Khan, Bournemouth University, Poole, Dorset, United Kingdom

2:30 – 3 pm

3668981: Understanding the Load-Dependence of Nanoscale Adhesion Using In-Situ Experiments in a Transmission Electron Microscope

Tevis Jacobs, Andrew Baker, Sai Bharadwaj Vishnubhotla, University of Pittsburgh, Pittsburgh, PA, Rimei Chen, Ashlie Martini, University of California, Merced, Merced, CA

3 – 3:30 pm – Break



☀ Session 8G

ENVIRONMENTALLY FRIENDLY FLUIDS IV

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3667627: The Performance of Diesel Engine Oil Containing Ashless Anti-Wear Additive and Detergent

Yasunori Shimizu, Moritsugu Kasai, Idemitsu Kosan Co., Ltd., Chiba, Japan

2 – 2:30 pm

3669374: Soybean-Based Cutting-Fluid Lubricants and Emulsifiers

Albert Darling, Daniel Garbark, Battelle Memorial Institute, Columbus, OH

2:30 – 3 pm

3669386: Traction Coefficient Analysis in Environmentally Friendly Fluids

Zach Hunt, VBASE Oil Company, Pendleton, SC

3 – 3:30 pm – Break

☀ Session 8H

SYNTHETIC LUBRICANTS AND HYDRAULICS II

Session Chair: Ryan Fenton, BASF Corporation, Tarrytown, NY

Session Vice Chair: Lauren Huffman, Dow Chemical, Midland, MI

1:30 – 2 pm

3668709: Dynamometer Testing of Hydraulic Fluids in a Simulated Backhoe Loader Trenching Cycle

Paul Michael, Milwaukee School of Engineering, Milwaukee, WI

2 – 2:30 pm

3679369: Effects of Corrosion Inhibitors on Liquid Superlubricity of Water-Based Lubricants

Jannat Ahmed, Qian (Jane) Wang, Yip-Wah Chung, Northwestern University, Evanston, IL, Ning Ren, Ying Yang, Roger England, Valvoline Inc., Lexington, KY

2:30 – 3 pm

3668663: The Unexpected Active Behaviour of Synthetic Esters as Cobase Stocks on Resistance to Oxidation

Siegfried Lucazeau, NYCO, Paris, France

3 – 3:30 pm – Break

3:30 – 4 pm

3647952: Liquid Amides – Novel High-Performance Base Oils

Claire Ward, Croda, Goole, United Kingdom

4 – 4:30 pm – Synthetic Lubricants and Hydraulics Business Meeting

☀ Session 8I

FLUID FILM BEARINGS III

Session Chair: TBD

Session Vice Chair: TBD

1:30 – 2 pm

3641565: Fluid Film Bearing Damage Detection from Vibration Data

John Yu, Baker Hughes, Houston, TX

2 – 2:30 pm

3650184: Tribology Induced Water Pump Bearing Failure

Christopher Dellacorte, Samuel Howard, NASA, Cleveland, OH

2:30 – 3 pm

3641442: Performance Analysis of Multirecess Hybrid Spherical Journal Bearing Operating with Power Law Lubricant

Satish Sharma, Adesh Tomar, Indian Institute of Technology Roorkee, Roorkee, Uttarakhand, India

3 – 3:30 pm – Break

☀ Session 8J

MATERIALS TRIBOLOGY IV

Session Chair: TBD

Session Vice Chair: TBD

Session Information TBD

☀ Session 8L

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Session Information TBD



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Education Courses

The 2022 STLE Annual Meeting & Exhibition features 12 industry-specific education courses offered on two days of the conference: Sunday, May 15, and Wednesday, May 18. The schedule is designed to give attendees more flexibility when planning their conference attendance.

All courses are full day (start at 8 am and end at 5 pm).

STLE education courses are \$430 with a full meeting registration (except for the NLG Grease course which is \$830), \$605 for STLE members without a meeting registration, and \$775 for a non-member with no meeting registration. If you have questions regarding these courses, please contact Rebecca Lintow, STLE Director of Professional Development, rlintow@stle.org or (847) 825-5536.

****Please note that course titles and content are subject to change. Visit www.stle.org/annualmeeting and see the Program Guide distributed on site in Orlando for the most up-to-date information and list of course instructors.***

Sunday, May 15

Advanced Lubrication 301: Advanced Additives

Advanced Lubrication 301 covers the molecular structures and chemistries of lubricant additive types. Additives examined will include antioxidants, rust inhibitors, detergents, dispersants, antiwear additives, extreme pressure additives, friction modifiers and rheology and viscosity modifiers.

Basic Lubrication 101

Basic Lubrication 101 is primarily for the individual entering the lubrication field who needs a broad introduction to the field of lubrication, lubrication principles and lubricating materials. This course is also for individuals not directly involved but who need a broad overview of lubricants and basic lubricating components. This course does not require a formal scientific degree or background, although many technical terms and concepts are covered. Experienced industry professionals attend the course to be kept up to date on the latest developments, especially in those areas not directly related to their job function or area of expertise. Thus, Basic Lubrication 101 is usually attended by a broad cross section of industry professionals such as technical service, sales, marketing, manufacturing, maintenance, and managers who in some way are involved in the industry.

Metalworking Fluids 115: Metal Removal Fluids

Metalworking Fluids 115 covers the key concepts needed to better understand how metalworking fluids are prepared, used, and maintained. Students will be informed about the reasons for using metal removal fluids and their functions. The chemistry of metal removal fluids, insight into the need to control microbial contamination and the importance of adopting a health and safety program in a facility that machines metal are covered. Key topics include measures needed to understand and control metal removal fluid failure.

NLGI Grease 101

(Presented in cooperation with NLGI)

This course is a comprehensive overview of all aspects of lubricating grease. Grease formulation components are thoroughly covered, including base oils and the many different thickener types. Manufacturing technologies are reviewed, as well as grease testing significance and methods. Included is a good discussion detailing how to select the proper grease for different applications, and a variety of examples of both industrial and automotive applications are discussed.

Synthetic Lubricants 203: Non-Petroleum Fluids and Their Uses

Synthetic Lubricants 203 is designed primarily for formulators and users of lubricating materials. This course provides an overview of non-petroleum-based lubricants, their comparison to each other and to petroleum oil. Each section covers the chemistry, strength, and weaknesses of each material and basic application.

NEW!

Electric Vehicles

The Electric Vehicle (EV) course provides an introduction to hardware, tribology, lubrication, thermal management, and testing related to EV. The course starts with an overview of hybrid, fully battery and fuel cell electric vehicles. It covers the driveline systems of hybrid and full electric units. The course also covers lubricant, tribology and thermal management challenges and requirements for EVs. Finally, we'll conclude with discussion about established test methods for EV fluid evaluation.





The largest and most useful meeting covering all aspects of tribology and lubrication engineering.”

Wednesday, May 18

Advanced Lubrication 302: Advanced Lubrication Regimes

Advanced Lubrication 302 goes more in-depth on lubrication regimes, wear, and wear mechanisms, as well as lubricant failure analysis. This course includes a series of lubricant failure analysis case studies on automotive engines, gears, and bearings.

Automotive Lubrication 202: Gasoline

Automotive Lubrication 202 provides an overview of the engine and drivetrain systems and lubrication requirements of these systems. This course will also look at tribology testing of components within these systems and the future of tribology testing for automotive applications.

Basic Lubrication 102

Basic Lubrication 102 is an overview of equipment systems (gears, bearings, seals, compressors, and engines) and their lubrication requirements, including a module on grease. Like Basic Lubrication 101, this course does not require a formal scientific degree or background, although many technical terms and concepts related to the use of lubricants in various mechanical devices are covered. This course is intended for a diverse group, including individuals involved in technical service, sales, marketing, manufacturing, maintenance, and managers who want to know more about how lubricants work in service. This course assumes fundamental knowledge of lubricants and lubrication principles, as presented in the Basic Lubrication 101 course.

Hydraulics 201: Hydraulic Fluids and System Overview

This course provides an overview of the basic mechanical components used in hydraulic fluid power transmission. The composition and performance of hydraulic fluids will be discussed. The course will also feature sections on maintenance and troubleshooting as they pertain to hydraulic systems and in-service fluid analysis.

Metalworking Fluids 240: Metalworking Fluid Formulation Concepts

This course is provided in response to many requests from attendees at STLE's other metalworking fluid courses who asked for more specifics on formulation. The course begins with some universal formulating basics, such as experimental design, order of additions for ingredients, and considerations when scaling up from beakers to large blending tanks. Also covered will be base stocks, performance additives, emulsifier selection, HLB, qualification tests, optimization for stability, both in the drum and in use, bioresistance, microbicide selection and use, and recalcitrant functional additives. The course instructors will also discuss formulating for disposability and for global distribution. A panel discussion with all instructors will complete the course. While several example formulations will be presented throughout the sessions, this course will not provide specific ready-to-use commercial formulations.

Synthetic Lubricants 204: Base Stock Selection and Applications

Synthetic Lubricants 204 provides an introduction to synthetic lubricant base stocks and applications. It compares the use of these synthetic lubricants to petroleum-based products and compares between types of synthetic lubricants.

STLE

Certification Exams

Thursday, May 19

All four STLE technical certification exams: Certified Lubrication Specialist (CLS)[™], Oil Monitoring Analyst I and II (OMA)[™] and Certified Metalworking Fluids Specialist (CMFS)[™] will be conducted concurrently on Thursday, May 19 from 9 am to noon. If you are interested in taking an exam during STLE's 2022 Annual Meeting & Exhibition, please contact Gina Cairo at (847) 825-5536 or email certification@stle.org.

Exam Fees:

- **First exam: \$450 (STLE member) • \$625 (Non-member)**
- **Retake exam: \$225 (STLE member) • \$305 (Non-member)**



Networking & Special Events

Please note that all annual meeting events are at the Walt Disney World Swan and Dolphin Resort.



Student Networking Reception

Sunday, May 15 • Ticketed Event

Students and young tribologists from around the world gather for an event defined by its networking value, camaraderie and good times. If you're from the next generation of STLE members, come join us for an evening of friendship and relationship building.

Speakers Breakfast

Sunday through Thursday, May 15-19

Lead authors and education course presenters are invited to meet with Session and Paper Solicitation Chairs for a continental breakfast at 7 am on the days of their presentations. This is a great time to review the session schedule and note any last-minute changes. Speakers should plan on attending.

Networking Reception

Monday, May 16

This is the annual meeting's central networking event and a way for you to reconnect with old friends while making new ones. Since people come to STLE's Annual Meeting & Exhibition from around the world, this truly is an international event. Relax, socialize and add to your list of professional contacts through this outstanding networking event

Exhibitor Appreciation Hour

Back by popular demand, two hours of dedicated exhibit time will occur at this year's show:

Monday, May 16 and Tuesday, May 17 from 3-4 pm. Refreshments will be served in the trade show. Technical sessions, education courses, Commercial Marketing Forum presentations and all other annual meeting activities will cease at this time. Come support the meeting's exhibitors—and find solutions to your most pressing technical issues.

President's Awards Luncheon

Tuesday, May 17 • Ticketed Event



Ken Hope



Ryan Evans

The annual meeting's major business function draws virtually all attendees for a two-hour event honoring STLE's incoming and outgoing presidents, award winners and top volunteers. Come honor 2021-2022 President Ken

Hope with Chevron Phillips Chemical Company and 2022-2023 President Ryan Evans with The Timken Company. A ticket for the President's Awards Luncheon is included in your meeting registration and free to STLE Corporate Member representatives (two tickets) and students. Guest tickets for the luncheon are \$50 and can be purchased on site at the STLE Registration Desk.

STLE is seeking sponsorships for the Networking Reception, President's Awards Luncheon, Welcome Gift, Education Course Lunches and Refreshment Breaks. **For more information, contact national sales manager Tracy Nicholas VanEe at (630) 922-3459, emeraldcomminc@yahoo.com.**



Call for Student and Early Career Posters

STLE is seeking student and early career posters at its 2022 Annual Meeting & Exhibition. Event organizers are inviting early career professionals and students from all areas of tribology research to participate in a special session dedicated to early career and student posters. Posters must deal with an aspect of tribology research that can be translated into friction, wear, and lubrication. Early career and student poster research topics can be co-authored by faculty and other researchers, but only the lead author may exhibit their posters and discuss their work at the session. The posters will be judged by a conference committee, and awards will be given to the best posters.

Submission criteria & information

- Abstract submission deadline: **March 14, 2022** (via www.stle.org/annualmeeting). Notification of acceptance will be sent to participants shortly after this date.
- The poster must present original work by participants during the 2021-2022 academic year.
- The participant may submit only one poster as the lead author.
- As the lead author of the poster, the participant should have performed the major portion of the work.
- Lead authors must be full-time graduate or undergraduate students registered during the 2021-2022 academic year.
- Posters can be no larger than 48 x 48 inches.
- Posters must be set up Sunday afternoon or Monday morning. The author must be present at the poster display during the judging session on Monday, May 16, during lunch and the scheduled conference break that afternoon.

Award category (*three winners in each category)

- **Platinum:** superior scientific and presentation quality (\$300 prize)
- **Gold:** good technical quality (\$200 prize)
- **Silver:** overall quality worthy to be encouraged (\$100 prize)

*Winners will be announced during the President's Awards Luncheon on Tuesday, May 17.

For additional questions about the early career and student poster session, please contact Merle Hedland at (630) 428-2133 (STLE Conference office), or email mhedland@stle.org.

2022 STLE Annual Meeting Exhibitors

More than 120 organizations are expected to display their newest products and services at the 2022 STLE Annual Meeting & Exhibition. Following is the list of exhibitors as of December 13, 2021. Visit www.stle.org/annualmeeting and see the Program Guide distributed on site in Orlando for the most up-to-date list.

Acme-Hardesty Company
Advanced Chemical Concepts Inc.
Afton Chemical Corporation
Analytik Jena
ANGUS Chemical Company
Applied Rigaku Technologies, Inc.
Aalytical Instruments
Baron USA, LLC
BASF
Biosynthetic Technologies
BYK USA Inc.
Cannon Instrument Company
Colonial Chemical Inc.
Compass Instruments
Eastman
Emery Oleochemicals
ENEOS USA Inc.
Evonik Oil Additives USA, Inc.
Falex Corporation
FedChem/Federal Process
Industrial Quimica Lasem S.A.U.
INEOS Oligomers
Kao Chemicals Europe, S.L.U.
King Industries, Inc.
Koehler Instrument Company Inc.
LANXESS Corporation
Münzing
Napoleon Engineering Services
Oil Filtration Systems
Optimol Instruments
Palmer Holland
PCS Instruments
PerkinElmer
Phoenix Tribology Ltd.
Pilot Chemical Company
PMC Crystal
Ravago Chemicals
Rianlon Americas, Inc.
Rtec-Instruments
Sasol Chemicals GmbH
Savant Labs
Sea-Land Chemical Company
Soltex, Inc.
SONGWON Management AG
Tannas Company & King Refrigeration
The Lubrizol Corporation
United Soybean Board
Vanderbilt Chemicals, LLC
Zschimmer & Schwarz

2022 STLE Annual Meeting Exhibition & Sponsorship Opportunities

Reserve Your Exhibit Space in Orlando!

STLE's annual trade show is where you can catch up on the lubricant industry's latest products, services, and technologies. Many annual meeting attendees say they have saved thousands of dollars and solved complex lubricant-related problems by making a connection at STLE's trade show

*Standard booth sizes are 10-by-10-foot plus six 20-by-20-foot super-sized booths (special package rates apply).

Booth pricing fees:

- \$2,675 | STLE Corporate Members
- \$3,075 (per 10 x 10 booth) | Non-Members

STLE's exhibition features companies from the following product categories:

- Lubricant additives
- Metalworking fluids and additives
- Base oils
- Environmental protection re-refining
- Condition monitoring/testing analysis
- Industrial fluids
- Consulting services
- Equipment material supplies and services
- Lubrication management
- Synthetic lubricants

Commercial Marketing Forum

The Commercial Marketing Forum (CMF) is a series of 30-minute marketing sessions at STLE's 2022 Annual Meeting where participants may promote your company's products and services, something not allowed in the technical sessions. Your CMF session is promoted in the Annual Meeting Program Guide, directing attendees to your presentation. CMF time slots are sold on a "first come, first serve" basis. Pricing for time slots to present is based on membership status and if you are exhibiting at the annual meeting.

Commercial Marketing Forum Pricing:

- \$660 for STLE Corporate Exhibitors
- \$800 for STLE Corporate Members
- \$940 for STLE Individual Members
- \$1,020 for Non-Members

For more information about Annual Meeting exhibit booth reservations, CMF, and sponsorship opportunities, contact national sales manager Tracy Nicholas VanEe at (630) 922-3459, emeraldcomminc@yahoo.com.



Sponsorships

Annual Meeting sponsorships come in all shapes, sizes and prices and are designed to fit everyone's marketing budget.

If you are interested in gaining exposure and raising your company's profile in Orlando (thereby reaching some 1,600 members of the lubricants industry), STLE offers several sponsorship opportunities, including:

Palladium Plus Level – \$5,000 (plus material costs where applicable)

- Keynote Session
- Wi-Fi Service (**Sold**)

Palladium Level – \$4,000 (plus material costs where applicable)

- Annual Meeting Mobile App
- Badge Lanyards (**Sold**)
- Directional Floor Signs (**Sold**)
- Education Course Lunches
- Guest Room Keycards (**Sold**)
- Refreshment Breaks (Plus Water Stations)
- Registration Bags (**Sold**)

Titanium Plus Level – More than \$3,000

- Welcome Gift
- Recharging Lounge
- Exhibitor Appreciation Hour Raffle

Titanium Level – \$3,000

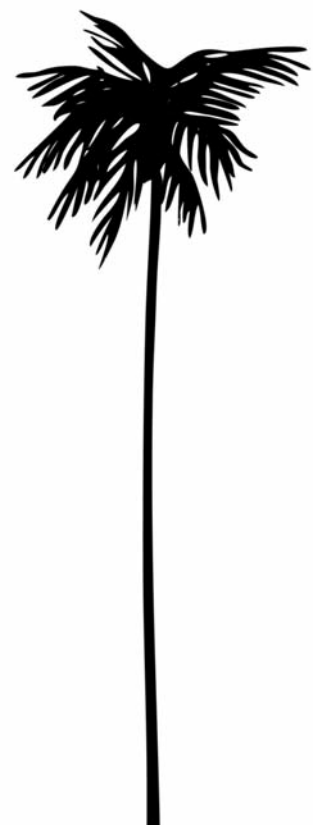
- Education Course Materials
- President's Awards Luncheon

Platinum Level – \$2,000

- Speakers Breakfast Series

Multiple Sponsors Opportunities

- Monday Networking Reception



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2022 STLE Annual Meeting Sponsors

Sponsors as of Dec. 13, 2021

STLE wishes to thank the following sponsors for their generous support of the 76th STLE Annual Meeting & Exhibition, May 15-19, 2022, at the Walt Disney World Swan and Dolphin Resort, Orlando, Florida.
Updated signage with sponsors information will be included on site in Orlando.

Palladium Plus: \$5,000
The Lubrizol Corporation
Wi-Fi Service

Palladium: \$4,000
Afton Chemical Corporation
Guest Room Keycards

Ergon, Inc.
Badge Lanyards

Monson—An Azelis Company
Registration Bags
Palmer Holland Inc.
Annual Meeting Mobile App
Shell
Directional Floor Signs

Titanium Plus: More than \$3,000
Evonik
Exhibitor Appreciation Hour Raffle

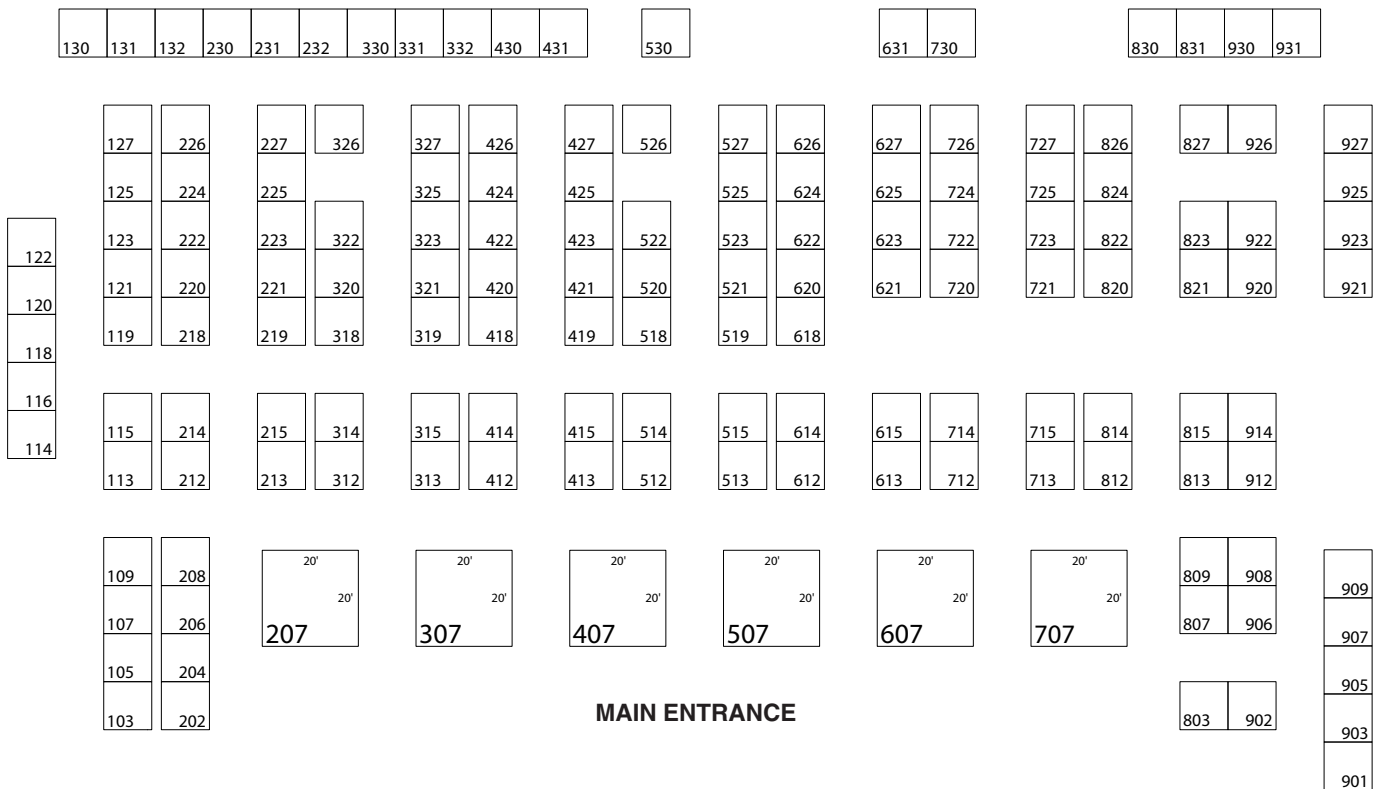
Titanium: \$3,000
Vanderbilt Chemicals, LLC
Networking Reception

Platinum: \$2,000
Zschimmer & Schwartz
Speakers Breakfast Series

Gold \$1,000
Bisley International
Networking Reception
The Timken Company
Networking Reception

2022 *Orlando* Trade Show Floor Plan

Walt Disney World Swan & Dolphin Exhibit Hall



2022 Exhibition Hours

Exhibit Setup Hours:

- Sunday, May 15 – Noon – 5 pm
- Monday, May 16 – 6 – 11 am

Exhibit Hours:

- **Monday, May 16** – Noon – 5 pm
(Exhibitor Appreciation Hour: 3 – 4pm)
- **Tuesday, May 17** – 9:30 am – Noon & 2 – 5:30 pm
(Exhibitor Appreciation Hour: 3 – 4 pm)
- **Wednesday, May 18** – 9:30 am – Noon



Walt Disney World Swan and Dolphin



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