Third Quarter 2010

Lubeletter

Synthetic Lubricant News from Nye Lubricants, Inc.

NEWSClips

At ***SemiconWest 2010***, the Nye Semicon Team introduce new Ultra Low Outgassing lubricants for high-vacuum applications, part of the NyeTorr product family. The show took place last July at the Moscone Center in San Francisco, CA.

Dewayne Massie, Nye Corrugating Industry Manager, will be exhibiting at **TAPPI/AICC 2010 Corrugated Week** in Baltimore, MD. After a successful ACCCSA show in Costa Rica, Dewayne will introduce NyeCorr to all attendees at this show.

Nye exhibited at the **ACCCSA show** in San Jose, capital city of Costa Rica, alongside our Channel Partner, TransAmerica Lubricants. The show took place from July 18 to 21, 2010. ACCCSA (Asociación de Corrugadores del Caribe, Centro y Sur América) is a corrugating industry association for Caribbean, Central and South American companies.

Product Releases:

Fluorocarbon Gel 866R-MS - An EP fortified, rust inhibited, PTFE thickened, light viscosity grease intended for sliding surfaces where a combination of good film strength and low breakaway force is needed.

NyeFilm® 530 - 5% dispersion of ester wax in an isoparaffinic solvent. This lubricant provides friction reduction, wear protection and corrosion resistance for salt water conditions like fishing reels.

Nye Synthetic Oil 276LA - Oil for high temperature oven chains. 276LA is food grade approved, able to survive high temp and match or surpass the performances of Klüber Hottemp+.

Fluorocarbon Gel 865L-MS - A PTFE thickened, medium viscosity, synthetic hydrocarbon grease intended for sliding metal surfaces. Benefits include good film strength and low breakaway force.

Ultraclean Lubricants: A Specialized Process for Critical Applications

Often there is a fine line between success and failure. In many specialized lubricant applications the difference between success or failure could be a particle the size of a grain of sand or a molecular haze from an additive. Unfortunately, many design engineers do not pay enough attention to the cleanliness of the lubricants they specify for an application. They typically select lubricants for temperature, viscosity, wear protection, corrosion inhibition, and other functional properties. It is not until there is a high percentage of unexplained rejects or, worse, failures in the field that the spotlight turns toward the lubricant.

SMALL PARTICLES – BIG PROBLEMS

Contamination in every shape and form can alter the performance of critical applications. Molecular contamination, volatile material that can be released from lubricants, can fog the optics in satellites or wreak havoc in a semiconductor cleanroom. An open circuit in a switch could be the result of a particle wedged between the contacts. Lubricant on a disk drive provides protection for the occasional bumps that happen as the flying head cruises 500 angstroms over the surface of the disk. Without lubrication, the surface would wear quickly. The presence of solid contaminants in the oil, however, can jeopardize the protective film, turning the flying head into a virtual golf club hitting particles of debris across the surface of the disk or driving them into the disk surface. Miniature precision bearings found in disk drives, spacecraft gyros, high speed dental drills, or positioning equipment used in vacuum chambers contain balls as small as 350 microns — which means that specks you can't see with an unassisted eye (<45 microns) can pose a serious threat to the life and operation of these bearings. The life of a bearing depends on a micro-thin film of lubricant that separates the ball and the raceway. The rotation of bearings creates this elastohydrodynamic (EHD) film. Any solid contaminant greater in diameter than the EHD film can result in "debris denting", where the contaminate jams between the two surfaces, damaging one or both surfaces. Further, the denting sometimes creates additional debris, which causes bearing "noise." Repeated denting action can eventually lead to "peeling" or microspalling, a very shallow chipping of the surface caused by metal fatigue. In the fiber optics industry, contamination plays a more passive, but nonetheless harmful role. It does not gouge or dent. It just blocks the light — typically in fiber optic connectors, one of the few junctures on this information highway where light waves can be interrupted. Fortunately, however, lubricant contamination, with a bit of foresight, can be minimized or avoided altogether. Nye Lubricants, for over 35 years, has been involved in developing innovative procedures, test methods and equipment to provide ultraclean lubricants to the Aerospace, Semiconductor, and Photonic Industries.

WHERE DOES IT COME FROM?

Solid particles in lubricants come from many sources but raw materials, the manufacturing process, and the environment are the most common culprits. Raw materials such as the base fluids, gellants, and additives used to make lubricants may contain paper fiber, plastic debris, hair and iron oxide.

Volatile contamination lurks within the chemical structure of the base oil and additives. This chemical menace remains hidden until conditions such as temperature or vacuum release it from the lubricant to migrate to surfaces where it may cause substantial harm.

During the manufacturing process, lubricants can pick up metal from misaligned machine parts, rubber from gaskets, and carbon from kettles. Dust particles, fabric fibers, hair, glass; even nuts and bolts are just some of the environmental contaminants Nye has removed from lubricants during the past 35 years.

MORE On-line

New Method for Evaluating the Scuffing Load Capacity of Gear Oils

The transmission of power through gearing systems is at the heart of many Automotive and Industrial applications. With the critical nature of gears to an application's function it is important that they be designed with long life and endurance in mind. At higher speeds of operation in a gearing system adhesive wear (scuffing) will start to occur. It is at this stage where the surface film strength of the oil as well as the additive package will show their true importance.

Being able to predict scuffing wear, endurance properties of gear oils, and ultimately the life expectancy of gearing systems are problems that concern many Design Engineers. Previously the best way to perform pre-evaluation testing on gear oils was to run the ASTM D-5182 (FZG Scuffing Wear Test). However this test method is very expensive as it utilizes a full size gear set. Another deterrent to performing the ASTM D-5182 is that it can be dangerous to run as the test method uses highly loaded gears and shafts turning at high speeds which could cause personal injury at the point of failure. As an alternative Nye proposes to use an SRV4 Linear Reciprocating Tribometer (See Figure 1) to simulate the FZG Scuffing Wear test.

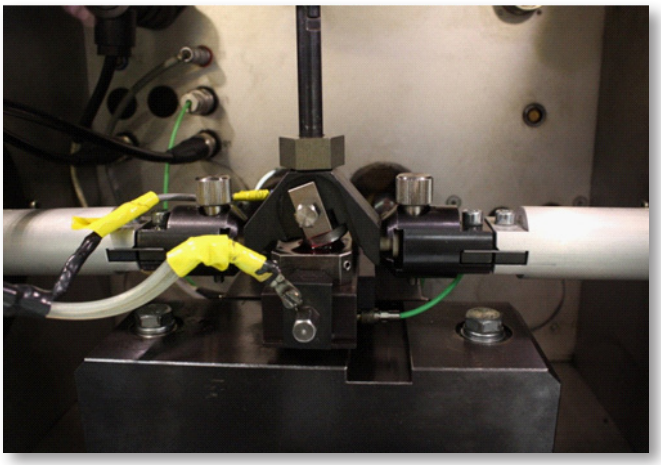

Figure 1: SRV Setup in FZG Scuffing Wear Simulation

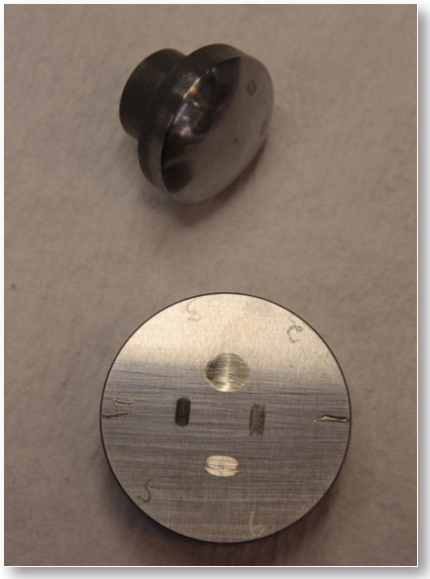

Figure 2: Upper and Lower FZG Specimens

This new method Nye has developed was accomplished by working with Optimol Instruments to make test fixtures that would have the same contact geometry as meshing gear teeth in the FZG Scuffing Wear test. This test fixture is composed of a semispherical upper specimen (See Figure 2) made of 20MnCr5 case hardened surface polished steel and lower discs (See Figure 2) made of 20MnCr5 case hardened cross ground steel. These materials are identical to what is used in the FZG Scuffing Wear test.

The FZG Scuffing Wear test is performed over 14 stages where the load is increased on the pinion gear and the subsequent Hertzian Contact Pressure is increased at the point where the gears contact. Since the contact stress of the semispherical specimen is the same as a full size gear used in ASTM D-5182, a stage program was developed using the same Hertzian Contact Pressure to simulate the conditions of the FZG Scuffing Wear test. To expand upon the ASTM D-5182 three additional theoretical stages have been added which will help separate superior gear oils from each other. These additional stages will allow us to look at oils that pass the traditional 14 stage FZG test in a different manner to help differentiate the best gear oils.

Through the development of this new test method and our continued focus on finding new cutting edge raw materials, Nye is looking to expand the technology of gear oils in the industry and work with partners who seek higher performance. Nye is currently developing a new generation of Synthetic Gear Oils which will have lower wear, increased biodegradability, and bring longer life to our customer's applications. In Table I, there are some results from our initial development. A standard grade Mineral Oil was tested as a baseline. It failed halfway through the FZG test criteria (Stage 7 of 14) but by using our proprietary additive package we were able improve the oil's capability by 5 stages. The Alkylated Naphthalene sample Nye made up came close to passing the FZG criteria but when our proprietary additive package was added it was able to make it to the final stage before failing. Currently the best performing formulation we have developed is a new biodegradable ester oil which passes both the 14 stage FZG test and our expanded 17 stage test without failure.

Oil	Mineral Oil	Mineral Oil	Alkylated Naphthalene	Alkylated Naphthalene	PAO	Ester
Additive	None	Proprietary	None	Proprietary	Proprietary	Proprietary
KV @ 40°C	29.8 cS	29.9 cS	35.9 cS	36.0 cS	30.7 cS	19.4 cS
KV @ 100°C	5.2 cS	5.0 cS	5.4 cS	5.3 cS	5.9 cS	4.3 cS
FZG Failure Load Stage using SRV	7	12	13	17	11	>17
SRV OK Load (ATSM D-5706)	400N	600N	350N	800N	550N	400N

Table I: Evaluation of Several Gear Oils in the Scuffing Wear Test

By utilizing new synthetic fluids, cutting edge additive technology, and our new Scuffing Wear simulation on the SRV4 we are confident that we can develop new innovative gear oils that will take performance to the next level.

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