What value did you find from the technical sessions?

“At this meeting I learned quite a bit from the variety of papers being presented. The quality was good and so were the speakers and I especially liked some of the new work presented on tribology of greases.”
What was your favorite thing about the annual meeting?

“NLGI annual meeting was an excellent opportunity for our company to meet a large number of companies in a few days. Every day is organized with opportunities to network existing or new contacts.”
What was your favorite thing about the annual meeting?

“I have been attending NLGI meetings for over two decades. At each meeting I always look forward to catching up with old friends and making a few new ones. The network opportunities that the NLGI annual meeting offers is definitely my favorite part and I can honestly say that networking at NLGI is a lot better than most conferences I attend.”
NETWORKING & EDUCATION
CLOSING PARTY
The NLGI Awards recognize those who, through their farsightedness, enterprise and innovation, pioneered significant and lasting improvements within the Industry.

**TOM STEIB**
This year’s recipient is Tom Steib with The Elco Corporation. Tom started in the grease business with The Southwest Division of Witco in Bakerstown, PA. Tom started in the lab and worked his way up to plant manager. At Southwest, Tom was a co-inventor on a patent for low soap Calcium Sulfonate grease.

Tom was hired by The Elco Corporation, now Italmatch Chemicals, as operations manager. He is now the Vice President Manufacturing where he oversees the daily operations of three manufacturing plants producing and shipping additives for lubricants.

Tom chairs the Finance Committee as a valued member of the NLGI Board, and we have witnessed firsthand his reliability, trustworthiness and dedication. It is our distinct honor to present this award to Tom Steib.

**Sponsored by Texas Refinery Corp**
**NLGI Founders Award**

*In recognition of the three NLGI founding Companies, the Founders Award is presented to a company that has had a positive impact on the NLGI in the tradition established by these founding fathers.*

**STRATCO**

This year’s recipient has a long and valued history with NLGI and was one of the earliest joining members. STRATCO was founded as Stratford Engineering Corporation in 1928 before becoming STRATCO, Inc. in 1984. Accepting this award on behalf of STRATCO is Diane Graham, President & CEO. Diane has been the CEO since 1982, was NLGI’s first woman President in 1992 and received the NLGI Fellows Award in 1987. Today, the company is headquartered in Scottsdale, AZ where they continue to serve the grease industry throughout the world through technology innovation, equipment, process design and contributing technical papers at industry conferences in the USA, Europe, India and China. It is our honor to present this year’s Founders Award to STRATCO, Inc.

*Sponsored by H.L. Blachford Ltd.*

**NLGI Fellows Award**

*Acknowledges valuable work within the Institute, in the technical development of greases, grease tests, or the promotion of grease usage.*

**DICK BURKHALTER**

This year’s recipient is Dick Burkhalter with Covenant Engineering Services, LLC. Dick has more than twenty years of plant operations experience. In 1995, he founded Covenant Engineering Services. He has served on the NLGI board of directors for eighteen years, authored and presented six technical papers at the annual meetings, co-chaired two panel discussions, and has been published in The Spokesman, STLE, and Machinery Lubrication.

*Award presented by Pat Walsh, Awards Committee Chair.*
NLGI Award for Educational Excellence

“For outstanding instruction as exemplified by subject knowledge and presentation skills in NLGI Grease Educational courses.”

This year’s award goes to two deserving recipients -

**Michael Anderson** with Falex Corporation and

**Chuck Coe** with Grease Technology Solutions, LLC

**MICHAEL ANDERSON**
Michael Anderson received a BS degree in Chemistry and Business Economics. Upon graduation, he joined International Harvester Corporation and was involved in the physical and performance testing of petroleum products and automotive chemicals. In 1982, Mr. Anderson joined Keil Chemical Division of Ferro Corporation and worked in product development and technical support until 1984. He joined Falex in 1984 as Manager Technical Services. Since then, he has held positions including Marketing Manager, Vice President of Marketing, Vice President of Testing Services and is currently Area Manager for Falex products in Asia Pacific and Latin America. He also serves Falex Corporation as the company Tribologist. Additionally, Michael is a STLE Certified Lubrication Specialist.

**CHUCK COE**
Chuck holds a BS Chemical Engineering, along with the NLGI’s CLGS and STLE CLS professional certifications. He worked for Mobil and ExxonMobil for over 32 years. He retired from ExxonMobil and launched Grease Technology Solutions LLC, a grease training and consulting business in 2009. He is a past president of NLGI, is currently serving on the Board of Directors, and is the Grease Education Course Chair of STLE. He has authored a number of technical papers and articles on grease and received Best Marketing Paper and Best Paper awards from both NLGI (2008) and ELGI (2009), and both the John A. Bellanti Memorial Meritorious Service Award (2012) and the NLGI Fellows Award (2015).

Award presented by Greg Morris, Shell Global Solutions. Sponsored by Shell Global Lubricants
WAYNE MACKWOOD
This year’s recipient is Wayne Mackwood of Lanxess Canada. Wayne is a dedicated individual who is passionate about the Institute and is currently a member of NLGI’s Board of Directors and Executive Committee.

Wayne has been a member of the NLGI Board since 2011 and currently serves as Treasurer. He is a recognized expert in the design, manufacture and use of CSC Grease and has developed over 150 grease formulations. He has authored more than a dozen technical papers, holds two patents, and has given more than 20 presentations at leading conferences and seminars around the world.

Sponsored by Pigging Solutions

GREG MORRIS
This year’s recipient is Greg Morris, Grease Product Application Specialist- Americas, with Shell Global Solutions US. Greg has a Bachelor’s degree in Chemistry from West Virginia University specializing in Analytical Methods. He has worked in industrial lubricants since 1998, in multiple roles within Shell, supporting both the commercial and technical community. Prior to his current role, Greg was a plant formulation chemist, local and national sales manager, engineering service manager, as well as the regional sales manager for Grease in North America.

Sponsored by Chevron Lubricants

ANDREW HEIMER
This year’s recipient is Andrew Heimer of Chemtool, Inc. Andrew holds a degree in chemistry and began working in the industry as an analytical chemist. Andrew joined Chemtool three years ago where he served in a few different roles including Grease R&D Chemist, Grease R&D Manager and now Process Development Engineer.

Award presented by Bill Mallory, Royal Mfg Co., Inc. and sponsored by Koehler Instrument.
Clarence E. Earle Memorial Award

For outstanding contribution to the technical literature relating to lubricating greases during the year.

This year’s award goes to two deserving recipients -

**Mehdi Fathi-Najafi** with Nynas AB and **John Kay** of STRATCO, Inc.

**MEHDI FATHI-NAJAFI**
Mehdi holds a Licentiate degree in Chemical Engineering Design as well as a Masters of Science in Chemical Engineering. He has about 25 years of experience within the base oil and lubricating grease industry. Mehdi joined Nynas AB in 2008 as a senior technical coordinator. Today, his main function is in support of the lubes and grease industry.

**JOHN KAY**
John graduated summa cum laude with a degree in mechanical engineering. He was employed by a major design/build mechanical contractor in St. Louis, Missouri from 1980 through 1996 where he became the principal design engineer in 1988. John joined STRATCO in 1997, where he is now the Vice President of Engineering. He has authored several technical papers and articles for NLGI as well as having served on the board of directors for 10 years.

Award presented by Pat Walsh, Awards Committee Chair and sponsored by TrustLube B.V.

Golden Grease Gun Award (new award this year)

This award acknowledges valuable work within the Grease Industry in the development of grease technology, manufacturing, testing, applications and better understanding of grease behavior or the promotion of grease usage.

**BILL MALLORY**
This year’s recipient is Bill Mallory with Royal Mfg Co, Inc. Bill studied mechanical engineering at Oklahoma State University and served in the US Army until he joined the family owned business. Bill has been active in the development process, procedures, formulation, plant design, equipment, manufacturing and sales of all greases produced by Royal.

Award presented by Pat Walsh, Awards Committee Chair
This year, we’d like to honor two deserving recipients – David Como and Bill Mallory.

**DAVID COMO**
Retiring in 2009, Dave was a senior member of the Global Development Leadership Team for Dow Corning Corporation’s Molykote® lubricants business, representing the Americas area and was responsible for Molykote’s Solid Lubricants Technology globally. Dave has served on the NLGI board of directors since 1999 and is NLGI’s Immediate Past President.

**BILL MALLORY**
Bill joined his family owned business in 1960. During his tenure, Bill successfully guided the growth of Royal Manufacturing into one of the leading independent grease and lubricant manufacturers in the industry. Bill is retiring from Royal but plans to remain active in the industry that he's helped to build.

*Award presented by Pat Walsh, Awards Committee Chair*
The Food Grade Greases Working Group is a joint working group of the ELGI and NLGI. Food lubricants are among the most crucial products in the food chain; small volumes with high impact. As food safety is more and more in the center of the news, we as an industry must continue to react and be proactive. It is in the industries interest to cooperate with decision makers to define and meet global standards. The Food Grade Lubricants Work Group is the platform where future developments on standards and legislation are reviewed. The greases used in the food industry include, food, beverage preparation & filling, animal feed and foods, personal care products and the pharmaceutical industry were focused. This can be extended to cover any production facility that wishes to operate in or supply to the food chain, for example a mineral preparation company supplying to the food supplement sector.

The Biobased Greases Working Group is a joint working group of the ELGI and NLGI. Results from the round robin testing (6 members that tested 8 grease samples) on oxidation stability were presented. The test methods performed in the Round Robin were: Oxidation Stability by Oxygen Pressure Vessel Method (ASTM D942), Rapid Small Scale Oxidation Test (RSSOT, similar to ASTM D7545), Modified RPVOT (ASTM D2272) with a test temperature of 150°C and induction time of 25 hours evaluating the greases after liquefying in a silicone oil, and PDSC (ASTM D5483.)

The cold temperature properties of vegetable base oils are not similar to mineral base or synthetic base fluids. Vegetable base oils undergo crystallization at low temperatures. The Round Robin Group is starting preliminary work. This Round Robin Group has gathered a series of methods that are used to measure low temperature performance. Initial screening of low temperature properties of biobased and conventional base oil rheology is also being performed. The Round Robin Group needs to agree on methodology to be used, identify volunteers and decide on the type and number of test samples to be used. Some of the test methodologies that have been discussed as being used are: Flow Properties of Lubricating Greases (DIN 51805), Testing Rheological Properties of Lubricating Greases - Part 2: Determination of Flow Point using an Oscillatory Rheometer with a parallel-plate measuring system (DIN 51810-2), Low Temperature Cone Penetration (DIN 13737), Low Temperature Torque (ASTM D1478) and Lincoln Ventmeter.

The selection of the biobased greases to be evaluated would be made based upon: base oil type and viscosity, type of thickener system and NLGI Consistency. This selection would be made on which one most influences the low temperature performance of biobased greases.
The GREASE PARTICLE EVALUATION WORKING GROUP is a joint working group supported by ELGI and NLGI and continues to make good progress toward defining a system for evaluating the size and number of particles in a grease sample. The group, which is working to evaluate robust methods for measuring these properties, gets together at both the NLGI and ELGI Annual Meetings in addition to other scheduled discussions throughout the year. This group has been assessing the feasibility of combining the results from two test methods as a particle evaluation system. The meeting reviewed the background information, as well as the status of current testing, including an update on an industry round robin that is currently underway with 19 industry/academia participants studying 11 grease samples with changes in formulation.

The results on the rerun round robin with some changes were considered and presented, i.e. uses vertical (85 to 90 degrees) scraper, use 4 particle size ranges for more even distribution and easier rating (15-25 microns, 26-50 microns, 51-80 microns, >80 microns.) The consideration was given changing lower level to 10-25 microns align with SKF and used the photographs as a guide to identify scratches.

The photos (6) were circulated to participants for their review and opinion on the rating. Joe Kaperick, Afton Chemicals investigated correct light and settings to get best pictures of scratches for various 6 tested greases.

Kuldeep Mistry, Timken, Anuj Mistry, Fuchs and Chris Pether, Afton a lead in the white paper write-up to give guidance to users on availability of different methods for grease particle evaluation. This would include a large number of methods which are already in place and standardized by various bodies. It would explain pros/cons of different methods with respect to: what is being measured, cost, availability and ease of use.

Mike Kunselman from the Center for Quality Assurance (CQA) was introduced and mentioned CQA’s role in the GC-LB program for management, specification and performance standards of greases. Next, Dr. Gareth Fish discussed the test methods currently included in the GC-LB standard (ASTM D4950) and highlighted several tests that have been identified as problematic for various reasons. The WG was set up with a 10-year plan to replace the NLGI GC-LB Specification. In the short term, the goal is to define requirements for multi-purpose greases (MPG) with higher performance specifications and to define four sub categories for licensing MPG+ Characteristics (better water resistance, higher load carrying capacity, better salt water resistance, longer life). Several test methods will be added to the specification to better understand performance of the test greases and each sub-category will have additional performance requirements beyond the MPG Specifications. Sample specifications were presented. The issues with replacing dropping point (ASTM D2265) and high temperature grease life (ASTM D3336) tests were discussed.
FEATURED INDUSTRY SPEAKERS

This year’s featured industry speakers were Frank Berens and Piet Lugt, PhD, both with SKF Engineering & Research Center. The topic of their presentation was “A World of Reliable Rotation Grease Lubrication in Rolling Bearings.” Mr. Berens began the presentation by providing the audience with a background of SKF’s business elaborating on the wide variety of products and markets SKF serves. Mr. Berens also discussed some global trends and how these trends will apply to the future direction of the lubricant industry.

Dr. Lugt then began to discuss how to understand grease lubrication in rolling bearings and the many considerations that must be accounted for when selecting a grease for different applications. Grease life is usually the most important performance parameter. Much of SKF’s grease research, in collaboration with academia, is directed towards the development of models, based on the physics and chemistry of grease, that make it possible to predict grease performance.

TECHNICAL PRESENTATIONS

Technical Session 1

The presentations started with George S. Dodos, PhD of Eldon’s S.A., who’s paper was titled “A study on leakage tendencies of rolling bearing lubricating greases.” The paper discussed how grease lubrication of rolling bearings has the primary task of minimizing friction and wear between the rollers and the ring surfaces, providing at the same time protection against corrosion and sealing support. Dr. Dodos mentioned that during operation, separation and overflow of grease or oil from the bulk grease charge may occur, induced by high temperature and bearing rotation resulting in grease leakage. This leakage can cause premature deterioration of the bearing, shortening its service life, as well as contamination of the nearby environment. In his study, the leakage tendencies of a series of rolling bearing lubricating greases were evaluated by a variety of methods.

Next, Kazumi Sakai of JXTG Nippon Oil & Energy Corporation presented a paper titled “Influence of grease component on energy-saving performance.” Mr. Sakai provided an overview of grease lubrication and why the energy-saving performance of greases has become increasingly important for rolling element bearing applications. Underscoring widely-used lithium-type greases, the influence of the grease component was investigated through measurements of the power consumption of a motor employing real bearings and comparing greases made with different base oil viscosity, thickener type and additive incorporation. The results were suggestive of the importance of the thickener entrainment to the contact and the grease movement around the contact.

What value did you find from the technical sessions?

“The technical sessions are the linchpin of the entire conference. No other annual conference in the U.S. focuses entirely on the chemistry and application of lubricating greases. And no other conference in the world presents more such information on an annual basis.”
Gus Flaherty of Nye Lubricants Inc. presented a paper called “Bearing Simulation Tribometer for Estimating Relative Grease Life in Boundary Film Lubrication.” In this paper, Mr. Flaherty covered the growing technical demands for lubricating greases in challenging applications in the aviation, semiconductor and aerospace industries and indicated new tools must be implemented to measure lubricant performance since the limitation of bench testing full bearings setups becomes prohibitive due to cost and time factors. This has led to the creation of advanced bearing simulation testing like the Spiral Orbit Tribometer (SOT). In the presented research, a PAO grease was evaluated to determine the significance of various molybdenum additives on the relative lifetime in a bearing compared to performance in a bearing simulation tribometer. During the question and answer section Mr. Flaherty suggested future work will include surface analysis of the wear scars generated by SOT testing.

Michael Holloway of 5th Order Industry then presented “A Primer on Grease Testing for Performance and Condition Monitoring” which provided an overview of many conventional and new lab tests that can be used to indicate field performance. As Mr. Holloway presented, he inquired with audience members for feedback on their experiences with the tests and had contributions from David Turner (Citgo), Andy Waynick (NCH Corporation), Rich Wurzbach (MRG Labs) and Piet Lugt (SKF Research and Technology Development).

The first technical session was closed out by NLGI India Chapter Best Paper award winner Sachin Kumbhar of Environ Specialty Chemicals Pvt. Ltd who presented the paper “Alkylated naphthalenes for High Temperature Applications.” Mr. Kumbhar's paper provided an overview of alkylated naphthalene chemistries and properties and highlighted their use as co-base fluids to impart thermo-oxidative stability to oil and grease formulations when replacing a portion of Group II, III or IV base oil. The paper presented data in various applications and highlighted the improved performance of greases and chain lubricants formulated with alkylated naphthalenes as well as a field study demonstrating the benefits in plywood manufacturing.

Would you recommend others to attend?

“Yes. If you work in the area of lubricating greases in a technical, manufacturing, supplier, or user capacity, then the annual NLGI meeting is the best venue for gaining whatever information or professional contacts you might need.”
The afternoon session of technical presentations opened with Chuck Coe’s annual review of the 2018 Grease Production Survey. Mr. Coe, of Grease Technology Solutions, provided an overview of what the NLGI production survey is and the type of information included and moved on to summarize the key results and trends from the most recently conducted survey.

The paper “Fundamentals of Water Soluble Thickeners for Industrial Lubrication” was presented by Erik Willet, PhD of Functional Products Inc. In his paper, Dr. Willet outlines some advantages provided by water-based lubricants including the reduced need for petroleum derivatives and greater fire safety over hydrocarbon alternatives. The first step toward developing new industrial water-based lubricant requires thickening the fluid to typical ISO viscosity grades. This paper evaluated several different polymers using water as a solvent and focused on thickening efficiency and viscosity index improvement and has produced two useful novelities: a clear synthetic water soluble VI improver with no cloud point; and a low cost thickener from biomass.

Next, Brian Casey, PhD of Vanderbilt Chemicals LLC presented a paper titled “Oxothiomolybdate Salts as Novel, Highly Sulfurized Molybdenum Additives.” Dr. Casey began his presentation with a brief overview of molybdenum-based additives before introducing a new class of molybdenum-based additives for use in lubricants which are ionic in nature and contain highly sulfurized binuclear oxothiomolybdate dianion cores. A range of additives possessing distinct physical and performance properties can be produced by varying the chemistry of the counteraction. Lithium-complex grease formulations containing these additives as single components and in combination with other additives were evaluated using SRV, 4-Ball and MTM Bench tests and the performance was compared to traditional solid molybdenum-based additives and liquid organomolybdenum additives. The results Dr. Casey presented indicate that the novel oxothiomolybdate salts are useful, multifunctional additives capable of delivering friction reduction, anti-wear and extreme pressure performance in grease applications.

Liwen Wei, PhD, of Novitas Chem Solutions presented the paper “Lithium Option: A Novel and High Stability Calcium Grease” which focused on a rheologically stable calcium sulfonate grease. This novel class of high stability calcium grease developed was presented by Dr. Wei as a viable and cost-efficient option to supplant lithium grease; the use of which is under threat due to escalating Lithium cost today. This HSC is based on calcium sulfonate thickener in tandem with calcium carboxylates with sulfonate content less than 5%. This offers a lower cost than calcium sulfonate grease, in addition to high stability and better performance than the existing lithium greases.

Following, Vasu Bala, PhD of Tiarco Chemical Corporation presented a paper titled “Performance Considerations in Formulating Multi-Purpose EP Greases.” Dr. Bala gave an overview of the grease market before discussing performance trends for Extreme Pressure (EP) greases and formulation considerations in meeting performance balances for load bearing, wear and yellow metal corrosion. Current sourcing demands for key raw materials used in thickeners were highlighted along with a brief overview on the attributes of the various common greases used. Dr. Bala highlighted the continuous strive for energy efficiency driven by Original Equipment Manufacturers’ (OEM) trends. In order to meet these higher performance trends in multipurpose EP greases, careful consideration is needed regarding the type and functionality of key EP, anti-wear and corrosion additives used. Test results on formulation options with select additives were discussed to attain high load bearings while improving anti-wear and corrosion performances.
NLGI President Joe Kaperick of Afton Chemical Corporation presented next with a paper titled “Back to Basics: The ABC’s of Grease Additive Performance.” Mr. Kaperick’s main focus was on the role of additives in providing the essential performance characteristics typically required by bearing greases and other fully formulated lubricating greases. Research in the area of grease chemistry can reach from the mundane to the esoteric but this paper stresses that sometimes it’s good to step back and examine the basic assumptions and “common wisdom” upon which those studies are often based. During his presentation, Mr. Kaperick covered a variety of additive types evaluated by several different test methods to examine in more depth some of the foundation aspects of grease performance to support or refute the commonly held “facts” of grease additives.

“New Process Methods to Improve the Thickener Yield of Calcium Sulfonate-Based Lubricating Greases” was presented by J. Andrew Waynick from NCH Corporation. Mr. Waynick provided an overview to the history of calcium sulfonate-based grease technology development starting with the first lubricating greases made from highly overbased calcium alkyl benzene sulfonates which were disclosed in the 1960’s. These products would eventually be known as simple calcium sulfonate and required about 50% of the overbased calcium sulfonate to provide an NLGI No. grade grease. About 20 years later, the first calcium sulfonate complex greases were developed and more recently, several new process methods for making calcium sulfonate complex greases have been developed. During this presentation Mr. Waynick focused on three new process methods to improve thickener yield, their impact on relative grease cost and performance, and insight into why they work as they do.

Roland Ardai of AXEL Christiernsson International AB presented a paper titled “Environmentally Acceptable Lithium Complex Grease for Wide Temperature Range.” Mr. Ardai began his presentation giving an overview of EAL and EEL requirements. As those rules and regulations are being revised, new challenges and opportunities are having an impact on environmentally friendly grease business. Previously, aquatic toxicity and biodegradability requirements had been difficult to meet with lithium complex based greases however there is now an opportunity to enter the market with such a thickener. Mr. Ardai gave an overview of the regulation changes before going on to compare the performance of an EU Eco-Label compliant, biodegradable and non-toxic lithium complex grease with that of a non-bio, industrial version based on conventional mineral oils.

The last paper of the day was presented by Lou Honary, PhD of ELM, Inc. and was titled “Transforming Technologies in Grease Industry –Biobased Content - Microwave-Based Reactors - Alternative Cooling.” Dr. Honary started his presentation by reviewing examples through history of technology with examples of accidents that had transformative effects. He then elaborated to give an overview of three transforming technologies that could have a positive impact on the grease manufacturing industry. Products produced using these new technologies were reviewed. Specifically, effects on soap formation, consistency, oxidation and dropping point were studied and reported. Dr. Honary indicated that in addition to the work already conducted, the impact of this technology on fields outside of grease manufacturing will be explored.
The second day of technical talks started with a paper presented by Kuldeep Mistry, PhD of The Timken Company, titled “Grease Evaluation for Continuous Caster Bearings (Development of an Innovative Technique to Accurately Measure Water Content in these Greases).” Dr. Mistry stated that the continuous caster is one of the most challenging environments for bearings from the ladle, down through the bender and segments, to the discharge area. In this application many critical positions are subject to high loads and low rotational speeds, often at elevated temperatures. Additionally, many bearings must perform in an environment heavily contaminated with water, steam and scale making it very important to accurately measure the water within a grease. In this study, the learnings of grease selection for the continuous caster bearings are disseminated and a new procedure for measuring the water content of grease was presented.

Next, Baojie Wu of Sinopec Lubricant Co., Ltd., Tianjin Branch presented a paper titled “Tribological Performances of Novel Molybdenum Dithiocarbamate (HBHS-MoDTC) in Greases studied by Four-Ball, SRV Testers and Mini-Traction Machine (MTM).” This paper evaluated several different greases with and without HBHS-MoDTC to determine the antiwear and friction-reducing properties exhibited in three different tribological contact geometries represented by each tester. Mr. Wu presented data generated under varying conditions and concluded that HBHS-MoDTC is a very potent additive to improve the tribological performance of grease under severe conditions.

Michael Anderson of Falex Tribology NV, presented a paper titled “Adhesion and tackiness: How do they influence the frictional performance of greases?” During this presentation Mr. Anderson introduced tackiness as a key grease property and explained the current limitations for testing this property. Greases are extensively used to decrease friction between industrial and technological components and their performance in the field has been observed to strongly depend on their interaction properties. Mr. Anderson presented a new method that was developed to precisely measure the adhesion and tackiness of greases, based on repeated indentation and retraction measurements. However, until now the link between these intrinsic grease characteristics and their frictional performance has not yet been fully understood. For this reason, this paper focused on investigating the effect of adhesion and tackiness on the friction of greases.

The paper titled “Customizing SRV Tribological Test Techniques to Better Replicate Working Conditions” was presented by Robert Mulkern of Nye Lubricants and Dr. Raj Shah of Koehler Instrument Company. In it Mr. Mulkern discussed how tribology plays a major role in considering the use of a lubricant. Application demands, often, transcend typical ASTM methods. Tried-and-true test methods such as 4-Ball Wear and Timken OK Load are frequently chosen to evaluate a lubricant’s performance. To expound on quotidian tribological test methods, the SRV oscillation and wear technique has proven to be a versatile tool. A variety of case studies were conducted. By creating and controlling unique test parameters, the results from the SRV can save development time and money compared to other more typical tests.
In a presentation titled “The Dropping Point Test – Time to Drop it?” Gareth Fish, PhD with The Lubrizol Corporation, covered the history of various methods for evaluating the dropping point of a grease and the limitations to the test as it exists today. It is stated that as originally approved in 1940, the ASTM D566 (ISO 2176) dropping point test was used to give an indication of the higher temperature performance of the grease. Historically, there was a rule suggesting the upper operating temperature of a grease was approximately two-thirds of the dropping point. In this paper, Dr. Fish posits that the dropping point test should be retired from service as it has ceased to have any meaning in the real world and should be replaced with a more robust method. However, as it is expected that the D2265 dropping point test will be around for years to come, ways to get high values through additives and thickener technology were also discussed.

The first recipients of the NLGI Research Grant, Alan Gurt and Lijesh KP, both graduate students at Louisiana State University working with Professor Michael Khonsari, presented their paper “Review of Entropy Considerations in predicting the life of grease.” In this paper, it was discussed that though there exists an estimate for the life of grease in specific applications which have been thoroughly examined, no method has been widely accepted to predict the life of grease for a general case. A promising approach to estimating the life of a grease subjected to mechanical degradation by shearing well below the oxidation temperature has been put forward by applying the principles of irreversible thermodynamics. This paper reviewed recent progress on this subject and provided suggestion for future research.

What value did you find from the technical sessions?

“Excellent opportunity to establish and grow an individual's knowledge of the industry and have exposure to new trends in the industry.”

Technical Session 4

During the new Lunch & Learn part of the program, two professors addressed attendees. First, Professor Robert L. Jackson of Auburn University provided an overview of the Auburn Tribology Education and Research Program, stressing the importance of tribology education. There are immense resources spent annually on issues pertaining to friction, wear and lubrication, together known under the umbrella term: tribology. Industry demand is high for graduates with a background in this multidisciplinary field. Despite this, there are few tribology educational opportunities. In light of this, the Tribology and Lubrication Science Minor was created and officially approved at Auburn University. Prof. Jackson and those under his tutelage have made contributions to this field. This research and how it ties in to the Tribology Minor student experience were discussed.
The second Lunch & Learn presentation was given by Professor Diana Berman of the Materials of Science and Engineering Department at University of North Texas. Dr. Berman presented a paper detailing her research titled “Biolubrients based on the unique fatty acid structure of Chinese Violet Seed Oil.” In her presentation Dr. Berman stated that increasing transportation and other industrial activities since the dawn of the last century has consumed much of our non-renewable fossil-based energy resources (such as petroleum) every day, and a significant portion of the energy produced is spent overcoming friction in moving mechanical systems. A recent discovery was that of a unique structure of the oil extracted from the seeds of Orychophragmus violaceus, a landscape ornamental native to China that is a relative of canola. The oil showed excellent lubricative properties and thermal stability. These findings provide a direct pathway for designing a new class of plant-based lubricants that are more effective and environmentally friendly than widely used synthetic oils.

The paper, “Optimizing Aviation Maintenance Planning with In-service Grease Analysis” was presented by Rich Wurzback of MRG Labs. It discusses how rotary wing aircraft flight controls and drivetrains include multiple components that are grease lubricated, including bearings, swashplates, and splines. Periodic relubrication of these components during established maintenance intervals are the primary method for replenishment of grease prior to degradation, to ensure reliable and safe operation of assets. Mr. Wurzback presented the methods developed to obtain representative samples from bearings, splines, data analysis methods that combine maintenance and operating histories with grease analysis results, and initial findings that may lead to more economical operation of critical assets.

Next, the paper “The Development of Lubricating Greases for Wind Turbines Applications” was presented by Gareth Fish, PhD, of The Lubrizol Corporation. With the continued growth of wind turbines (WT) for renewable energy generation, a significant amount of work has been published looking at improved gearbox fluids. However, there has been little focus on the greases and open gear lubricants used in wind turbine systems and components. Dr. Fish discussed issues with developing greases to meet the WT specification requirements of friction, low wear, fretting, and corrosion. He also reported on findings to enable lubricating grease to pass the standard bearing grease test requirements and of the ripple test.

The paper, “Can lubrication systems be reliable (in changing conditions)?” was presented by authors Daphne van der Puijl and Chiel van Daelen of Trustlube Group B.V. The objective of this paper was to show the different types of greasing systems in the market, the limitations of traditional grease systems and recent innovations. Greasing should take place during operation; however, in many cases it is not possible or safe to stand near the greasing points at this time. Greasing systems are designed to surmount this obstacle and make greasing during operation feasible. But how reliable are these systems? These and more topics were reviewed in this paper.
Kimberly Matthews of Bestolife Corporation presented the paper “Betting on Environmental Thread Compounds.” Ms. Matthews pointed out that Environmental, Health and Safety regulations for the oil and gas industry are very common and noted that even though rules continue to multiply, the implementation of the numerous regulations can move slowly into the industry depending on the risk severity. For several years, the industry has alleged that lead-based thread compounds would be phased out and replaced with nonmetallic options. After a brief overview of EH&S regulations, this paper described why anhydrous calcium and calcium complex greases have fulfilled the need for a biodegradable, non-toxic, and non-bioaccumulating base for environmentally friendly thread compounds by exploring the physical characteristics and ecological toxicity are examined for both greases.

“Grease Compatibility Charts are Dangerous!” presented by Chuck Coe of Grease Technology Solutions, introduced drawbacks to grease compatibility charts which have been around for many, many years. These charts are based solely on thickener type and assess compatibility as “compatible”, “borderline” or “incompatible.” Unfortunately, such charts are unreliable, and in many cases, in violent disagreement with one another. Mr. Coe presented a study of the compatibility of 6 different commercial greases, debunking the usefulness and safety of these dangerous charts.

Would you recommend others to attend?

“I would highly recommend the annual NLGI meeting for its individual technical development, insight into new technical presentations and the many opportunities to network with the industry. It is also well organized to bring your spouse or family and enjoy the many different locations and activities.”

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Would you recommend others to attend?

“I would absolutely recommend attending NLGI courses and annual conference. This is a “must” event in our annual calendar both for networking and educational reasons!”

Mehdi Fathi-Najafi of NYNAS AB presented “Grease Production, CO2 emission … a New Relationship!” It delved into the fact that the grease industry is regarded to be very conservative; for example, although conventional lithium grease was invented in 1942, 55 percent of the global grease production is still based on this technology and is close to 90 percent in countries such as China and India. Surprisingly, prior to a recent technical paper no one has studied the energy consumption and possible environmental impact of the grease manufacturing process. In this presentation Mr. Fathi-Najafi aimed to measure the energy consumption in full-scale production when a pressurized reactor is used and compared to a traditional open kettle reactor. The authors believe that the outcome of this study could be a milestone in assessing grease production in terms of significant reduction of carbon dioxide and increase awareness of the impact of our industry in the global arena.

The final technical paper titled “Innovations in Grease Process Control Improve Results” was presented by Arnold Josefson of Emerson Automation Solutions. Mr. Josefson detailed how reproducibility of grease production has been an issue that has vexed the industry since higher performance products became the norm. By applying a proper control philosophy and applying the latest instrumentation to improve the predictability of the reaction, it is possible to improve the repeatability of the product and provide better consistency and reduce costs. Mr. Josefson discussed steps taken to improve the production process and reduce operating costs in a modern continuous grease unit through process design, instruments and control.

What value did you find from the technical sessions?

Absolutely. The NLGI annual meeting has something for everyone. The technical talks help update folks about the latest research and trends in the grease industry. The education course helps newcomers learn, and the various opportunities that new attendees get to interact with folks who have a lot of experience in our industry is also unique to the NLGI conference due to the intimate nature of the annual meeting.”

ABOUT THE AUTHORS:

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THANK YOU TO ALL OF THOSE WHO PARTICIPATED IN OUR 2019 ANNUAL MEETING SURVEY.

Congratulations to Michael Tann, Account Manager, Lubrizol as this year’s winner of a Visa gift card.