SUMMER 2014

PetroChoice : Partner Pages

Energy Efficiency With Lubricants

Mobil Industrial Lubricants

Advanced synthetic lubricants can help us address energy demand to achieve sustainability. ExxonMobil Corporation defines sustainability as balancing economic growth, social development and environmental protection so that future generations are not compromised by actions taken today. For example, oil that extends lubricant drain intervals may contribute to health and safety by reducing the amount of interaction between humans and the machines. The choice of a proper lubricant can also help extend equipment life, enhancing reliability and equipment availability leading to increased return on capital or economic growth. And longer oil life can also help reduce waste and environmental impact related to energy use.

Energy Loss in Industrial Equipment

The causes of efficiency loss in equipment (gearboxes, engines, hydraulic systems, etc.) generally fall into two categories: speed dependent and load dependent. The load dependent losses are of interest as they result from internal fluid friction and metal-to-metal contact. They may be improved upon by using a suitably formulated lubricant with carefully selected base oils and additives to improve efficiency.

Frictional losses can occur under all three lubrication regimes: hydrodynamic, elastohydrodynamic (EHL) and most significantly boundary lubrication, where metal surfaces are in contact.

Hydrodynamic lubrication exists in systems where the contact occurs over a relatively large area and the pressure in the contact region is not too high. A significant part of the energy losses in the hydrodynamic scheme are related to the viscosity of the oil under operating conditions. Components operating under this regime are found in a large number of industrial and automotive applications and most often include journal and thrust bearings.

EHL is associated with components where the load is supported over a small area. In this system, the load is so high that the surface of the mating components elastically deforms to form a small contact patch. The lubricant film is drawn into this area and separates the surfaces. Under these high pressure conditions, the oil is sheared, with the extent of shear loss determined by how the oil behaves under high pressure conditions, greater than 1 Gpa. Examples include all types of rolling element bearings, such as those found in engines and gears. Boundary lubrication occurs as the bodies come into closer contact at their asperities; the heat developed by the local pressures causes a condition which is called stick-slip and some asperities break off. At the elevated temperature and pressure conditions chemically reactive constituents of the lubricant, commonly referred to as anti-wear additives and friction modifiers, form a chemical film on the surface and prevent direct metal-to-metal contact. This phenomenon may occur in all components found in engines and gears and is the most common of the lubrication regimes experienced.



Lubricant Bench and Rig Testing

Synthetic lubricants may be used to improve energy efficiency, however not all synthetic lubricants provide the same benefits. In controlled testing, three synthetic oils were tested and the results showed that Polyalphaolefin (PAO, API Group IV) – only based gear oil were superior and showed an average of 6% efficiency over an API Group III / PIB-based gear oil. Further testing found PIB-containing gear oils showed significant shear loss versus PAO-only based gear oil, with corresponding higher wear rates which would result in shorter equipment life.

Experiments to measure finished lubricantrelated energy efficiency benefits are inherently challenging. A Mini Traction Machine (MTM) was used to measure the traction forces transmitted across a lubricant film under varying amounts of sliding while controlling load, speed and temperature. The actual traction coefficient measurement over a range of slide to roll ratios shows that synthetics have much lower traction coefficient than typical mineral oil based products. This leads to more energy efficient operation, reduced heat generated, and lowers overall system operating temperatures.

Testing was also carried out using a conventional EHL ball on disc rig equipped with temperature mapping using infrared imaging. This provides a map of lubricated contact under highly loaded EHL conditions with varying amounts of sliding, while controlling load, speed and inlet temperature. The data generated showed variation in temperature as the disk surface is heated due to shearing of the fluid in the contact zone. The temperature rise is a function of the heat generation per unit area, which is the product of the fluid shear stress under the contact conditions and sliding speed.

For a given sliding speed, fluids with lower shear stress will provide lower temperature rise across the EHL contact. Advanced synthetic lubricants were evaluated against conventional mineral oil based lubes and found to reduce the temperature in the contact zone by >4°C, leading to lower overall system operating temperatures.

The next phase of testing was done in a highly instrumented worm gear box specifically developed by ExxonMobil to evaluate lubricant efficiencies. Worm gears were chosen because the worm forms elliptical contact against the wheel, where sliding motion is predominant, creating a relatively inefficient energy transfer environment (70 - 80%) compared to other types of gearing.

A Modular Small Worm Gear (MSWG) test rig was used in this part of the testing. It employs two torque meters to measure torque into and out of the gearbox. The output torque is divided by input torque to provide the percent efficiency. Torque, rather than current, is measured in this test as current/ voltage measurements have much higher associated error.

This testing shows the efficiency of advanced synthetic technology (reference oil) and mineral oil based gear oil. Efficiency is determined from data from the latter part of the test run, after the gearbox reaches thermal equilibrium. The gearbox is run at full speed (1800 rpm input), 100% of rated load at 20/1 reduction ratio. Each gear box is separately calibrated and run-in, and tests are bracketed by reference oil runs to take into account any consistent drift in the data.

The reproducibility of this test has been determined to be +0.25% (absolute). The results from this highly controlled testing indicate an energy efficiency improvement of 3% when comparing these two lubricants.

Thermo-graphic images, taken from the MSWG show that advanced synthetics run approximately 15°C (27°F) cooler than typical mineral oil based industrial gear oils. Lower operating temperatures lead to increased equipment life, improved efficiency and reduced maintenance costs.

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Employee Spotlight

VINCENT SMITH

This issue's Mid Atlantic Division employee spotlight shines on Vincent Smith.

Vincent was born in District Heights, MD and spent his first 7

years living outside of the Washington D.C. area. When he was 7, his family moved to Berryville, VA where he attended Clarke County schools, graduating high school in 1982. After high school, Vincent moved to Winchester, VA and attended Fairfax Community College to study Computer Training.



Vincent has had a long career in the oil industry- 32 years to be exact! He

had been hired right out of high school by Garland Canter, Inc., a Phillips 66 Jobber, driving Fuel Oil and Gasoline trucks. He also stepped into to fill in for the Wrecker Service that Garland M. Canter owned at Shawnee 66. He was the first person under 21 hired by the company, and it proved to be a good decision. From Garland Canter, Vincent moved to Quarles Petroleum as a sales representative. He also attended tech school to learn more about Gilbarco, Gasboy, Tokheim, and Wayne Fuel Dispenser Pump repair. He moved up from driving a truck to selling Propane, Diesel Fuel and Shell and Mobil oil products. After 17 years with Quarles, Vincent made the move to Tri County Petroleum, now PetroChoice. He has been a driving force selling in our Virginia territory for the past 11 years, earning multiple achievement awards.

Having started in the industry at such a young age, Vincent has learned a lot through the years. He attributes his longevity to the knowledge he has acquired on the job. He appreciates going to see a customer, learning what machines they have and helping them figure out which specific products will most benefit their machines. He says there is always something new to learn every day. He is a great team player, and often provides advice and guidance to other members of his team.

Vincent currently lives in Winchester, VA with his wife Jennifer, an avid tennis player. They share 4 kids, Vincent II (22), Brooke (22), Marcus (20), Trevor (16), and a big Black German Sheppard named Beau (2) who is spoiled rotten! In the summer months, they enjoy Fishing and Kayaking on the Shenandoah River. They also enjoy taking their boat out on Lake Anna (VA).

Vincent looks forward to continual growth with PetroChoice, and plans to retire with the company many years from now. -Lindsay Bankert, Corporate Marketing

The Caitlin Conundrum

Russ Singleton likes a challenge. As General Manager of Caitlin Chrysler-Dodge-Jeep in Jenkintown, PA he was faced with one of monumental proportion. How could he take over an abandoned, dilapidated Chevrolet facility that was built over 50 years ago, and transform it into a new state-of-the-art car dealership? To complicate matters, how could he do it while profitably selling new cars and running a service department amid all of the construction?

Russ is no stranger to renovating an entire dealership, having done so as the GM of Spencer Chevrolet in Springfield, PA. With the help of PetroChoice, the vacant dealership was revitalized, but the challenge at Caitlin Chrysler was on a much larger scale due to the size of the building and the amount of demolition required.

One of the first calls that Russ made was to Scott Viguers, his Territory Manager at PetroChoice. A meeting was initiated that included veteran Equipment Specialist, Bill Shapcott, the architect, and the General Contractor. It was decided that the project would be done in three phases.

The first phase was turning the old body shop into 5 productive service bays while selling new cars out of a trailer. Four Rotary 10,000 lb Shock Wave lifts and an 18,000 lb heavy duty 4-Post lift with 2 rolling bridges was installed. Existing air piping was rerouted. Exhaust hoses, lube and waste oil equipment, was put in place while



Pictured L-R: MacroAir Fan, Rotary Lifts, Clean Burn Unit and Exhaust Reels the rest of the dealership was being gutted.

Once the majority of the structural construction was completed, the colossal "phase two" portion of the project was began. The new service area would accommodate 31 service bays. It included more Rotary lifts, four 320,000 BTU Clean Burn waste oil heaters, three 16' Macro Air fans, two Eurovent aluminum exhaust rails with telescoping trolley exhaust reels, 700 feet of Prevost light weight aluminum piping for compressed air, four banks of lubricant reels, a waste oil evacuation system complete with emergency shut off, and storage tanks for over 3,500 gallons of virgin and waste oil.

The lifts and miscellaneous equipment in the old body shop/ temporary service bays was disassembled and relocated to the main shop in a fashion that would not interfere with the dayto-day operation of the service department.

The final phase is still a work in progress. Additional equipment is ordered as the business continues to thrive. Caitlin Chrysler continues to successfully sell new and used cars which has ultimately resulted in more traffic in the back end. There are currently 6 more Rotary lifts scheduled for installation, as well as additional air drops, another telescoping exhaust trolley, lube reels, waste oil drains, and possibly another Macro Air fan.

"The trust factor and our excellent relationship were the reasons that I chose to use PetroChoice again." Russ stated when asked about partnering with PetroChoice for a second project. "I am absolutely satisfied with the equipment and the work performed. You did not let me down."

> -Scott Viguers, Territory Manager

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Energy Efficiency With Lubricants

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Lubricant Field Testing

Field testing of advanced synthetic technology was carried out in a Falk double reduction gear box driven by an 1150 HP induction motor at a taconite mine in Minnesota. The gear box is coupled to a primary ore conveyor that is approximately one-quarter mile in length. It is supported by a series of guide rollers and standards, with the rollers positioned in a concave arrangement that cups the conveyor to channel the taconite ore to the center of the conveyor as it being transported.

The Falk gearbox is a double reduction parallel shaft speed reducer with a ratio of 39.4:1, driven by a 4160 VAC, four pole, 3-phase 1150 HP GE induction motor. The motor is directly coupled to the high speed input shaft of the gear box providing 1792 RPM that is reduced to 45 RPM at the gear box output shaft. The maximum calculated torque output from the gear box at is 137,189 ft-lbs.

The efficiency study was undertaken using an A-B-A-B comparison methodology. The conventional gear oil representing the 'A' series studies and the advanced synthetic representing the 'B' series. The premise was to determine if one gear oil type was more efficient, requiring less motor input power to generate comparable torque as a function of loss reduction in the gear box. During the study, power input to the motor was compared relative to the torque required to transfer the taconite ore over various time periods. Load curves were created for each period as function of input power to the motor versus output torque produced by the gearbox.

To obtain measurements, a Fluke 1760 three phase power analyzer was used to monitor input power to the motor. Input power was captured at the main MCC feeding the motor, where true three phase power readings were continuously recorded along with motor RPM at 200msec intervals. The power recordings were time synchronized with the torque values taken on the output shaft of the gear box. The readings were captured using a strain gage mounted to gear box output shaft.

As the conveyor belt transports batches of ore, the power consumption cycles up and down. Amidst these cycles, 10 periods of steady state operation were identified. These steady state periods were the basis of the efficiency calculations, and these periods were considered as independent samples to calculate confidence intervals on the estimates of mean efficiency. Including both high and low load conditions, using 95% confidence intervals, the advanced synthetic lubricant was found to be 3.6% (+/ 1.3%) more efficient than the conventional mineral oil based product as shown below.

Based on measured watt usage and assuming continuous operation, using the advanced synthetic lube can save from \$8,700 to \$17,400 per year using a range of \$0.05 to \$0.10 per kilowatt hour.

Conclusion

Based on the results presented, advanced synthetic products have the potential to significantly reduce energy consumption in gearboxes, demonstrating energy savings of up to 3.6 percent versus conventional mineral based gear oils.

Our test gear box held 330 gallons and the cost to upgrade the gear oil from mineral to advanced synthetic was approximately \$6,600. Based on the test results, the increased oil expense would be recovered after 5 - 9 months of operation and any additional runtime achieved on a single charge of oil, would be energy savings realized by the user.

ExxonMobil has conducted several field trials documenting energy efficiency gains with engines, gearboxes and hydraulic systems. Mobil Delvac 1 has proven up to 2% fuel savings in diesel engines. Mobil Pegasus 1 engine oils have proven fuel efficiency savings in natural gas engines. Mobil SHC Series oils have proven 1 - 6% energy efficiency gains in gearbox applications. Mobil DTE 10 Excel Series hydraulic coils have proven 4 – 8% energy savings in hydraulic applications.

In sustainability terms, the choice of proper advanced synthetic lubricant clearly leads to increased return on capital investment and provides economic growth. Remember, energy usage is predicted to grow substantially over the next 30 years. Using an energy efficient lubricant is one way to help meet this demand.

- ExxonMobil Industrial Lubricants

Employee Spotlight

RICK SCHULTZ

This issue's Midwest Division employee spotlight shines on Rick Schultz.

Rick was born and raised in La Crosse, WI, along the Mississippi River. After high school he attended the University of Wisconsin- La Crosse where he studied math, chemistry and education. Rick continued his studies at Winona State University (MN) and graduated with a degree in Education Administration.



After earning his degree, Rick taught Junior High for 6 years in Sparta, WI. He moved into a High School administration role in the same school district, but was not satisfied with his career path. He saw a sales opportunity with Oakite Products, a chemical and solvent company based in New Jersey, and began his sales career.

Rick stayed with Oakite for 4 years selling to general manufacturing accounts before moving on to Chemtool, Inc. as a Western Regional Sales Manager. After 8 years with Chemtool, Rick found a growth opportunity to become the Vice President of Industrial Sales with Lube-Tech Inc., a distributor out of the Minneapolis- St. Paul area. His career thrived for 13 years with Lube-Tech, but his previous employer, Chemtool, wanted him back. They enticed him with an offer he couldn't refuse- setting up sales forces throughout Europe. This meant overseas travel to cities like Prague, Czech Republic, Rome and Belgium!

Rick had been familiar with PetroChoice (formerly Anderson Lubricants) and our employees from his dealings with his previous employers. When he found out about an open position to create more of a general manufacturing presence in the Minneapolis- St. Paul area, he rose to the challenge and accepted the position.

With over 35 years of sales and sales management under his belt, Rick credits his success to his ability to establish relationships with both customers and the people he works with. In fact, building those relationships has created lifelong friends.

After being a world traveler, Rick decided to plant his feet back in Wisconsin. He currently lives in a small town of 2,400 people with one stoplight- Osceola, WI. He and his wife, Dayle, enjoy hunting so much that they bought a farm about 45 minutes from their house to use as hunting grounds. They also take an occasional trip to Lake Michigan to boat and fish for salmon. Rick is extremely proud of his two stepsons, one a doctor in Detroit, and the other who works computer graphics for Facebook in Seattle. He also enjoys spending time with his 2 granddaughters in Seattle and 2 grandsons in Detroit.

Rick is very excited to be a part of the PetroChoice team and working with Steve King, and looks forward to future growth within the company.

-Lindsay Bankert, Corporate Marketing

Recent Acknowledgements

 Congratulations to the following PetroChoice employees on passing the Machinery Lubrication Technician (MLT 1) exam.

Charlie Byrnes
Shawn Gilbertson
Brandon Haavisto
Chase Jackson

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Dusty Lundin Earl Nickula **Kevin Wilson**

From the Desk of Shane O'Kelly

Dear Valued Partners –

We are in the business of customer service.....but sometimes good service means giving a customer bad news. A good example of that situation occurred recently when our service team encountered a piece of equipment that was unsafe. The operators expressed their concern about the situation, but no one made the decision to shut it down. When our service team observed the equipment, they quickly saw the issues and immediately declared that is was unsafe for use.

For a busy customer, losing equipment on short notice really reduces the ability to make money. Some customers may ignore the problem and/or look for a workaround to keep their turnaround profitable. Luckily this customer was able to get their equipment replaced and is back up and running. Our service team is made up of true professionals and they made the right call, even if that's not initially what the customer wanted to hear.

Equipment inspections are important for our customers to maintain reliability and extend their equipment life. Our Service Team and Territory Managers can walk through your shop with you and discuss a plan of action for your current equipment, as well as make recommendations on how you may be able to capitalize on using new products and equipment.

If you see anything unsafe in your shop, on the job, or something the PetroChoice team is doing, bring it to someone's attention. Nothing is more important than everyone going home safely at the end of every day.

Sincerely, Shane O'Kelly PetroChoice Chief Executive Officer

Supporting Our Community

PetroChoice is teaming up with our customer, J.P. Mascaro & Sons, to host a blood drive in memory of Francesco "The Chief" Mascaro (1947-2013). Francesco Mascaro was an owner of J.P. Mascaro & Sons, and spent his whole life giving to others. The Mascaro Family has a goal of collecting 1,000 pints in the month of August to help others in need. There will be a blood drive location at PetroChoice's Duryea location, 1 Clark Road, Duryea, PA, on Thursday, August 21 from 2-7 p.m.

All presenting donors at the Duryea location will receive a coupon for a free medium Iced Coffee and a free donut from Dunkin Donuts, and a coupon for \$2.50 off the purchase of a 48 oz. container of Turkey Hill All Natural Ice Cream.

If you cannot make it to the blood drive, or do not live in the area, please visit www.redcrossblood.org or call 1-800-RED-CROSS to schedule an appointment near you. Support your community!

J. P. Mascaro & Sons







Upcoming Events

September 5-6, Great Lakes Logging & Heavy Equipment Expo, Oshkosh, WI
September 6, PA Energy Games, Hughesville, PA
September 10-11, Iron Range Miners' Expo, Chisholm, MN
September 24-25, Shale Insight 2014, Pittsburgh, PA

For more information about the events listed, contact Lindsay Bankert, lbankert@petrochoice.com



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